Elk Late-Successional Reserve Enhancement Project
Final Environmental Impact Statement

Shasta-McCloud Management Unit, McCloud Ranger District, Shasta-Trinity National Forest
Siskiyou County California, T40N, R1W, Sec. 4 & 5; and T41N, R1W, Sections 27 to 34, MDM
In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA’s TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

(1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights 1400 Independence Avenue, SW
Washington, D.C. 20250-9410;
(2) fax: (202) 690-7442; or
(3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.
Elk Lake-Successional Reserve Enhancement Project
Final Environmental Impact Statement
Siskiyou County California

Lead Agency: USDA Forest Service

Responsible Official: David R. Myers
Shasta-Trinity National Forest Service
3644 Avtech Parkway
Redding, CA 96002

For Information Contact: Cindy Diaz, Natural Resource Planner
Shasta-McCloud Management Unit
204 W. Alma Street
Mount Shasta, CA 96067
530 – 926 - 4511

Abstract: The Shasta-McCloud Management Unit of the Shasta-Trinity National Forest (Forest) is proposing to restore and enhance the Elk Late-Successional Reserve (LSR) and restore dry meadow habitat and thin stands in adjoining Matrix lands in and around Elk Flat. Treatments proposed on approximately 3,482 acres of National Forest System Lands fall within five broad categories: 1) Forest Restoration; 2) Meadow Restoration; 3) Fire Restoration and Fuels Reduction; 4) Hydrologic Function and Soils Restoration; and 5) Transportation System Management and Decommissioning of Unauthorized Routes.

The Final Environmental Impact Statement (FEIS) considers four alternatives in detail. Alternative 1, the Modified Proposed Action and the Forest Service preferred alternative, is the Proposed Action that was scoped to the public with modifications. Alternative 4 is the no action alternative. Alternatives 2 and 3 were developed in response to public comments received during scoping. Alternative 2 responds to concerns over road construction. Since the project does not propose new Forest Transportation System (FTS) road construction, it limits new temporary road construction. Thinning, meadow enhancement, and machine piling treatments beyond ¼ mile from an existing FTS or inventoried Unauthorized Route (UA) would not be implemented. Prescribed fire would still be conducted. Alternative 3 responds to the issue regarding treatments in natural stands within Northern Spotted Owl (NSO) designated critical habit (CH). No underburning or thinning would be implemented within natural stands in the CH. Plantations within the CH would still be included in the project.
Document Structure

The Forest Service has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into a Summary followed by four chapters, Appendices, and Index:

**Summary:** The Summary provides a brief synopsis the key elements of the FEIS. The summary emphasizes the major conclusions, key issues, and the decision to be made.

**Chapter 1. Purpose and Need for Action:** The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency’s proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

**Chapter 2. Alternatives, including the Proposed Action:** This chapter provides a more detailed description of the agency’s proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes resource protection measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

**Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area, followed by required disclosures.

**Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.

**Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

**Index:** The index provides page numbers by topic.
# Table of Contents

Document Structure ........................................................................................................... i
Summary ................................................................................................................................... vii

**Introduction.** .......................................................................................................................... vii
Purpose and Need for Action and Proposed Actions ............................................................... viii
Public Involvement .................................................................................................................. xii
Alternatives ............................................................................................................................... xii
Conclusions ............................................................................................................................... xv
Decision to Be Made .................................................................................................................. xviii

**Chapter 1. Purpose of and Need for Action** ........................................................................ 1
Introduction ............................................................................................................................... 1
Background ................................................................................................................................. 1
Location ..................................................................................................................................... 1

Management Direction ............................................................................................................ 4
Late-Successional Reserves Allocation: Prescription VII-Late-Successional Reserves and Threatened, Endangered, and Selected Sensitive Species .............................................................................. 6
Matrix Allocation: Prescription VIII-Commercial Wood Products (CWP) ....................................... 7
Riparian Reserves Allocation: Prescription IX-Riparian Management ........................................... 7
Other Designations .................................................................................................................... 7
Revised Recovery Plan for Northern Spotted Owl ........................................................................ 8

Purpose and Need for Action ..................................................................................................... 9
Introduction and Summary .......................................................................................................... 9
Purpose and Need Discussion ..................................................................................................... 10

**Proposed Action** .................................................................................................................. 39
Introduction and Summary .......................................................................................................... 39
Decision Framework .................................................................................................................. 44
Public Involvement .................................................................................................................... 44

Issues ......................................................................................................................................... 45
Issue 1 – Large Trees and Snags ............................................................................................... 45
Issue 2 – Road Construction ..................................................................................................... 45
Issue 3 – Critical Habitat ......................................................................................................... 46
Issue 4 – Mushroom Collection in Elk Flat ................................................................................. 47
Issue 5 – Machine Piling .......................................................................................................... 47
Other Related Efforts ................................................................................................................ 47

**Chapter 2. Alternatives, Including the Proposed Action** .................................................... 49
Description of Actions ............................................................................................................... 49
Forest Restoration Treatments .................................................................................................. 49
Fire Restoration and Fuels Reduction Treatments ...................................................................... 54
Meadow Restoration ................................................................................................................ 55
Hydrologic Function and Soils Restoration ............................................................................... 56
Transportation System Management and Road and Landing Actions ........................................ 57
Other Connected Actions ........................................................................................................ 59
Alternatives Considered in Detail, Resource Protection Measures and Monitoring .................... 59
Alternative 1 - The Modified Proposed Action ........................................................................... 59
Alternative 2 - No New Temporary Road Construction Other than Those Required for Landing Use/Access ........................................................................................................................................ 66
Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl .............................................................................................................. 72
Alternative 4 - No Action .......................................................................................................... 78
Comparison of Actions - Alternatives Considered in Detail .......................................................... 79
Forest and Meadow Restoration Treatments ............................................................................. 79
Fuels Treatments ................................................................................................................... 81
Roads and Landings ............................................................................................................... 82
Hydrologic Function and Soils Restoration Actions .................................................................... 83
Other Connected Actions ........................................................................................................ 84

**Resource Protection Measures Common to All Action Alternatives** ................................ 84
List of Tables

Table 1. Successional Condition of Elk Flat LSR within the Project Area ......................................................... 3
Table 2. Vegetation types in Elk project area, as classified by CWHR (CDFW, 2008) ........................................... 4
Table 3. Forest Plan land allocation, management prescription acres and percentages of total project area ... 4
Table 4. Desired Late-Successional and Old-Growth Characteristics as Described in the NWFP and LSRA 17
Table 5. Seral Stage Condition of Treatment Units in the Project Area ............................................................. 19
Table 6. Introduction of Proposed Action Treatments in Response to the Purpose and Need ......................... 40
Table 7. Alternative 1 Summary of Forest Restoration Treatments Including Meadow Enhancement 61
Table 8. Alternative 1 Summary of Reforestation Actions ............................................................................. 63
Table 9. Alternative 1 Summary of Fuels Reduction Treatments ................................................................. 64
Table 10. Alternative 1 Summary of Road and Landing Actions .............................................................. 65
Table 11. Alternative 1 Summary of Hydrologic Restoration Actions .......................................................... 66
Table 12. Alternative 2 Summary of Vegetation Restoration Treatments and Changes from Alternative 1 67
Table 13. Alternative 2 Summary of Reforestation Actions ........................................................................ 69
Table 14. Alternative 2 Summary of Fuels Reduction Treatments and Changes from Alternative 1 .... 70
Table 15. Summary of Alternative 2 Road and Landing Actions and Changes from Alternative 1 71
Table 16. Alternative 2 Summary of Hydrologic Restoration Actions .......................................................... 72
Table 17. Alternative 3 Summary of Vegetation Restoration Treatments and Changes from Alternative 1 73
Table 18. Alternative 3 Summary of Reforestation Actions and Changes from Alternative 1 ........ 75
Table 19. Alternative 3 Summary of Fuels Reduction Treatments and Change from Alternative 1 .... 76
Table 20. Alternative 3 Road and Landing Actions by Forest Plan Allocation and Changes from Alternative 1 77
Table 21. Summary of Alternative 3 Hydrologic Restoration Actions .......................................................... 78
Table 22. Summary of Forest and Meadow Restoration Treatments Involving Timber Harvest .................... 79
Table 23. Summary of Reforestation Treatments ......................................................................................... 81
Table 24. Summary of Fuels Reduction Treatments ...................................................................................... 82
Table 25. Summary of Road and Landing Actions .......................................................................................... 82
Table 26. Summary of Hydrologic Restoration Actions (acres) .................................................................... 83
Table 27. Levels of Acceptable Mortality When Underburning Natural Stand Units - Underburn Only .... 88
Table 28. Levels of Acceptable Mortality When Underburning Natural Stand Thinning Units ................. 88
Table 29. Comparison of Effects of Alternatives Considered in Detail .......................................................... 97
Table 30. Indicators and Measures of Effects for Silviculture and Forest Health ........................................... 129
Table 31. Alternative 1 Acres of Stand Density Reduction .............................................................................. 133
Table 32. Alternative 1 Average Percent of Pine-Limiting SDI in Thinning Stands ........................................ 133
Table 33. Alternative 1 Acres of Insect and Disease Treatment and Risk Reduction .................................. 135
Table 34. Alternative 1 Plantation Treatments to Accelerate Development ................................................. 135
Table 35. Alternative 1 Average Trees Per Acre Over 24 Inches DBH In Thinning Units Pre and Post-Thinning 136
Table 36. Alternative 1 Average Overstory Tree DBH in Thinning Units Pre and Post-Thinning .......... 136
Table 37. Alternative 1 Average snags per acre over 20 inches DBH in Thinning Units Pre and Post-Thinning .. 137
Table 38. Alternative 1 Acres of Increased Heterogeneity .......................................................................... 138
Table 39. Alternative 1 Acres of Hardwood Release ................................................................................. 138
Table 40. Alternative 2 Acres of Stand Density Reduction ............................................................... 141
Table 41. Alternative 2 Acres of Insect and Disease Treatment and Risk Reduction ................................ 142
Table 42. Alternative 2 Plantation Treatments to Accelerate Development ................................................. 142
Table 43. Alternative 2 Acres of Increased Heterogeneity .......................................................................... 143
Table 44. Alternative 2 Acres of Hardwood Release ................................................................................. 144
Table 45. Alternative 3 Acres of Stand Density Reduction ........................................................................... 145

Appendix I – Comments on DEIS and Responses ....................................................................................... I-1
Index .............................................................................................................................................................. 1
Table 46. Alternative 3 Acres of Insect and Disease Treatment and Risk Reduction ...........................................146
Table 47. Alternative 3 Acres of Increased Heterogeneity ....................................................................................147
Table 48. Alternative 3 Acres of Hardwood Release ............................................................................................148
Table 49. Average Percent of Pine-Limiting SDI ..................................................................................................149
Table 50. Average Trees Per Acre, > 24” DBH .....................................................................................................149
Table 51. Average Overstory DBH .......................................................................................................................150
Table 52. Average Snags ≥ 20” DBH ....................................................................................................................150
Table 53. Summary of Effects to Silviculture and Forest Health ..........................................................................151
Table 54. Fire Behavior ........................................................................................................................................154
Table 55. Summary of Fire and Fuels Effects by Alternative ................................................................................161
Table 56. Indicators for NSO and sensitive species Relative to Purpose and Need and Key Issues ................166
Table 57. Acres of Suitable, Dispersal, and Capable Habitat and Acres of Critical Habitat (CH) in NSO Action Area ........................................................................................................................................173
Table 58. Acres of Suitable and Capable Habitat in NGO and Fisher Analysis Areas and Project Area ........173
Table 59. Hydrologic Resource Indicators and Measures ...................................................................................202
Table 60. ERA of Ongoing and Past Activities at the Sub-Drainage Scale .............................................................209
Table 61. Summary of Hydrologic Resource Elements and Indicators: The Expected Response by the Indicator from the Proposed Action, Alternatives and Effect to the Resource ...........................................................................215
Table 62. Soil Disturbance Recovery Rates ..........................................................................................................218
Table 63. Indicators and Measures of Effects for Soils .........................................................................................219
Table 64. Elk Flat LSR Enhancement Project Erosion Hazard Rating (EHR) ..........................................................225
Table 65. Soil Resiliency Index Rating ................................................................................................................225
Table 66. Comparison of Alternatives for Soil Productivity .................................................................................232
Table 67. Transportation Resource Indicators and Measures for Assessing Effects ...........................................236
Table 68. Existing FTS Roads by Maintenance Level and Functional Class ...........................................................239
Table 69. Summary comparison of environmental effects ...................................................................................243
Table 70. Change in Employment from Previous Year, 2002-2010 .................................................................252
Table 71. Cost Benefit Matrix Cost Description ................................................................................................254
Table 72. Present Net Values and Benefit/Cost Ratios of Action Alternatives ...................................................255
Table Appendix A-1 Unit-Specific Existing Condition and Objective Information Pertaining to Treatment Prescriptions ..............................................................................................................................A-1
Table Appendix A-2. Unit Treatments by Alternative ..........................................................................................A-6
Table Appendix A-3. Estimation of Actual Machine Piling by Unit ..................................................................A-31
Table Appendix A-4. Stream Flow, Water Table Elevation and Riparian Vegetation Restoration ......................A-33
Table Appendix A-5. Proposed Road Actions by Alternative .............................................................................A-36
Table Appendix A-6. Estimated Temporary Road Needs by Unit ......................................................................A-40
Table Appendix F-1. Present and Reasonably Foreseeable Future Activities in the Elk Vegetation Management Project’s General Cumulative Effects Boundary and the Project Boundary .........................................................F-2
Table Appendix H-1. Poverty Status by State and County, 2000 and 2005 .........................................................H-7
Table Appendix H-2. Seral Stage Diversity in Ash Creek Watershed ...............................................................H-28
Table Appendix H-3. Summary of Silviculture Treatments and Effects to Seral Stage .....................................H-29
Table Appendix H-4. Summary of the Capability of NFS Lands in the Ash Creek Watershed ..........................H-30
Table Appendix I-1. Commenter Number, Name, Organization and Date Received ........................................I-1
Table Appendix I-2. Comment List by Commenter ............................................................................................I-2
Table Appendix I-3. Index to Responses by Concern Topic ...............................................................................I-11

List of Figures

Figure 1. Vicinity Map ...........................................................................................................................................2
Figure 2. Forest Plan Land Allocations ..................................................................................................................5
Summary

Introduction
The Forest Service has prepared this environmental impact statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives considered in detail.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located in the online project record.

Location
Located in Siskiyou County, California, the Elk Late-Successional Reserve Enhancement project (Project or Elk Project) is approximately 9 miles northeast of the community of McCloud and 70 miles northeast of Redding.

Management Direction
Forest Plan land allocations of Late Successional Reserve, Matrix-Commercial Wood Products, and Riparian Reserves comprise the 3,519-acre project analysis area (project area). The Project area includes the entire Elk Flat LSR, which constitutes approximately 76 percent of the project area, plus adjoining Matrix-Commercial Wood Products Emphasis lands in and around Elk Flat meadow. Riparian Reserves overlay the LSR and Matrix lands along intermittent and ephemeral streams.

Late-successional reserves were established as part of the conservation strategy for species associated with late-successional and old-growth forest ecosystems under the Northwest Forest Plan (NWFP, 1994). They maintain a functional late-successional and old-growth forest ecosystem and Shasta-Trinity National Forest Land and Resource Management Plan (Forest Plan) standards and guidelines are designed to maintain and protect these important ecosystems from large-scale losses due to uncharacteristic wildfire, insect and disease epidemics, and major human impacts. Natural ecosystem processes such as gap dynamics, natural regeneration, pathogenic fungal and insect activity, and low-intensity fire remain active (NWFP pp. Standards and Guidelines, p. B-1) The Forest Plan includes standards and guidelines for LSR and the Shasta-Trinity National Forest Late Successional Reserve Assessment (LSRA) provides LSR-specific guidance (Forest Plan pp. 4.37, 4.43; LSRA p. 174).

Commercial Wood Products (CWP) prescription applies to the Matrix land allocation within the project area. CWP lands are managed to obtain an optimum timber yield of wood fiber within the context of ecosystem management (Forest Plan p. 4.67).

The Riparian Management prescription is to maintain or enhance riparian areas, wildlife and fisheries habitat, and water quality by emphasizing streamside and wetland management (Forest Plan p. 4.59) and applies to riparian areas regardless of land allocation.

Wildland Urban Interface (WUI) associated with adjoining private lands and structures overlays portions of the project area. As part of the National Fire Plan, Federal agencies conduct fuels reduction in and around the

---

1 A letter from the NWFP Regional Ecosystem Workgroup clarified interpretation of the LSRA in 2009 (Mohoric, 2009)
WUI to reduce the risk of stand-replacing wildfire to people, communities and natural resources while restoring forest ecosystems to more closely match their historical characteristics.

**Purpose and Need for Action and Proposed Actions**

**Existing Condition**
The majority of forest stands in the Elk Flat LSR lack high quality late-successional habitat and are deficient in structural diversity. High stand densities slow tree diameter growth through competition for limited resources and impede the transition of early- and mid-successional forest toward late-successional habitat. Based on CWHR (California Wildlife Habitat Relationship) vegetation classification, most of the project area is ponderosa pine with about 10 percent in sierra mixed conifer vegetation classification where increased elevation transitions from essentially flat ground. Lower elevation areas in the eastern and southeastern portions are composed of ponderosa pine-dominated stands, transitioning to white fir-pine and mixed conifer-pine in the central and western portions. Plantations ranging in age from just over 10 years to over 40 years old account for 25 percent of the project area, with the older plantations being predominantly ponderosa pine. The Elk Flat Meadow is the only non-forest vegetation type and accounts for 15 percent of the project area. The natural stands range in age from 60 to 120 years old.

Although most of the project area is ponderosa pine type forest, white fir is often the dominant species in the natural stands. Past harvest practices selectively removing the large, overstory pine and Douglas-fir, along with decades of fire suppression have combined to encourage proliferation of white fir in the ponderosa pine forests. Preferential removal of the large overstory trees left smaller, more shade tolerant trees such as white fir.

Past fire suppression practices have encouraged unnaturally high density, heavy ladder fuels in the understory and accumulation of brush. Fire suppression essentially removed a natural process from the landscape that otherwise would periodically remove surface fuels, much of the young small diameter understory trees and a portion of midstory and overstory trees. This transition in species composition occurs because white fir is able to establish in a shaded understory environment and over time grow into the overstory. In contrast, pines require more light and openings to successfully regenerate and do not survive well in a shaded understory environment. The mixed conifer stands are similar in species composition to the ponderosa pine stands, but generally contain a higher proportion of white fir in the overstory. Approximately 1,500 acres (54 percent of land capable of producing late-successional forest) consists of this mid-successional forest of dense, overstocked stands that are near or exceed site capability.

These over-crowded trees grow very slowly and stand vigor suffers. The existing conditions will delay or prevent development into late-successional forest on approximately 1,500 acres of early and mid-successional forested stands. The same conditions that affect successional development reduce the value of these forests for connectivity to existing late-successional forest.

High densities bring high tree mortality rates. Approximately 10 percent of the Elk Flat LSR is currently comprised of large pockets of standing dead and down trees that increase the risk of additional habitat loss through increased fire hazard. Black stain root and *Heterobasidion* root disease, combined with the overstocked conditions, prolonged drought and insect attacks also contribute to mortality. The high numbers of standing dead trees pose an increased safety risk to visitors. The Forest Plan and LSRA define desired fuel loadings as 5 tons per acre in the Matrix-Commercial Wood Products portion of the project area and 5 to 35 tons per acre in the LSR. Dead trees have fallen to the ground creating hazardous conditions approaching 60 tons per acre of surface fuels in some areas that may increase to 100 plus tons as tree mortality spreads in coming years.

The Forest Service recognizes that natural disturbance is an important process within late-successional forest ecosystems, but both human and natural processes have altered the disturbance regime in the Elk Flat LSR.
such that without action, further habitat loss will result from density-related mortality, root disease, insect attacks and predicted lethal fire effects. Without action, the ongoing stand-replacing events in the Elk Flat LSR will continue, jeopardizing existing and future late-successional habitat. Nesting, roosting, foraging, denning and dispersal habitat for late-successional dependent species would remain at risk, including approximately 720 acres of designated critical habitat for the northern spotted owl.

Conifer encroachment is diminishing the dry meadow areas of the McCloud Flats including Elk Flat. The meadow at Elk Flat is less than 50 percent of its extent in 1944 (USDA-FS, 2011 p. 69). Restoration of the natural fire regime and fire return interval would contribute to maintenance of the dry meadow vegetation conditions. Intermittent streams, such as Ash Creek and Swamp Creek, are recognized as providing considerable ecological value, especially in the absence of perennial flow, to systems dependent on them. Hydrologic processes, such as flooding, that maintained Elk Flat in the past are disrupted by lack of connection to Swamp Creek and its intermittent channel system. Historical road systems have diverted flow from Swamp Creek, concentrating flow and disconnecting it from spreading out over the meadow.

Ash Creek lacks riparian plant communities and floodplain interaction. Scattered riparian vegetation is limited to discontinuous locations where sunlight can reach the forest floor along Ash Creek, but is absent along Swamp Creek as well as other smaller intermittent channels. Woody debris recruitment is a necessary component in channels; however, input in large amounts is causing woody debris dams and channel widening. An accelerated rate of bank erosion along Ash Creek, where the accumulation of woody debris is high, diverts water around log jams.

Hardwoods have a high value to wildlife for foraging, nesting, denning and resting, as well as providing habitat for prey species. Aspen and California black oak occur as a scattered, very minor vegetation component within the project area, generally in the understory at a reduced abundance and decreased vigor. Fire exclusion has allowed white fir understories to become established in many stands. As white fir develops, it eventually overtops and shades out hardwoods.

There are approximately 6.5 miles of unauthorized routes in the project area. Unauthorized routes were not designed as part of the Forest Transportation System (FTS). They are not maintained and are not open to legal vehicular access, are not shown on the Forest’s Motor Vehicle Use Map (MVUM). Unauthorized routes often present a potential resource concern for soils, vegetation, erosion, and wildlife. A 0.1-mile segment of an unauthorized route accesses a popular dispersed recreation site on the edge of Elk Flat meadow. There is no legal vehicular access to this long-established use area.

**Purpose and Need for Action and Proposed Action**

In comparing the desired conditions with existing conditions, the Forest Service identified one primary and five secondary purposes for action. To meet the needs identified for these six purposes, the Forest proposes activities within five broad categories of actions: forest restoration, fire restoration and fuels reduction, meadow restoration, hydrologic function and soils restoration, and transportation management and unauthorized route decommissioning. The six purpose and needs, with the corresponding objectives and proposed actions are:
<table>
<thead>
<tr>
<th>Primary Purpose and Need</th>
<th>Objectives and Proposed Actions</th>
</tr>
</thead>
</table>
| **1. Risk Reduction**   | **Objectives:** Address insect and disease conditions, stand composition, structure and density concerns, and return the natural fire regime and reduce fuel loading to:  
- promote resilience  
- treat insect and disease centers  
- preserve larger legacy ponderosa pines  
- promote diversity  
- promote and preserve habitat elements  
- reduce ladder fuels  
- reduce surface fuels  
- restore the natural fire regime  
**Actions:** Forest and fire restoration and fuels reduction treatments including:  
- underburning on 3,482 acres  
- machine piling and pile burning on up to 1,461 acres  
- variable density thinning from below, with site-specific prescription elements on 1,273 acres of natural stands and 584 acres of plantations (acres exclusive of unthinned patches in at least 10% of the stand). |

<table>
<thead>
<tr>
<th><strong>Secondary Purposes and Needs:</strong></th>
<th><strong>Objectives and Proposed Actions</strong></th>
</tr>
</thead>
</table>
| **2. Accelerate Habitat Development**  | **Objectives** - Correct conditions that delay or prevent development of late-successional forest or reduce connectivity to existing late-successional forest. **Actions** – The actions described in #1 above also help address Purpose and Need #2. In addition:  
- reforestation of 313 acres – Interplanting of 10 acres, planting of up to 2-acre group selections, and planting of a 79-acre extensive mortality area, to promote stand species and age diversity  
- soils restoration through windrow respreading in 2 older plantations totaling 167 acres |
| **3. Meadow Restoration**  | **Objectives** – Return early seral vegetation, restore the natural fire regime, and restore hydrologic function in support of maintaining meadow habitat.  
**Actions** - Forest, meadow, fire, and hydrologic function restoration, and fuels reduction treatments:  
- meadow enhancement treatments on 379 acres to remove encroaching conifer (acres exclusive of 139 acres of unthinned patches within Elk Flat meadow).  
- thinning with meadow enhancement to feather treatment into adjoining forest stands and on 56 acres of adjoining plantations  
- broadcast burning to return the natural fire regime on the 518 acre Elk Flat meadow unit  
(Also see P&N #5 below; where hydrologic function restorations actions overlap Elk Flat meadow they contribute to meadow restoration) |
## Primary Purpose and Need

<table>
<thead>
<tr>
<th>4. Hardwoods - Retain hardwoods as a stand component at density levels commensurate with development of late-successional stands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong> – Assure hardwoods thrive and remain in stands at naturally occurring levels.</td>
</tr>
<tr>
<td><strong>Actions</strong> - Forest restoration, fire restoration, aspen restoration adaptive management treatments:</td>
</tr>
<tr>
<td>- thinning with oak release (about 30 acres in total) and aspen release (about 24 acres in total)</td>
</tr>
<tr>
<td>- fire restoration to maintain natural processes within the oak and aspen release areas</td>
</tr>
<tr>
<td>- aspen restoration adaptive management to monitor success and assure aspen restoration if initial release fails to stimulate suckering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Hydrologic Function Restoration - Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong> – Correct floodplain function, improve streambank stability, improve health of riparian vegetation, and return the natural fire interval in riparian reserves.</td>
</tr>
<tr>
<td><strong>Actions</strong> - Hydrologic function restoration</td>
</tr>
<tr>
<td>- decommissioning of unauthorized routes that intersect stream channels, floodplain and stream recontouring on approximately 8.1 acres</td>
</tr>
<tr>
<td>- recontouring stream channel and floodplains, add embedded woody debris on approximately 7.2 acres</td>
</tr>
<tr>
<td>- thinning in Riparian Reserves to promote riparian vegetation on approximately 65 acres (previously included in the natural stand thinning, under P&amp;N #1) excluding UTPs</td>
</tr>
<tr>
<td>- meadow enhancement in riparian reserve on approximately 65 acres (Unit 402).</td>
</tr>
<tr>
<td>- revegetation in the Riparian Reserves on approximately 94.9 acres</td>
</tr>
<tr>
<td>- underburning through riparian reserves on approximately 80.4 acres of underburn –only, and 65 acres thinning and underburning, and 65 acres of meadow enhancement in Unit 402 will promote riparian vegetation health</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Transportation Management - Manage the National Forest Transportation System and Decommission Unauthorized Routes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong> – Restore unauthorized routes and provide legal access to an established dispersed site.</td>
</tr>
<tr>
<td><strong>Actions</strong> – Transportation system management</td>
</tr>
<tr>
<td>- decommissioning 6.4 miles of unauthorized routes</td>
</tr>
<tr>
<td>- adding 0.1 mile of existing unauthorized route to the managed road system</td>
</tr>
</tbody>
</table>

Figure Appendix D-1 and Figure Appendix D-2 show the maps of the Proposed Actions. Thinning in natural stands will leave approximately 60 to 100 trees per acre, depending on the average size of the trees. Higher densities will be retained where wildlife rest/roost clumps of larger trees combine with smaller trees (less than 10 inches DBH) to provide age and structural diversity that contributes to habitat function. Lower densities would be applied in areas that are primarily dominated by ponderosa pine, higher densities would be retained in mixed conifer, and white fir dominated stands. Instead of applying one target density across a stand, the variable density thinning prescription would help promote within-stand structural variation that contributes to habitat function for late-successional species, while providing the needed growing space, nutrients and water for the remaining trees.
All thinning treatments incorporate site-specific prescription elements designed to enhance late-successional habitat. Unthinned patches composing at least 10% of treated stands are excluded from silviculture treatments as unthinned patches. Areas in the LSR that provide relatively large blocks of late-successional habitat will have no or moderate thinning treatments. These areas are not currently at risk, or are at risk but are being left untreated to maintain current nesting, roosting, denning and foraging habitat for the northern spotted owl, fisher and northern goshawk.

Radial thinning surrounding individual large pines is incorporated to increase retention of these valuable trees in stands. Small (less than 2-acres) group selections, replanted with non-host (for black stain root disease) species, will be inserted to break up disease centers and provide structural and species diversity. Conifer removal surrounding oak and aspen trees will encourage hardwood species retention, health and vigor. Thinning variations around insect or disease centers will remove symptomatic trees and create a buffer to prevent root-to-root contact between infected and non-infected pine. Light level increases on the forest floor inhibit black stain root disease progression; and regenerating mortality areas with a mix of non-host conifer species as well as widely spaced pine would discourage reinfection. Small group selections would regenerate pine in areas of dense, homogenous white fir and increase age diversity in older plantations.

While most conifers would be removed outside unthinned patches in the portion of Elk Flat meadow, in the LSR land allocation, largest, predominant pines would be retained. More conifers would be retained along the edges to “feather” the meadow treatment into surrounding stands.

Prescribed fire through underburning would be utilized every 5 to 10 years for 2 to 3 entries across the project area to return fire to the ecosystem. Where surface fuels are particularly heavy, machine piling and pile burning would occur before the first underburn entry.

Recontouring of existing disturbed areas impacting stream channels and floodplains will help return natural floodplain function and elevate the water table at Elk Flat. Thinning in Riparian Reserves will increase sunlight for riparian vegetation, regulate woody debris entry into stream channels, and strengthen streambanks.

One 0.3 mile segment of an existing road needs reconstruction, otherwise NTS roads used in the project would be maintained. Maintenance level-1 roads would be opened for the project, and then closed again at the conclusion. 6.4 miles of unauthorized routes would be decommissioned and 0.1 miles would be added to the NTS to access the dispersed use area at Elk Flat.

**Public Involvement**

**Scoping**

The Notice of Intent (NOI) was published in the Federal Register on February 28, 2013 (USDA-FS, 2013). The NOI asked for public comment on the proposal by April 1, 2013. In addition, as part of the public involvement process, the agency prepared a scoping document that was mailed to interested individuals, organizations and agencies on February 14, 2013 (USDA-FS, 2013b). A Notice of Intent was published in the Redding Record Searchlight on February 27, 2013 and March 3, 2013. Public meetings were held March 5 and March 26, 2013 in McCloud and Mt. Shasta. The Forest Service received 11 comment letters or emails.

All comments were reviewed. Issues were identified from public scoping comments. Issues are statements of cause and effect, linking environmental effects to actions. Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand (FSH 1909.15 Ch. 12.4).
Key Issues

The Forest Service sorted the issues into two groups: key and non-key issues. Key issues were defined as those directly or indirectly caused by implementing the proposed action. Non-key were identified as those that are: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. Other Comments were non-issues (e.g. no cause effect) or were identified as a question or a general statement (general in nature).

The Forest Service identified the following key issues during scoping:

Issue 1 – Large Trees and Snags

Large tree and snag removal and group selection logging would directly harm forest health and late-successional ecosystems in Late-Successional Reserves, Riparian Reserves and Critical Habitat; prevent rather than facilitates forest succession processes; and is not consistent with the Northwest Forest Plan.

Issue 2 – Road Construction

Road construction directly harms forest health and wildlife and results in long-term impacts to soil health and productivity.

Issue 3 – Critical Habitat

Treatments within designated critical habitat for the northern spotted owl violate the 2011 Revised Recovery Plan and the 2012 Final Critical Habitat Rule for the Northern Spotted Owl.

Issue 4 – Mushroom Collection in Elk Flat

There will be negative impacts to Boletus mushroom growth and collection activities within Elk Flat.

Issue 5 – Machine Piling

Machine piling has disproportionately harmful impacts on watershed and soil resources.

A notice of availability of the Draft Environmental Impact Statement (DEIS) appeared in the Federal Register on January 15, 2016 and a legal notice for comment was published in the Redding Record Searchlight on January 19, 2016. The comment period lasted for 45 days, concluding on February 29. Appendix I provides a summary of the comments received from 14 comment letters, and the responses to the comments.

Alternatives

Key Issues 2 and 3 prompted development of alternatives to the proposed action considered in detail. Issues 4 and 5 prompted development of alternatives considered but not in detail. Analysis of concerns brought forward in Issue 1 is included in Chapter 3. Alternatives 1, 2, 3 and 4 are considered in detail. Chapter 2 provides Alternative details. Summaries of actions by alternatives are provided in Table 22 through Table 26 (pp. 79 to 83) and Maps are in Appendix D.

Alternative 1-Modified Proposed Action

Alternative 1 is the Modified Proposed Action and the Agency Preferred Alternative. Alternative 1 is also the environmentally preferred alternative in the long term. It is a slightly modified version of what was scoped as the Proposed Action. Appendix G describes the incremental changes between the Proposed Action and Alternative 1. Alternative 1 Proposed Action is summarized above in the Purpose and Need for Action and Proposed Actions starting on page viii. The proposed treatments would be implemented through a combination of commercial and non-commercial thinning using mechanical and hand methods.
Alternative 2-No New Temporary Road Construction Other Than Those Required for Landing Use/Access

Alternative 2 responds Key Issue 2 regarding temporary road construction impacts on forest health and connectivity within the LSR. It is similar to Alternative 1 with the exception that no temporary roads would be constructed to complete project activities other than to access landings (typically, a landing “driveway” is about 200 feet). Project activities would be completed utilizing the existing FTS roads and existing unauthorized routes in the project area. Alternative 1 identified the need for approximately 2.9 miles of new temporary road to complete thinning activities and no new permanent road construction was proposed. While the total acreage between Alternatives 1 and 2 treated is the same, the difference is between the treatment types. This alternative reduces the ability to mechanically treat approximately 103 acres with a corresponding decrease in needed landings. Hydrologic function restoration completed through mechanical means also drops slightly as access to the work areas decreases. All other project design criteria, thinning, fuels treatments, and road actions are the same as Alternative 1. Despite no construction of new temporary roads under Alternative 2, other than what is needed to access landings, the total project area would still be underburned and in accordance with the RPMs. Maintenance and other actions relating to the FTS system would be the same under Alternative 2 as Alternative 1; however, the maintenance would be less intensive due to reduced hauling.

Alternative 3-No Treatment of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl

Alternative 3 is responsive to the issue regarding the assertion that treatments within designated critical habitat for the northern spotted owl (NSO) violate the 2011 Revised Recovery Plan and the 2012 Final Critical Habitat Rule. Alternative 3 is the environmentally preferred alternative in the short-term. Under Alternative 3, no NSO critical habitat would be treated, with the exception of the thinning and other mechanical treatments proposed in seven plantations (7, 12, 13, 14, 208, part of 15, and part of 6). No units within critical habitat would be underburned under Alternative 3. In comparison to Alternative 1, the plantations in critical habitat that are prescribed for machine piling and pile burning would require additional fireline construction to provide a barrier between the pile burning areas and the surrounding untreated natural stands. Alternative 3 treats 270 fewer acres with silvicultural harvest than Alternative 1. All other project design criteria, thinning and fuels treatments, and road actions outside of critical habitat are the same as under Alternative 1.

Alternative 4-No Action

Alternative 4 is the no action alternative. The analysis of the no action alternative provides reviewers a baseline to compare the magnitude of environmental effects of the action alternatives. Alternative 4 is the continuation of the existing condition, current management and ongoing activities in the project area. Current management and ongoing activities in the project area, as permitted under past, current or potential future NEPA may include road maintenance, hazard tree felling, fuelwood collection, over-snow vehicle use associated with the Pilgrim Creek Snowmobile Park, dispersed recreation (e.g., sightseeing, hunting), forest products collection and other permitted special uses. Additional thinning and hydrologic restoration in unit 401 under the Pilgrim Vegetation Management Project is pending. This analysis includes modeling of stand growth and fire behavior that is predicted if no new action is taken in the project area. Under no action, no treatments or road actions would be implemented to accomplish the purpose and need and project resource objectives.

Alternatives Considered but Not in Detail

Seven additional alternatives, as well as the original Proposed Action, were considered but not in detailed analysis. These Alternatives were either duplicative (the original Proposed Action), or did not adequately meet the Purpose and Need for Action or would cause more harm to the environment. Alternatives considered but
not in detail include: Alternative 5 – No Treatment in Elk Flat Meadow to preserve Boletus mushroom habitat; Alternative 6 – Limit Harvest to Trees Less Than 10 Inches in Diameter; Alternative 7 – Eliminate the Use of Machine Piling within Treatment Units and Substitute Hand Piling; Alternative 8 – Limit Harvest to Trees Less Than 20 Inches in Diameter with the Elk Flat Late-Successional Reserve; and Alternative 9 - No New Temporary Road Construction; Alternative 10 – Add Unauthorized Routes to the Forest Transportation System; and Alternative 11 – Shift and Expand the Unthinned Patch Locations in Elk Flat. Chapter 2 provides a detailed discussion of these alternatives, and why they were not considered in detail starting on page 119.

Conclusions
This FEIS discloses the environmental effects of four alternatives, including no action. The no action alternative is included to provide a baseline to compare the environmental effects resulting from implementing one of the action alternatives.

Table 29 in Chapter 2, starting on page 97, provides a summary of the effects described in Chapter 3.

Table 29 summarizes effects as they relate to the five Key Issues, six Purpose and Need statements, and other resource effects. In some cases, effects between the action alternatives are similar. The project is consistent with the Shasta-Trinity National Forest Land and Resource Management Plan and applicable laws, executive orders, and policies.

Effects Relative to Purpose and Need for Action
All action alternatives would meet the project purpose and need to varying degrees. Alternative 1 meets it to the highest degree. In some cases, Alternatives 2 and 3 are equal to Alternative 1 but otherwise provide a reduced response.

Primary Purpose

1. Risk Reduction in Early, Mid and Late-Successional Habitat and Increased Stand Resilience to Disturbance (Objectives I and III of the LSRA) (LSRA pp. 174-179)

Alternative 1 provides the most risk reduction through the most extensive treatments for insect and disease activity, the most acres treated for stand density reduction, and the most fuels reduction and the greatest extent of fire regime restoration. Alternative 1 provides the highest likelihood of stand resilience immediately post project through the next twenty years. Alternative 2 is the next most effective response followed by Alternative 3. Alternative 3 leaves the natural stands within critical habitat at a similar risk to No Action and the Purpose and Need for Action would not be met within those stands.

Secondary Purposes

2. Accelerate Development of Late-Successional and Old-Growth Forest Characteristics (LSRA Objective II) and Promote Late-Successional Habitat Connectivity (LSRA Objective IV)

All action alternatives thin plantations and meet this Purpose and Need for action. Alternative 2 treats 14 fewer acres of plantations than Alternatives 1 and 3. No action jeopardizes the potential of development of late-successional habitat. Alternative 1 also treats the most natural stands that may also be in a dense mid-successional condition that jeopardizes development of late-successional habitat. Alternative 2 is slightly less

---

2 In this context the LSRA is referring to young stands and plantations (up to 12.9” DBH) as early seral (LSRA p. Appdx. E) and reducing the risk of setting these young stands back successional through large-scale disturbance. The objective does not include areas that are not capable or are most valuable as early-seral habitat such as meadow.
effective than Alternative 1. Alternative 3 leaves mid-successional natural stands in critical habitat untreated, even with prescribed fire, leaving those stands in the same condition as No Action. The Purpose and Need for Action would not be met within the critical habitat natural stands under Alternative 3. All three action alternatives respread old windrows in two plantations to restore soil conditions and productivity.

3. Restore Meadow Habitat in Elk Flat
Alternatives 1 and 3 restore Elk Flat meadow in full. Alternative 2 has a 25-acre reduction in conifer removal, but still provides for return of fire to the ecosystem. No Action jeopardizes retention of the early seral meadow habitat at Elk Flat.

4. Retain Hardwoods as a Stand Component at Density Levels Commensurate with Development of Late-Successional Stands
All three action alternatives fully restore aspen. In alternative 1 oak release would occur as a component of thinning treatments in stands totaling 567 acres. Alternative 2 has 33 fewer acres and Alternative 3 has 148 fewer acres of stands treated with an oak release component, compared to Alternative 1. No action and the untreated areas of Alternatives 2 and 3 do not meet this Purpose and Need for Action.

5. Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries
All three action alternatives meet this Purpose and Need by restoring riparian vegetation and floodplains in the Riparian Reserves and treating stands to improve resilience to disturbance and attain all of the Aquatic Conservation Objectives (ACS). Thinning within the Riparian Reserves favors diversity, health and vigor of riparian vegetation, regulates input of woody debris, and enhances instream structure. Alternatives 2 and 3 have slightly reduced benefits because of fewer acres treated. No Action does not meet this Purpose and Need for Action; current trends in hydrology would continue degrading the watershed and riparian areas and ACS Objectives would not be met.

6. Manage the National Forest Transportation System and Decommission Unauthorized Routes
All three action alternatives meet this Purpose and Need for Action. They decommission 6.4 miles of unauthorized routes and provide access to the dispersed site at Elk Flat.

Effects Relative to Key Issues

Issue 1 – Large Trees and Snags
All action alternatives leave large predominant trees in all prescriptions. Some trees over 24 inch DBH would be removed for density reduction in dense mid and late successional stands and in meadow enhancement. Some dominant trees may be removed in the group selection, oak release, aspen release and radial thinning prescription elements within thinning stands. Most conifers, except for all predominant trees and some dominant trees, would be removed in the meadow enhancement. Modeling results at year 20 project there would be considerably more trees per acre over 24 inches than presently exist, but do not account for insect and disease mortality. Observed mortality in the project area and research on density related pine mortality both indicate that higher numbers of trees per acre over 24 inches DBH are very unlikely to develop or persist over time, given the current conditions. Density reduction thinning in all action alternatives would promote the resilience and survival of the residual large trees and meet the Purpose and Need.
Snags would be retained in all action alternatives except where hazard abatement is needed for human safety considerations. An estimate of 20 percent reduction was used to reflect snags removed for hazard abatement, but given the intent to retain snags as feasible, a higher proportion may be retained.
Issue 2 – Road Construction

No alternatives construct new FTS roads. All action alternatives decommission 6.4 miles of existing inventoried unauthorized routes. The No Action alternative does not decommission the routes. All three action alternatives construct new temporary road that is decommissioned at the end of the project. While Alternative 2 was developed in response to this issue, Alternative 3 has slightly less estimated miles of new temporary road construction due to the decreased thinning acres; Alternative 1 constructs 2.9 miles, Alternative 2 1.6 miles (to access landings only), and Alternative 3 includes 1.5 miles.

Issue 3 – [NSO] Critical Habitat

Under Alternatives 1 and 2, there will be a temporary reduction in the quantity and quality of northern spotted owl foraging habitat designated as critical habitat (Primary Constituent Element or PCE 3), resulting in short-term and minor adverse effects to PCE 3 on 270 acres. Effects to the other three PCEs will be wholly beneficial, insignificant or discountable. Variable density thinning treatments will degrade foraging habitat (PCE 3) as some stand components of trees, canopy closure, layering, snags and logs will be reduced or removed on approximately 224 acres. Stand components of PCE 3 will be similarly reduced and removed, but at a more intensive scale such that foraging habitat quality and function is downgraded to dispersal habitat (PCE 4) on approximately 46 acres. The overall habitat function in affected stands will not be removed. While these treatments under Alternatives 1 and 2 will result in both a short- and long-term beneficial effect to NSO habitat and critical habitat, they are not considered insignificant or discountable in the short-term. These effects would occur in 82% of the PCE 3 in the project area in a home range that is 59% on private lands and currently below recommended levels of suitable habitat to better support survivorship and productivity.

There would be some short-term and minor adverse effects to components of PCE 3 (including NSO prey base). The larger proportion of suitable habitat on NFS lands at both the ST-215 core and home range scales, the current unoccupied status of the home range by a reproductive or territorial pair, and the management direction for, and conditions in, the Elk Flat LSR afford an opportunity to positively affect structural and compositional changes in components of PCE 3 over the long-term. The treatments in critical habitat will increase foraging habitat resilience and long-term habitat capability to support NSO life history functions and contribute positively toward the expected function of the Elk Flat LSR and ST-215 home range to provide a key area for dispersing juveniles, subadults or non-territorial NSOs.

Degraded foraging habitat functions at the pre-treatment habitat level after treatment, since important habitat elements are maintained and provide for foraging (e.g., at least 40-60% or higher canopy closure, basal area of 125-200+ sqft/ac, layering, abundant large snags and logs). For the project, degraded foraging habitat is expected to transition to pre-treatment quality over 5-20 years after treatments start, depending on treatment type. Downgraded foraging habitat from black oak release and radial thinning around legacy pine is expected to transition to pre-treatment quality levels over 10-30 years. These are estimated timeframes, barring any events such as epidemic insect or disease outbreaks, or uncharacteristic stand replacing fire, that can reset the seral stage in a stand or part of a stand.

The treatments in PCE 3 affect and maintain 68 percent of PCE 3 in the project area, and result in 14 percent of PCE 3 being converted to PCE 4 in the short term. Dispersal PCE 4 would transition to foraging habitat over the 10-30 year period as remaining conifer trees and released oaks grow larger, with a long-term improvement in overall foraging suitability due to larger trees with structure, increased resilience, and an increase in hardwood and prey species diversity. The treatments affect less than one percent of the ECS-3

---

3 Although the action alternatives do add 1/10th of a mile of existing unauthorized route in response to Purpose and Need #6 in the Matrix land allocation to access an existing dispersed recreation site. No road construction would be required on this section of existing route.
Critical Habitat Subunit and are considered discountable in terms of reducing the overall intended function of this Critical Habitat Subunit.

Alternative 3 treats 472 fewer acres than Alternatives 1 and 2. It will not have short-term or minor adverse effects to any PCEs. Approximately 152 acres of PCE 1 (capable habitat) and one acre of PCE 4 would be benefitted from thinning in older ponderosa pine plantations. This represents 21 percent of the total Critical Habitat in the project area. While some protection would be afforded to the natural stands from the treatments in the older plantations, all PCE 2 (nesting/roosting) and PCE 3 would remain in its current condition and at risk of loss from ongoing density-related mortality and the potential for uncharacteristic wildfire.

No Action (Alternative 4) continues the current trends. Critical habitat elements would remain vulnerable to loss from overstocking, insect and disease outbreaks and a potential reduction or removal of habitat elements or connectivity from passive crown fire. Preliminary modeling of a wildfire under 97th percentile weather conditions predicts up to 40% mortality in the natural stands. Approximately 63 percent of this area is designated as Critical Habitat.

**Issue 4 - Boletus Mushroom Collection in Elk Flat [Boletus Habitat in Elk Flat]**

All action alternatives reduce current or potential boletus mushroom habitat at Elk Flat through Meadow Enhancement treatment designed to restore and maintain early-seral meadow habitat in response to Purpose and Need #3. All action alternatives retain unthinned patches that would retain some existing boletus habitat within Elk Flat meadow. Alternative 2 includes 25 fewer acres (at 354 acres of Meadow Enhancement) than Alternatives 1 and 3 (379 acres).

**Issue 5 – Machine Piling**

Alternative 3 includes the least amount of machine piling at up to 1,365 acres. Alternative 2 has up to 1,402 acres and Alternative 1 has the most at 1,461 acres. All units are expected to meet soil quality standards at the completion of the project. Existing detrimental compaction in four units would be alleviated. No action would leave the existing compaction. Effects to watershed health are mostly short-term disturbance to water-holding properties.

**Decision to be Made**

The Forest Supervisor is the deciding official and will decide whether to implement Alternative 1- Modified Proposed Action, or implement one of the other action alternatives that meet the project purpose and need, or take no action.
Chapter 1. Purpose of and Need for Action

Introduction
The Forest Service has prepared this environmental impact statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This environmental impact statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives considered in detail.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located in the online project record.

Background
Many of the past century’s traditional approaches to land management and increasing ecosystem health problems have contributed to deficient late-successional habitat across the landscape and to more severe wildland fires. The Northwest Forest Plan (NWFP, 1994) calls for timely management decisions to ensure better results in projects that reduce the risk of uncharacteristic wildfire and restore forest health. Authorized under the National Forest Management Act of 1976 (NFMA), this project is designed to move the landscape toward the desired condition for the Elk Flat Late-Successional Reserve (LSR). Project design is guided by the visions, goals, strategies and design criteria embodied in the NWFP, the Shasta-Trinity National Forest Land and Resource Management Plan (Forest Plan, 1995) (including Management Areas 2 and 3), and the Forest-Wide Late-Successional Reserve Assessment (LSRA, 1999). There are no specific objectives for the Elk Flat LSR in the LSRA; however, the project is consistent with general objectives from the LSRA. It is also consistent with or incorporates recommendations from:

- the Forest Plan Aquatic Conservation Strategy (ACS) objectives,
- the Revised Recovery Plan for the Northern Spotted Owl (Recovery Plan) (USDI-FWS, 2011), and the Revised Critical Habitat Rule for the Northern Spotted Owl (Final Rule) (USDI-USFWS, 2012),
- the National Fire Plan (USDA & USDI, 2000),
- the Forest’s Fire Management Reference System (USDA-FS, 2015), and

A project consistency review with the Regional Ecosystem Office (REO) will be required for proposed treatments, as stated in the NWFP Record of Decision (ROD) on pages C-12, 13, and 26.

Location

Vicinity
The Elk Late-Successional Reserve Enhancement Project (project) is located in Siskiyou County, California, approximately nine miles northeast of the community of McCloud and 70 miles northeast of Redding (Figure 1). The project analysis area (project area) is approximately 3,519 acres. Elevation ranges from 4,000 to 4,500 feet. The climate is characterized by cool, wet winters and warm dry summers with an average annual precipitation of 48 inches. Most precipitation falls between October and May (WRCC, 2010).
Figure 1. Vicinity Map
Project Area

Figure 2 (page 5) shows the project boundary. The Elk Flat LSR is bounded on the north and west by privately owned industrial timberlands and by Matrix lands to the south and east. Table 1 shows the distribution of seral stages within the project area.

Table 1. Successional Condition of Elk Flat LSR within the Project Area

<table>
<thead>
<tr>
<th>Successional Condition</th>
<th>% of Area (capable of supporting late-successional habitat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late-successional</td>
<td>46%</td>
</tr>
<tr>
<td>Mid-successional</td>
<td>30%</td>
</tr>
<tr>
<td>Early-successional</td>
<td>24%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Located within the California Cascades province (Agee, 1993), 75 percent of the 3,519 acre project area is classified as ponderosa pine (*Pinus ponderosa*) forest. To the west and northwest, approximately 10 percent of the project area is classified as Sierra Mixed Conifer (SMC)4 and 15 percent as perennial grassland (PGS) under the California Wildlife Habitat Relationship (CWHR) System (CDFW, 2008).5

Average elevation throughout most of the project area is 4,150 feet, and as lands transition from essentially flat to gentle predominantly east facing slopes, elevation increases to 4,400 feet. While the CWHR classifies the majority of the project area as ponderosa pine type, field reviews show there is a variety of species classes, primarily due to lack of fire to reduce white fir and cedar regeneration. Field reviews also show there are older remnant (or predominant) Douglas fir, white fir, cedar and sugar and ponderosa pine trees (see cover, and p. 18)

The ponderosa pine-dominated natural stands are primarily within the eastern and southeastern extent of the project area. It is also a stand component in other lower elevation portions of the project area in mixed-conifer pine, and white fir-pine stands. The SMC forest type increases where there is an increase in elevation; dominated by white fir, incense cedar, ponderosa and sugar pine, and higher incidences of Douglas fir and black oak. Plantations range in age from just over 10 years to over 40 years, and account for 25 percent of the project area. The majority of the 20 to 40+ year-old plantations are ponderosa pine, with younger plantations having a wider range of species. The Elk Flat meadow is the only non-forest vegetation type and accounts for 15 percent of the project area.

---

4 The name “Sierra Mixed Conifer” should not be confused by the fact that the project falls within the Southern Cascade Mountain range. The SMC vegetation type is mapped within mid to higher elevations throughout much of the central North-South axis of the State of California including the Sierra Nevada and Southern Cascade mountain ranges.

5 The CWHR crosswalks to the CalVeg classification system and is used in the Forest’s 2007 existing vegetation layer to display reginal dominance types. Those types within the project area break down further into ponderosa pine (PP), mixed conifer fir (MF), ponderosa pine-white fir (PW) and mixed conifer pine (MP). Table 2 above only lists the CWHR vegetation types for the project area as a general reference. More information is available at [http://www.fs.fed.us/r5/rlr/projects/classification/cv-cwhr-xwalk.html](http://www.fs.fed.us/r5/rlr/projects/classification/cv-cwhr-xwalk.html)
Table 2. Vegetation types in Elk project area, as classified by CWHR (CDFW, 2008).

<table>
<thead>
<tr>
<th>CWHR Vegetation Type</th>
<th>Percent Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sierra Mixed Conifer (natural)</td>
<td>10%</td>
</tr>
<tr>
<td>Ponderosa Pine (of which 25% is plantations)</td>
<td>75%</td>
</tr>
<tr>
<td>Perennial Grassland (Elk Flat Meadow)</td>
<td>15%</td>
</tr>
</tbody>
</table>

Based on Common Stand Exams completed in 2007 and additional fieldwork, measured tree ages in the natural stands ranges from 55 to 95 years with a minor scattered component of older remnant trees (see definition of predominant tree in the Glossary, p. 267). Average natural stand ages range between 60 to 100 years in some stands and 80 to 120 years in others (USDA-FS, 2007). Younger understory trees are present to varying degrees but in most instances are strongly suppressed by the mid and overstory, notably in homogenous pockets of white fir.

Management Direction

Land allocations (Table 3 and Figure 2) and management areas from the Forest Plan include:

**LSR** - Late-successional reserves (LSR) associated with the Elk Flat LSR (designated as RC-360 in the LSRA (LSRA, 1999) comprise approximately 87 percent of the project area (3,074 acres).

**Matrix** – 445 acres of Matrix lands with commercial wood products (CWP) emphasis.

**Riparian Reserves** – 240 acres of Riparian Reserves associated with Ash and Swamp Creeks and their tributaries overlay the Matrix and LSR allocations. Ash Creek bisects the Elk Flat LSR, and its (acres) of Riparian Reserves fall completely within the LSR in the project area, flowing intermittently from late spring through early fall. The ephemeral channel of Swamp Creek flows during snowmelt and high runoff periods and cuts across the eastern section of the project area within and along Elk Flat meadow. A portion of Elk Flat Meadow includes approximately 58.2 acres of Riparian Reserve in LSR and 10.3 acres in Matrix in Unit 402. Riparian Reserves overlay other land allocations and do not represent additional acres.

Table 3. Forest Plan land allocation, management prescription acres and percentages of total project area.

<table>
<thead>
<tr>
<th>Forest Plan Land Allocation</th>
<th>Forest Plan Management Prescription</th>
<th>Acres</th>
<th>% of Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late-Successional Reserves</td>
<td>VII - Late-Successional Reserves and Threatened, Endangered, and Selected Sensitive Species</td>
<td>3,074</td>
<td>87%</td>
</tr>
<tr>
<td>Matrix</td>
<td>VIII - Commercial Wood Products</td>
<td>445</td>
<td>13%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3,519</td>
<td>100%</td>
</tr>
</tbody>
</table>

Riparian Reserves IX-Riparian Management overlaying LSR 204 included above

IX-Riparian Management overlaying Matrix 36 Included above

Total 240
Figure 2. Forest Plan Land Allocations
Late-Successional Reserves Allocation: Prescription VII-Late-Successional Reserves and Threatened, Endangered, and Selected Sensitive Species.

Late-Successional Reserves (LSRs) were established in the Forest Plan and are intended to provide old-growth forest habitat, provide for populations of species that are associated with late-successional forests, and to help ensure that late-successional species diversity will be conserved. Management direction in LSRs is to protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late-successional and old-growth related species, including the northern spotted owl (NWFP, 1994 p. 8) (Forest Plan p. 4.37 to 4.43) (LSRA, 1999 p. 1).

Protection of LSRs includes reducing the risk of large-scale disturbance, including stand-replacing fire, insect and disease epidemics, and major human-caused impacts (LSRA p. 1). Both protection and enhancement can include application of silviculture and other treatments designed to reduce the risk of loss and/or accelerate development of late-successional stand characteristics (Forest Plan p. 4.37 to 4.39), (LSRA, 1999 pp. 174-203). The LSRA further describes that the overriding goal of management in LSRs is not only to maintain and protect, but also restore, conditions of late-successional forest ecosystems. Inherent in meeting this goal is the contribution towards the recovery of listed and petitioned late-successional associated species and treatments designed to provide these habitat conditions through time support the objectives for LSRs (LSRA, 1999 p. 174).

Forest Plan goals describe that the network of LSRs is designated to provide for a viable population of northern spotted owls throughout their historic range (Forest Plan p. 3.27). The Forest Plan adopts the NWFP as the Federal contribution to the recovery of the northern spotted owl. The Forest also expects the network of land allocations that are withdrawn from active timber management (e.g., wilderness, administratively withdrawn areas, wild and scenic rivers, others) to provide habitat adequate to maintain viable, well-distributed populations of federally listed or proposed and Forest Service sensitive species (p. 3.27). Where active management occurs in Late-Successional Reserves and Riparian Reserves, standards and guidelines and project design features for snags, logs, hardwoods, biodiversity and protection and enhancement of habitats also contribute towards this goal.

The Forest Plan standards and guidelines direct that the Forest maintain or enhance habitat for threatened, endangered, and sensitive (TE&S) species consistent with individual species recovery plans (p. 4.30), though recovery plans themselves are not regulatory.

Relationship to Other Plans

Late-Successional Reserve Assessment

The LSR allocation is managed under Forest Plan Prescription VII, Late-Successional Reserves and Threatened, Endangered, and Selected Sensitive Species. In accordance with NWFP Standards and Guidelines (NWFP, 1994 pp. C-11), the Forest prepared the Late-Successional Reserve Assessment (LSRA). The purpose of the LSRA was to develop management strategies for the LSRs, determine their sustainability, and provide information to decision makers for managing LSRs to meet Forest Plan goals and objectives. It describes four objectives that guide development and application of treatments in LSRs.

---

6 Including those land allocations such as Late-Successional Reserves or Riparian Reserves that may be treated to reduce the risk of losing habitat, to enhance habitat, and to contribute to Aquatic Conservation Strategy objectives but that do not regularly contribute to allowable sale quantity.
The Elk Flat LSR is described as a priority for treatment objective II, which is to “promote the continued development of late-successional forests” (LSRA, 1999 p. 178). The project is also designed to meet the other three treatment objectives (p. 175):

I. Protect existing late-successional habitat from threats (of habitat loss) that occur inside and outside LSRs.

III. Protect mid and early-successional vegetation from loss to large-scale disturbance events.

IV. Promote connectivity of late-successional habitat within LSRs.

As described in the LSRA and NWFP, where levels of risk in an LSR are particularly high, they may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those LSRs even if a portion of the activities must take place in current late-successional habitat. While risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if:

1. the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat,
2. the activities are clearly needed to reduce risks, and
3. the activities will not prevent the LSR from playing an effective role in the objectives for which they were established (NWFP pp. C-13) (LSRA, 1999 p. 174).

Matrix Allocation: Prescription VIII-Commercial Wood Products (CWP)
Commercial Wood Products lands are managed to obtain an optimum timber yield of wood fiber within the context of ecosystem management. Investments will be made in road construction, fuels management, reforestation, vegetation management, and timber stand improvement. Timber stands will be managed to obtain optimum growth and yields using cultural practices (Forest Plan p. 4.67).

Riparian Reserves Allocation: Prescription IX-Riparian Management
Riparian Reserve standards and guidelines apply to all Forest lands where Riparian Reserves overlap other allocations. Riparian Reserves are managed under Prescription IX, Riparian Management to maintain or enhance riparian areas, wildlife and fisheries habitat, and water quality by emphasizing streamside and wetland management (Forest Plan p. 4.59). All management activities must meet or not prevent attainment of the Aquatic Conservation Strategy (ACS) Objectives (NWFP pp. B-9, 10) (Forest Plan p. 4.53). Riparian Reserve widths are determined by the category of stream or waterbody and are established during the watershed analysis process. Two watershed analyses (WA) have been completed that include the Elk project area: the Edson WA and the Mt. Shasta WA (USDA-FS, 2011; USDA-FS, 2012).

Other Designations
Wildland-Urban Interface
Wildland Urban Interface (WUI) as defined in the Forest’s Fire Reference System (USDA-FS, 2015) encompasses approximately 1,135 acres of the project area (see Appendix D, Maps, Figure Appendix D-8). The policy of providing for firefighter and public safety is implicit in considering all fire and fuels desired conditions, regardless of land allocation and management direction (USDA-FS, 2009).
Northern Spotted Owl Critical Habitat

The FWS revised critical habitat for the NSO on December 4, 2012 and the Rule was finalized January 3, 2013 (USDI-FWS, 2012). There are 720 acres in the project area, part of Unit 8, Subunit 3-East Cascades South [ECS-3]. Critical habitat is located in the western portion of the Elk Flat LSR; it is not designated in the surrounding private lands or the project’s ponderosa pine-dominated stands or meadow at Elk Flat.

The Final Rule describes the East Cascades Unit (pp. 71930-71931) and ECS-3 subunit. ECS-3 consists of 112,179 acres of land managed by the Forest Service under the NWFP, and Forests that overlay the subunit (Shasta-Trinity, Klamath, Modoc). Its function is to “provide demographic support in an area of sparsely distributed, high-quality habitat and Federal land and to provide population connectivity between subunits to the north and south”. Special management considerations in ECS-3 are “required to address threats to the essential physical or biological features of critical habitat from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls” (p. 71931). The Final Rule states: “the increase and enhancement of NSO habitat in this subunit is especially important for providing essential connectivity between currently occupied areas to support the successful dispersal of NSOs, and may also help to buffer NSOs from competition with the barred owl” (p. 71931).

As with the Recovery Plan, the Final Rule describes that in the drier, more fire-prone regions of the NSOs range, habitat conditions will likely be more dynamic, and active management may be required to reduce the risk to essential physical or biological features of critical habitat from fire, insects, disease and climate change. It also describes that long-term NSO recovery could benefit from forest management actions that restore or maintain ecological processes and resilience (USDI-FWS, 2012 p. 71908).

While the Rule recommends active management, it also describes that treatment activities should be focused on lower quality habitat with lower relative habitat sustainability and be based on ecological restoration and application of ecological forestry principles, or be focused where ecological conditions are most departed from the natural or desired range of variability. It recommends:

1. Following the NWFP guidelines and focusing on lands in or outside LSRs where uncharacteristic disturbance has occurred, or where the landscape management goal is to restore more natural or resilient forest ecosystems;
2. Avoiding or minimizing activities in active NSO territories (or high-quality habitat in those territories), and;

Other

The project area is not in a congressionally designated or inventoried roadless area, a Key Watershed (Forest Plan p. 4.59) or a municipal watershed.

Revised Recovery Plan for Northern Spotted Owl

The Revised Recovery Plan for the Northern Spotted Owl (Recovery Plan) was released in June 2011 (USDI-FWS, 2011). The Recovery Plan identifies primary range-wide threats to the northern spotted owl (NSO) as competition with barred owls; ongoing loss of spotted owl habitat as a result of timber harvest, habitat loss or degradation from stand-replacing wildfire and other disturbances; and the loss and reduced distribution of spotted owl habitat due to past activities (pp. vii, II-2). It describes a Recovery Strategy that includes habitat conservation and active forest management to address these threats, including conserving more occupied habitat and unoccupied high-value habitat; and encouraging and initiating active management actions that restore, enhance and promote development of high value habitat, consistent with broader ecological restoration goals (pp. III-4 to III-5).
Specific to the dynamic, disturbance-prone, drier forests of the California Cascades physiographic province where the Elk project is located, it recommends active management “in a way that reconciles the overlapping goals of NSO conservation, responding to climate change and restoring dry forest ecological structure, composition and processes, including wildfire and other disturbances” (pp. III-20 to III-21). The California Cascades scores high in the Recovery Plan in terms of threats from ongoing habitat loss as a result of wildfire, and the effects of fire exclusion on vegetation change (pp. I-8). Management recommendations within dry forest ecosystems is fully described in the Recovery Plan, including seven principles that should be part of any dry forest restoration treatment (pp. III-20 to III-40).

Those principles, and recommendations under Recovery Actions 10 and 32, were utilized throughout project development. Refer to Appendix H for additional discussion on how the project is meeting the goals and standards and guidelines from the Forest Plan (pp. 3.27, 4.30). There are no other available species recovery plans that apply to the project.

**Purpose and Need for Action**

**Introduction and Summary**

The purposes, or objectives, of the project are derived from the project area management direction, including the Forest Plan and LSRA objectives, priorities and criteria. The need for action is determined by comparing the existing conditions with the desired conditions relative to the identified purposes. Existing conditions, causal mechanisms and needs for action in relation to the Forest Plan desired conditions were identified in Step 5 of the Edson WA and Chapter 5 of the Mount Shasta WA. Guided by the needs identified in the WAs, the interdisciplinary team further examined forest and meadow habitat and stream channel morphology within the project area to determine existing conditions including age, stocking, mortality, fuel loading, and presence of insects and disease, and stream channel function. One primary and five secondary purposes were identified.

The primary purpose is:

1. **Risk Reduction in Early, Mid and Late-Successional Habitat and Increased Stand Resilience to Disturbance (Objectives I and III of the LSRA) (LSRA pp. 174-179)**

---

7 The Forest Plan describes the desired condition, which is embodied in the forest goals and objectives, further clarified by the standards and guidelines, and is described for each Management Area (Forest Plan p. 4.6). The LSRA provides desired condition descriptions (starting page 162) and conditions existing at the time of publication in 1999 (LSRA, Chapter 2). The Recovery Plan provides objectives for conserving NSO habitat. Additionally, compliance with regulatory frameworks, consistency with policy, and consideration of best available science (per 40 CFR 1607.3) also helps guide identification of desired condition.

8 The analysis area of the Edson WA (USDA-FS, 2011) and the Mt. Shasta WA (USDA-FS, 2012) encompass the Ash Creek Watershed. The Edson WA covers part of the area originally included in the McCloud Flats Ecosystem Analysis (USDA FS, 1995). The McCloud Flats EA is cited in the Edson WA for specific information but the Edson WA is the most current watershed analysis for this area of overlap.

9 In this context the LSRA is referring to young stands and plantations (up to 12.9" DBH) as early seral (LSRA p. Appdx. E) and reducing the risk of setting these young stands back successional through large-scale disturbance. The objective does not include areas that are not capable or are most valuable as early-seral habitat such as meadow.
Secondary purposes are:

2. Accelerate Development of Late-Successional and Old-Growth Forest Characteristics (LSRA Objective II) and Promote Late-Successional Habitat Connectivity (LSRA Objective IV)

3. Restore Meadow Habitat in Elk Flat

4. Retain Hardwoods as a Stand Component at Density Levels Commensurate with Development of Late-Successional Stands

5. Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries.

6. Manage the National Forest Transportation System and Decommission Unauthorized Routes

Rationale for each purpose and the identified need for action in the project area is discussed in detail below. Crosswalks to Forest Plan direction are included.

Purpose and Need Discussion

1. Reduce Risk from Insects, Disease and Fire in Early-, Mid- and Late-Successional Habitat, and Increase Stand Resilience to Disturbance (LSRA pp. 174-179) ¹⁰

Need for Action

Action is needed because the existing conditions have departed from the desired conditions for:

1. insect and disease conditions,
2. stand composition, structure, and density,
3. fire regime, fuel loading and fire behavior.

The majority of the forested portion of the project area is departed from the natural fire regime and is at risk of large-scale undesirable disturbance due to existing fuel loading from the ongoing mortality that has occurred from high stand densities and associated stress from insects, disease and drought conditions. Without action, further stand and structural composition will be lost due to a combination of continued density related mortality, root disease, insect attacks and predicted lethal fire effects. These losses have and would continue to result in a further loss and decline of late-successional habitat and a failure to maintain or meet Forest Plan direction and LSRA objectives for the LSR and surrounding stands.

Background

As described in the NWFP (pp. B-7) and (LSRA p. 2) natural disturbance is an important process within late-successional forest ecosystems but humans have altered the disturbance regimes. Natural fire disturbance serves a key role in creating and maintaining vegetation community diversity and in consuming fuels accumulations. Due to fire suppression, some forests have become quite dense and multistoried, primarily from the invasion of shade-tolerant species. Density reduction in mid-level canopy layers by thinning may reduce the probability of crown fires occurring. At the same time, these forests may have become much more

¹⁰ In this context the LSRA is referring to early seral forest habitat, which is defined as young stands and plantations (up to 12.9” DBH) (LSRA p. Appdx. E)), and reducing the risk of setting these young stands back successional through large-scale disturbance. The objective does not include areas that are not capable or are most valuable as early-seral habitat such as meadows.
vulnerable to insects and diseases. The Recovery Plan describes that frequent and extensive outbreaks of native forest insects, such as bark beetles, have occurred historically in the western U.S. However, the anthropogenic influences through past management and fire suppression have altered the landscape vegetation patterns, subsequently altering the timing, duration and magnitude of outbreaks (pp. III-27).

Frequent low- to moderate-severity fires can remove dead fuel accumulations, as well as a minor portion of living vegetation, while leaving most of the larger overstory vegetation intact. It also frees up resources, which reduces competition among the surviving vegetation. This allows residual and overstory trees to grow more quickly and forest stands to develop more structural diversity. Small openings and areas of reduced overstory shading can also be created by frequent low- and moderate-severity fire, which allows understory vegetation to develop. Frequent low intensity disturbances of insects and disease can also create canopy openings and gaps in various strata of vegetation, and disease played an important role in shaping and maintaining special habitats in pre-settlement conditions (USDA-FS, 2011 p. 67). Without these frequent, lower intensity disturbances, forest stands continually grow until dieback begins, largely as a result of competition between trees for resources (e.g., water, nutrients, and sunlight). Under conditions of increasingly high density and competition for resources, tree growth slows or stagnates, tree vigor declines and forest stands become increasingly at risk for large-scale disturbance from events including insect outbreaks and high intensity fire.

The 1994 NWFP describes large-scale disturbances as natural events, such as fire, that can eliminate spotted owl habitat on hundreds of thousands of acres (pp. C-12). As a principle objective of silvicultural systems within LSRs, it identifies prevention of large-scale disturbances by fire, wind, insects and diseases that can destroy or limit the ability of the reserves to sustain viable forest species populations (p. B-5). It also calls for timely management decisions to ensure better results in projects that reduce the risk of catastrophic wildfire and restore forest health (pp. B.1, C.12 - 13). The Plan’s 20-year monitoring report summary for the ‘Status and Trend of Late-successional and Old-growth Forests’ states: “some portions of the NWFP area have been setback by decades from achieving those outcomes [expectations for older forest abundance, diversity, and connectivity] particularly resulting from large wildfires in the fire-prone portions of the NWFP area” (Davis, et al., 2015). Also, the summary report for the 20-year monitoring of the ‘Status and Trend of Northern Spotted Owl Habitat’ states: “large wildfires continue to be the leading cause for loss of NSO habitats on federal lands. Most of these fire-related losses have occurred within the network of large reserves that were designed for the protection and restoration of habitat for long-term northern spotted owl conservation” (Davis, et al., 2015). Range-wide, the nesting/roosting habitat lost from fire (505,800 acres) represents about 31 percent of the total habitat loss. The summary report further notes that the loss rates in fire prone portions of the NSOs range exceeded the expected 2.5% rate for the 20-year period at rates of 3.9 to 7.4% per decade, including the California Cascades area. Most large wildfires and resulting habitat losses have occurred in the federally reserved land use allocations [including LSRs] designed for NSO conservation (Davis, et al., 2015). Climate change is also expected to expand the area of fire-prone landscapes and an increased frequency of large wildfires this century has already been observed.

The California Cascades Province is identified as being an area of elevated risk to large-scale disturbance from changes in the characteristics and distribution of mixed-conifer forests that have resulted from fire suppression. Risk reduction and efforts are encouraged where they are consistent with the overall recommendations in management guidelines and the Recovery Plan notes that in some cases in dry forests, failure to intervene or restore forest conditions may lead to dense stands heavy with fuels and in danger of stand-replacing fires and insect and disease outbreaks. Active management is recommended to restore dry forest ecological structure, composition and processes, including wildfire and other disturbances (pp. III-20). Within both the California Klamath and California Cascades Provinces, the greatest threat to further loss and degradation of habitat for late-successional associated species is catastrophic wildfire (LSRA p. 174). As noted in the Recovery Plan (USDI-FWS, 2011 pp. III-6-7):
Natural landscape resilience mechanisms have been decoupled by fire exclusion and wildfire suppression activities (Hessburg et al. 2005, Moritz et al. 2011). Before the era of management, patchworks of burned and recovering vegetation, caused by mostly small and medium-sized fires, reduced the likelihood of the largest fires, which usually resulted from extreme weather events. Twentieth century fire suppression eliminated most of these fires, and forest landscapes are now susceptible to large wildfires.

The LSRA (p. 175) identifies the late-successional habitat in the Elk Flat LSR as at risk of loss to large-scale disturbance due to a high percent of expected late-successional sustainable level (5th highest LSR on the Forest at the time the LSRA was published). This LSR was included among the highest priority for treatment on the Forest for early to mid-successional habitat (objective III). The increase in mortality within the pine component between 2009 and 2012, and the continued mortality, also creates a high priority under criterion b, c, and d (pp. 179-180).

Desired and existing conditions relative to risk reduction (stand composition and structure, density, insects and disease, and fire and fuels) are described below.

**Insects and Disease**

*Desired Condition*

It is desirable to keep insects and related mortality at levels more closely associated with historic levels. This would fall into the range of no more than 0.2 to 0.5% of standing live biomass mortality/acre/year with occasional spikes of 1 to 1.5% during drought periods (LSRA p. 163). The Edson WA identified maintaining resilience of forest stands with respect to insects and disease as a key concern to address (p. 22).

Mortality levels caused by bark beetles in ponderosa pine stands are directly related to increases in stand densities (Zhang, et al., 2013; Oliver, et al., 1997; Oliver, 1995). In the absence of other forms of disturbance, stands grow increasingly dense over time until a threshold is reached and bark beetle mortality occurs. It has been widely held that a zone of imminent mortality begins when Stand Density Index\(^{11}\) (SDI) reaches 230. At this point mortality from bark beetles begins to increase; culminating at a maximum SDI of 365 (Oliver, et al., 1997; Oliver, 1995). As stands approach this maximum SDI, bark beetle outbreaks and wide-spread mortality develops, often killing large overstory pines and dropping stand densities to near or below an SDI of 230 (Oliver, et al., 1997; Oliver, 1995). Recent research (Zhang, et al., 2013) found that the imminent mortality SDI may be as high as 425, depending on site index, however the relationship of stand density driven pine beetle mortality remains the same. This relationship is evident with the widespread pine mortality from western pine beetle in the Elk project area.

*Existing Condition*

Although ponderosa pine mortality has been occurring regularly across the entire McCloud Flats, primarily due to black stain root disease (Leptographium wageneri) and western pine beetle (Dendroctonus brevicomis), pine mortality has increased dramatically over the past five years in the project area. Ponderosa pine trees weakened by black stain root disease provide a ready food supply that can support large build-ups of pine beetle populations. When the western pine beetles attack trees, they emit a chemical signal to attract more beetles, causing them to aggregate and expand out as they look for more food sources.

Due to the combined overstocking that increases individual tree stress stressed trees and the root disease, there are pockets of recent and ongoing mortality in ponderosa pine in numerous stands throughout the project area (Snyder, 2012). With a large beetle population outbreak, pine that are not infected with black stain root

\(^{11}\) Stand Density Index (SDI) is a measure that expresses relative stand density in terms of number of trees as related to the quadratic mean diameter in the stand. In other words, SDI is the degree of tree crowding within the stand.
disease, but are otherwise stressed by dense conditions or other factors, will also be attacked and killed. Direct field observations and long term (six consecutive years or more) aerial detection of pine mortality patterns indicative of black stain root disease have identified certain stands as known or likely areas of black stain root disease.

Mortality pockets range from several (10 to 25) trees to over 70 acres. In 2011, approximately 245 acres of pine mortality was identified based on field observations and aerial photography imagery taken in 2010. Expanded areas of mortality were observed in 2012 and 2014 and have continued to expand (Payne, 2015b).

Considerable bark beetle mortality has also occurred throughout the project area outside of stands where black stain root disease has been detected due to tree stress caused by dense conditions and other factors. Ongoing mortality is expected to continue as overstocked stand conditions support elevated bark beetle populations, including in areas where black stain has not been found.

The combination of overstocking (high stand density), root disease, and subsequent western pine beetle infestation has and continues to result in mortality of the larger diameter (20-inch, plus) ponderosa pine that were providing desirable habitat. This loss is particularly striking considering the lack of live large overstory pine or other species in the project area. Mortality is also spreading throughout pine plantations of various ages. Since the LSRA was published (1999), mortality levels in the Elk Flat LSR have increased dramatically, now putting it at “high risk to loss by large-scale disturbance due to adjacent areas of extreme fire hazard: identified as having two or more years of moderate or high levels of insect and disease-related mortality . . .” (LSRA p. 180).

Figure 3 shows the areas of mortality mapped on the south end of the project area based on field review and aerial imagery from 2009 and 2010. Figure 4 compares aerial imagery in the vicinity of unit 206 (the extensive mortality area) between 2005 and 2012. Figure 5 is a photograph of stand 206.
Figure 3. 2010 Aerial Imagery with Pine Mortality Areas Identified in the Southern Portion of the Elk Flat LSR Enhancement Project Area
Figure 4. Progression of Mortality in Unit 206 Vicinity Between 2005 and 2012\textsuperscript{12}

\textsuperscript{12} Unit 206 shown in the image is a plantation that was thinned in the interval. Other areas in the images were not thinned.
Heterobasidion root disease is also present in the project area and has infected white fir in units 160 (Snyder, 2012) and evidence is present in other units. The presence of slow-growing tops on many understory and intermediate white fir suggest that Heterobasidion is widespread within the stand. Because the use of borate stump treatments (used to reduce the spread of Heterobasidion) did not become a routine treatment until the
latest revision of the Forest Plan, there are numerous *Heterobasidion* root disease pockets on the McCloud Flats. Both black stain and *Heterobasidion* root disease may be present in the same stand.

Dwarf mistletoe (*Arceuthobium spp.*) infections are also present in both white fir and ponderosa pine. Fir engraver beetles (*Scolytus ventralis*) are present in dead and dying white fir. With few exceptions dwarf mistletoe and fir engraver beetle presence is generally light and not above endemic levels.

**Stand Composition, Structure and Density**

*Desired Condition*

Composition and Structure

The Forest Plan (p. 4.4) calls for a diversity of plants at all ecosystem scales. The desired condition within LSR is late-successional and old-growth forest in which structure and composition are consistent with site conditions and ecological processes (LSRA p. 162). Late-successional forests include mature and old-growth age classes. The intent in LSR to maintain natural ecosystem processes such as gap dynamics, natural regeneration, pathogenic fungal activity, insect herbivory, and low-intensity fire (NWFP pp. B-1).

The Forest Plan (pp. 4.81, 4.85) describes late-successional stands as containing large numbers of “Old-Growth” trees with large branching, flattened or dead tops, and high levels of decadence (broken tops, old and decaying wood). These older stands are structurally diverse and often multi-storied. The LSRA describes late-successional conditions as structurally diverse (p. 169). Conditions should not be uniform across the landscape. Denser patches should be intermixed with the more open areas. Decadence should be present or even obvious in the stand; snags and coarse woody material would be common, although in varying concentrations throughout the stand. Deformed, broken and diseased trees would also be common enough to provide nesting and roosting opportunities for wildlife. There would be gaps created by natural mortality where early-successional vegetation is present. Desired forest vegetation structure and composition would vary according to the vegetation community, soil conditions, site class, elevation, slope, aspect, climatic influences and other site circumstances. Table 4 provides the late-successional and old-growth characteristics from the NWFP and the LSRA.

| **Table 4. Desired Late-Successional and Old-Growth Characteristics as Described in the NWFP and LSRA** |
|--------------------|-------------------------------|
| NWFP (p. B-2, B-5) | LSRA (pp. 1, 164-165)        |
| Multispecies and multilayered assemblages of trees in the mixed conifer types. Multiple canopy layers. | Live old-growth trees. |
| Moderate-to-high accumulations of large logs and snags. | Snags. |
| Moderate-to-high numbers of trees with physical imperfections such as cavities, broken tops, and large deformed limbs. | Logs in streams. |
| Moderate-to high accumulations of fungi, lichens, and bryophytes. |                     |
| Smaller understory trees [Some smaller diameter (<10 inch DBH) trees provide perching and roost sites, contributing to vertical and horizontal structure (Carey, 2006).] Patchy understory. |                     |

Snags - Snags should be in a variety of size and decay classes and distribution should range from individuals to larger aggregations. Desired numbers of snags should vary based on vegetation type with the average number of snags at 3 to 7 per acre at least 20 inches in diameter. It is desired to have scattered individual snags and down logs as well as larger aggregations that result from natural events such as wildfire, insect
outbreaks and wind-storms. Larger aggregations are desired as long as they do not put other important late-successional characteristics at risk to large-scale disturbances. The desired levels identified in the vegetative descriptions (Tables 3-1 through 3-4 of the LSRA) represent an average for a landscape or treatment area (i.e., 100 acres). Numbers of snags and down logs can vary on any particular acre (LSRA, 1999 p. 164).

Coarse Woody Debris (CWD) – The Soil Quality Standards (Appendix O of the Forest Plan) defines large woody material as at least five logs per acre in contact with the soil surface. Desired logs are about 20 inches in diameter and 10 feet long, representing a range of decomposition classes. Logs in decomposition classes 3 through 5 should be protected from burning and mechanical disturbance. The desired condition for LSR however is 6 to 10 logs per acre depending on the vegetation type (see RPM 40e on page 91).

These conditions can begin to appear when forest stands are between 80 and 140 years old, depending on site conditions, species composition and site history (LSRA p. 162). In pine-dominated forest, stands under normal conditions are more open with relatively fewer snags and logs. On dry sites, stands may be well over 180 years before these characteristics develop. Figure 6 depicts approximate desired conditions for late successional habitat.

Figure 6. The Approximate Desired Conditions for Late-Successional Stands: Stand 150 Showing Spacing and Structure (November 2012)

The LSRA describes sustainable levels of late-successional habitat within LSRs as between 50 to 60% (of land capable of sustaining late-successional habitat) (p. 196). Vegetation would be varied over the landscape, consisting of dense multi-layered stands, more open multi-layered stands, dense and open single storied stands, a variety of trees per acre with differing size classes, snags, down logs, etc. The desired character is in line with site capability, elevation, slope, aspect and soil conditions.
Density

The desired condition for density for late-successional and old-growth stands on the McCloud Flats is 50 to 70% of normal basal area\(^{13}\) (Dunning, et al., 1933), (LSRA, 1999 p. 167), and should apply to stands 150 to 200 years old. This density range would allow stands to maintain desired characteristics for a longer time without an imminent threat of high levels of mortality. After the 200-year timeframe, basal area should not be as much of a concern in order to allow decadence and increased mortality processes to occur naturally.

The Forest Plan (pp. 4.79, 4.82, 4.86) describes the desired condition for Matrix lands as forest stands managed at levels that maintain and enhance growth and yield to improve and protect forest health and vigor, recognizing the natural role of fire, insects and disease and other components that have a key role in the ecosystem. Stand understories would appear more open with less ingrowth particularly in stands on sites where wildfire plays a key role in stand development. The actual target stand densities depend on stand species, site quality, stand age, and stand objectives along with the objectives of the LSRA for LSR allocations (i.e. stand densities are maintained at lower levels to grow larger old trees within LSR).

**Existing Condition**

**Composition and structure**

Most of the project area consists of dense relatively homogeneous forested stands of medium- and small-sized trees. Understory vegetation is sparse to nonexistent in these dense stands because most of the site resources are being taken up by the overstory and because little sunlight reaches the forest floor. In contrast, approximately 20% of forested stands are open-canopied and have available growth resources to support an appreciable understory vegetation layer. Currently the ecological processes that develop old-growth habitat are departed from their natural regimes.

Table 5 describes the seral stages present in the proposed treatment units in the project area. The Forest Plan description by Wildlife Habitat Relationship (WHR) classification, canopy closure, and DBH (Forest Plan p. 4.15) does not correspond well with the Elk project area where high site quality leads to early large tree development, atypical to the size-successional stage correlation described in the Forest Plan.

<table>
<thead>
<tr>
<th>Forest Plan Description</th>
<th>Site Specific Elk Project Area Description</th>
<th>WHR Seral Stage*</th>
<th>Canopy Closure (percent)</th>
<th>DBH (inches)</th>
<th>Acres</th>
<th>Percent of Capable^</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass &amp; forbs with or without shrubs and seedlings</td>
<td>same</td>
<td>1</td>
<td>≤ 10%</td>
<td>N/A</td>
<td>518^</td>
<td>14.9%</td>
<td></td>
</tr>
<tr>
<td>Shrub/seedling/sapling mixed or pure stands up to 20 feet in height</td>
<td>same</td>
<td>2</td>
<td>≤ 10%</td>
<td>N/A</td>
<td>0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Pole/medium tree stage including larger trees in the size range 20-50 feet in height</td>
<td>Pole to medium tree stage predominantly mid-successional with some early successional stands. May include some larger trees. Average height generally 20-60 feet. Average age is generally 15 – 50 years.</td>
<td>3a</td>
<td>10-39%</td>
<td>5” – 21”</td>
<td>573</td>
<td>16.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3b</td>
<td>40-69%</td>
<td>5” – 21”</td>
<td>658</td>
<td>18.9%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3c</td>
<td>≥ 70%</td>
<td>5” – 21”</td>
<td>96</td>
<td>2.7%</td>
<td></td>
</tr>
</tbody>
</table>

\(^{13}\) Basal area is the cross-sectional area of all trees in a stand measured at breast height and expressed as square feet per acre.
Large tree stage corresponding roughly to a late successional classification. Trees generally > 50 feet tall except for oak types at lower elevations. Average age is generally over 110 years

<table>
<thead>
<tr>
<th>Forest Plan Description</th>
<th>Site Specific Elk Project Area Description</th>
<th>WHR Seral Stage*</th>
<th>Canopy Closure (percent)</th>
<th>DBH (inches)</th>
<th>Acres</th>
<th>Percent of Capable# Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same except: Medium to large tree stage spanning mid and late successional classification. Average age is generally 60-100 years</td>
<td></td>
<td>4a</td>
<td>10-39%</td>
<td>21 + &quot;</td>
<td>179</td>
<td>5.1%</td>
</tr>
<tr>
<td>Same except: Medium to large tree stage spanning mid and late successional classification. Average age is generally 60-100 years</td>
<td></td>
<td>4b</td>
<td>40-69%</td>
<td>21 + &quot;</td>
<td>1,446</td>
<td>41.5%</td>
</tr>
<tr>
<td>Same except: Medium to large tree stage spanning mid and late successional classification. Average age is generally 60-100 years</td>
<td></td>
<td>4c</td>
<td>≥ 70%</td>
<td>21 + &quot;</td>
<td>13</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

Multi-layered large tree stage with obvious signs of late-successional. At least 2.5 snags per acre and 20 tons of dead/down material. Stands should contain at least 3 trees (alive or dead) per acre > 36” DBH. Dominant trees are over 180 years of age

Multi-layered large tree stage with obvious signs of late-successional. At least 2.5 snags per acre and 20 tons of dead/down material. Stands should contain at least 3 trees (alive or dead) per acre > 36” DBH. Dominant trees are over 180 years of age

<table>
<thead>
<tr>
<th>Forest Plan Description</th>
<th>Site Specific Elk Project Area Description</th>
<th>WHR Seral Stage*</th>
<th>Canopy Closure (percent)</th>
<th>DBH (inches)</th>
<th>Acres</th>
<th>Percent of Capable# Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same except: Dominant trees are generally 80-120 years old</td>
<td></td>
<td>4c - older</td>
<td>≥ 70%</td>
<td>21 + &quot;</td>
<td>0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Total 3,482 100%

Table Notes
* Classification using Wildlife Habitat Relationship (WHR) models
** Descriptions are specific to Elk Flat LSR project area where high site quality leads to early large tree development, atypical to size/successional stage correlation described in the Forest Plan.
# Capable of supporting late-successional forest
^ Mostly Elk Flat Meadow. While designated as capable, it is a meadow type rather than a forest type.

About 58 percent of the total natural stands in the Elk Flat LSR contain mixed tree species, stand elements and structure to support low- to moderate-quality foraging habitat for NSO, northern goshawk or fisher, with 28 percent of those stands proposed for underburning only. Approximately 22 percent of the total natural stands contain some proportion of late-successional habitat elements that provide reproductive habitat for these species, and all of these areas would be underburned only (summarized in the Chapter 3 wildlife section and described in detail in the Biological Assessment and wildlife Biological Evaluation). Most of these ‘higher value’ areas are isolated patches within larger stands surrounded by smaller trees, with few exceptions.

These stands generally meet the Forest Plan classification elements of older late-seral stands (4c in Table 5) except for stand age and canopy closure, which are required to exceed 70% to meet the Forest Plan classification. This divergence between habitat suitability for these late-successional dependent wildlife species and Forest Plan seral classification reflects the stand elements within a portion of the project area, namely ponderosa pine, that cannot sustain over the long term at densities that provide canopy cover greater than 70 percent.

Within the LSR, 2,836 acres are capable of supporting late-successional habitat (LSRA p. 125). Of the land capable of supporting-late successional habitat, 1,306 acres (46% of capable land within the LSR) were in late-successional habitat when the LSRA was published in 1999. Currently, there is a shortage of high quality late-successional habitat in the LSR. Many late-successional stands are deficient in structural diversity.

Although most of the project area falls in to the CWHR classification of ponderosa pine, white fir (*Abies concolor*) is often the dominant species in all size classes in the mixed conifer-pine and white fir-pine natural stands. Ponderosa pine forests typically contain a mix of tree species but the proliferation of white fir and relative scarcity of ponderosa pine reflects past harvest practices and decades of fire suppression policies. In the ponderosa pine-dominated natural stands, pine was the dominant species, but as described in the Purpose
and Need section for Risk Reduction (see p. 10) , there has been considerable mortality and loss of this species.

Initial logging occurred in the project area in the late 1800s and early 1900s. Large overstory ponderosa pine, sugar pine (*Pinus lambertiana*) and Douglas-fir (*Pseudotsuga menziesii*) were preferentially removed, with smaller trees and less marketable species left uncut. Though in some areas of the project, there are remnant trees (predominants) of these species.

The lack of a low- to moderate-intensity, frequent fire regime and fire suppression essentially removed natural and historic fire from the landscape, which would have periodically reduced surface fuels, much of the young small diameter understory trees and a portion of mid and overstory trees, depending on severity. Current stand conditions reflect an increase in a shade-tolerant understory and midstory, composed primarily of white fir and incense cedar (*Calocedrus decurrens*). This transition occurred because white fir and cedar are able to establish in a shaded understory environment and grow into the overstory over time. White fir, followed by incense cedar and ponderosa pine are the most common species in the understory. Douglas-fir and sugar pine represent a minor understory component in most stands, though in the higher value habitat areas are more predominant. Pine requires more light and openings to successfully regenerate, and does not survive well in a shaded understory environment.

Ponderosa pine is a component of large overstory trees (30 inches DBH and greater) where it is found in combination with white fir, incense cedar, Douglas-fir and sugar pine. The mixed conifer-pine stands that support foraging habitats are similar in composition to the ponderosa pine-dominated stands but generally contain a higher proportion of white fir in the overstory in combination with ponderosa pine, Douglas-fir, incense cedar and sugar pine.

Prior to the recent western pine beetle outbreak, snags occurred individually and in small groups throughout the natural stands. The 2007 stand exams (conducted prior to the heavy mortality onset in 2009-2012) found an average of 4.7 snags per acre within natural stands (50% of project area), with a median size of 20 inches DBH. The current mortality has likely increased snag densities to 10 or more snags per acre in the same size class. It is recognized that snags and large CWD provide important habitat elements and are important features to promote and maintain across the landscape. However, with the significant additional widespread mortality in pine, these snags will decay, drop and create large fuel loadings in excess of 100 tons per acre unless otherwise treated.

**Density**

Stands have grown increasingly dense over time, causing understory vegetation to die out due to overtopping and competition, and causing overstory trees to grow slowly due to inter-tree competition for resources. Non-conifer understory shrubs and herbaceous vegetation are lacking in the project area and are at levels considerably lower than would be expected under historic natural fire regimes. Both natural and plantation forest stands in the Elk Flat LSR are highly to extremely dense in relation to the survivability of pine (see also discussion about density related bark beetle vulnerability in ponderosa pine on page 12).

The 2007 stand exams recorded basal areas ranging from 156 to 342 square feet per acre with an average tree diameter of 16 inches. Because of the lack of low intensity fire or other past disturbance, stand densities increased as trees have continued to grow larger. Tree growth has slowed as stands approach and reach their maximum carrying capacity. Density related mortality is expected to continue to increase and spread throughout the project area. Many of the largest dominant and predominant ponderosa pine trees have died, or are dying in the project area.

The majority of the mid- and late-successional stands in the project area consist of dense, overstocked stands. Approximately 80% has dense (ranging from 40-90+%) canopy cover. The preponderance of small- and medium-sized trees reflects the lack of differentiation that occurs under dense, stagnant growth conditions.
Many of these stands have reached or exceeded a density threshold causing individual tree growth, health and overall stand vigor to decline. The current pine mortality demonstrates the limiting stand density relationship and resulting loss of desirable late-successional tree features including large overstory pine. While stand densities remain high, the risk of further loss of these stand elements persists.

Older plantations (greater than 40 years) currently exceed the threshold SDI of 365. These overstocked, monoculture ponderosa pine plantations are not developing desirable habitat features but are expected, with treatment, to provide an important source of future (next few decades) habitat. In the interim, they remain at risk of widespread mortality due the high density and present a risk to surrounding higher and moderate quality habitats.

Figure 7 illustrates the overly dense conditions in some natural stands in the project area. Figure 8 shows a stand with average basal area of 283 square feet per acre, an SDI of 419 and an average tree diameter of 16 inches. While basal area is often used as a measure of NSO (and other species) habitat suitability, other factors such as average tree diameter, species composition, decadence, and snag/CWD size also contribute to the overall suitability. Figure 9 illustrates the overly dense conditions in plantations.
Figure 7. Existing Condition of Unit 155 with BA of 283 and SDI of 419

Figure 8. Overstory Pine Density Exceeding Basal area 200 square feet per acre Prior to the Mortality (Unit 201)

(Stand Exam 2007, Photo July 2012)
Fire Regime

The Forest Plan states the goal of returning fire to its natural role in the ecosystem (p. 4.4). Stand understories appear more open with less ingrowth particularly stands on sites where wildfire plays a key role in stand development (pp. 4.79, 4.86).

Prior to historical logging, the natural fire regime was frequent low to moderate intensity fire, and much of the forest stands would have been fairly open-canopied with brush, forbs and grasses underneath. More dense stands of mixed conifers would have been present at higher elevations, along riparian corridors and on north-facing slopes where local moisture levels are higher and fires were less frequent. The Edson WA describes pre-settlement fire regime (USDA-FS, 2011 p. 89). Prior to European settlement of the region, wildland fire was the primary factor that influenced the vegetation patterns across the watershed.

Historically, approximately 91% of the Elk project area experienced a high frequency (0 to 35 years) low to mixed severity fire return interval.¹⁴ Fires started by lightning probably burned large areas during periodic

¹⁴ Fire return interval is the average period between fires under a presumed historical fire regime.
droughts with mixed severity, perpetuating shrubs and very open conifer forest. Native American sites in the watershed indicate that some wildland fires were deliberately started to maintain early-successional vegetation that favored game species such as deer and elk. Prior to organized fire suppression frequent low to moderate severity fire occurred as a combined result of summer drought, winter precipitation and lightning. Mature trees in this forest type are adapted to frequent surface fire. Historically, periodic wildfires limited the main species composition of dry sites to pines (cedar and fir are more susceptible to fire-induced mortality than pine due to their branch characteristics and bark qualities).

The LSRA (p. 163) notes it is desirable to have low to moderate intensity fires burn in LSRs. Low intensity fires can reduce fine fuels and ladder fuels, create a seedbed for a diversity of herbaceous plants, and create a patchy understory open enough for spotted owl movements. Moderate intensity fires are desirable if they create small openings in the canopy of less than one to five acres. This allows for ingrowth of tree seedlings and other early successional plants, and creates snag patches and concentrations of down woody debris which are important for prey base habitat. Burned openings are most desirable if they occupy only a small percentage (five to ten percent) of the stands providing habitat. Introducing a fire cycle more similar to what occurred in pre-suppression times will reduce the risk of catastrophic fires. Large stand replacing, high intensity fires are not desirable within LSRs.

The desired condition is a fuels profile where fire plays a natural role in the ecosystem with conditions that result in low to moderate fire behavior. When a natural ignition occurs within the project area, it would be allowed to play its natural role in the ecosystem.

Fuel Loading

Research has described natural frequent low-intensity fire in dry pine and mixed conifer forests in the West as "fuels limited" fire regimes (Agee, 1993; Schoennagel, et al., 2004). In other words, fuels sufficient to sustain and carry a fire are a more limiting and determining factor than weather or climatic conditions.

The Forest Plan describes dead and down material presence for LSR (p. 4.44) and matrix lands (p. 4.67). Actual [desired condition] fuel loadings vary according to vegetation type, but average from 5 to 35 tons per acre in LSR and 5 tons per acre in matrix lands with CWP emphasis.

The LSRA (p. 163) describes the desired variability of fuel conditions across the landscape as some high concentrations of fuel intermixed with areas of low fuel accumulations. Heavier scattered pockets of fuels would occur on relatively cool, moist sites, such as those found on north and east facing slopes, or low on slopes adjacent to perennial riparian areas. South and west slope aspects and upper slope positions, which are typically drier and harsher, would generally contain lighter fuel loadings, with fewer scattered pockets of heavy fuel. Site capability also influences fuel loadings. Fuels would break down with the assistance of fire and cycle nutrients back into the soil in a form available to vegetation. There would be a low, manageable level of excess residual natural and activity fuels that remains after management activities are implemented that would not contribute to increased probabilities of high severity wildfire within the LSR.

Fire Behavior

The LSRA (p. 163) describes the desired fuel conditions as those that promote low to moderate fire behavior. Low to moderate intensity disturbances (such as fire, wind, insects and disease) create canopy openings and gaps in vegetation, establish trees beneath the maturing overstory trees either in gaps or under the canopy, and close canopy gaps by lateral growth or growth of understory trees (p. 162).

The wildfire behavior goal is to develop a fuels profile that will have moderate wildfire intensities determined by flame length (a measure of fire intensity) on a 90th percentile (mid to late summer or hotter) fire weather day over most of the land base. The desired flame length and rate of spread would be those in which overstory trees are not likely to be killed (LSRA pp. 164-165). The LSRA recommends a fuels profile with moderate wildfire intensities determined by flame length (a measure of fire intensity) of four feet or less, allowing for
safe direct attack by hand crews, and rates of spread less than twenty chains (1 chain = 66 feet) per hour (LSRA p. 165). Fuel Models\textsuperscript{15} 2 and 9 are the desired condition. Fuel Models 2 and 9 are present, but the fire behavior within these fuel models is moderated by surface fuels and tree densities not exceeding desired levels.

- **Fuel Model-2** – Fire spread would be primarily through the fine herbaceous fuels, either curing or dead. These would be surface fires where the herbaceous material, litter and dead-down stemwood from the open timber overstory contribute to fire intensity.

- **Fuel Model-9** – Fires would move through the surface litter. Fuel bed depth would be less than 1 foot.

**Existing Condition**

**Fire Regime**

The Mt. Shasta region has experienced nearly 100 years of fire suppression resulting in a vegetation structure and composition that is vastly altered from historical conditions. The restricted size and frequency of fires across the landscape has resulted in increased stand density, a shift from fire-tolerant to fire-intolerant species, and reduced structural diversity throughout the region and watershed area. As a result, severe wildfires have increased throughout the Cascade Range, especially in the low and mid-elevation forests (USDA-FS, 2012 p. 58; Skinner, et al., 2006). Effective fire suppression within the dry forested landscape of the California Cascades Province where the project is located has resulted in changes to forest structure, stand density and species composition, changing the fire regime from frequent low intensity surface fires, to infrequent, stand replacement fires (Agee, 1993). In the past several decades, the frequency of large wildfires and the acres burned each year have increased across the western United States (Miller, et al., 2012), (Agee, et al., 2005). Many of these fires are burning with uncharacteristic severity and scale (Agee, et al., 2005).

The Elk project area has experienced the results of effective fire suppression. Large-scale, frequent, low-intensity fires have not occurred in the project area. The result has been an accumulation of surface and understory fuels and overstocked stands that are more susceptible to drought stress, insects and disease. Fire cannot play its natural role (short interval, low to mixed intensity fire regime) in the project area at this time. In a fire, dramatic changes to the stands could occur due to fire size, intensity, severity, and landscape patterns. (NWCG, 2006).

The entire project area is in fire regime condition class 3 (high departure) (USDA-FS, 2012a). The fire regime has been substantially altered from the natural (historic) range resulting in a high risk of losing key ecosystem components. Fire frequencies have departed from natural frequencies by multiple return intervals. There is no record of large fires in the project area in the last 100 years. There are numerous areas with fire scared trees indicating smaller fires throughout the project area.

**Fuel Loading**

Departure from the natural fire regime has led to dense accumulations of live and dead fuels, combined with the recent mortality from bark beetles. Current surface fuel loadings in the Elk Flat LSR range from 5 up to 60 tons per acre. Where there are high levels of existing and ongoing mortality, fuel loads are expected to increase to 35 to 100+ tons per acre when these dead and dying trees fall. Approximately 10% of the Elk Flat LSR is currently comprised of large pockets (10 to 70+ acres) of standing dead trees that present a current and future threat to the surrounding habitat and Forest visitors due to increasing fuel loads and safety.

\textsuperscript{15} Fuel models are tools that help land managers estimate fire behavior, and are described in terms of expected fire behavior and associated vegetation. Fuels models depict the types and amounts of fuels that are available to support fire, and are an important factor in determining fire behavior potential for a given site.
considerations. Smaller mortality pockets range from groups of 5 to 10 trees up to \( \frac{1}{2} \)-acre, primarily in the ponderosa pine component, with additional root disease-related mortality occurring in white fir stands.

Many conifer stands are overly dense with many small trees in the understory layer that can act as fuel ladders, allowing fire to move quickly from the forest floor into the upper canopy layer. Stand species composition is shifting from predominately pine to pine mixed with incense cedar and white fir. Incense cedar and white fir are prolific throughout the understory and mid-story of many stands. The shift in species composition from pine to cedar and fir increases the risk of loss due to wildfire. Figure 10 shows a typical mixed conifer stand with heavy ground fuel accumulation.

Fire Behavior

The large areas of pine mortality would influence fire behavior in the event of a fire start. Mortality pockets provide a component of late-successional reserve conditions in the form of multiple snags, standing dead trees and large CWD. However, the current and future fuel loads, and risk of natural and human caused fire starts would result in high heat and spotting that could ignite other dense forested stands within the project area. The current strategy for responding to a fire in this area is to not commit firefighters in the mortality zone, but back off to a safe location to manage the fire, potentially increasing risk to late-successional forest. The natural stands and older plantations are susceptible to high severity fire effects due to fire suppression and natural fire exclusion over the past 100 years.

In the case of a wildfire during the summer season, fire behavior modeling predicts rates of spread, flame lengths, and resistance to control that would result in high acreage burned and significant post-fire adverse effects on resources. Three fuel models account for approximately 85% of the LSR: Fuel Models-10, -2 and -9 (LSRA p. 126).

- **Fuel Model-10** is characterized by dense late-successional conifer stands (Timber Condition Classes 4N, 4G, and greater) with heavy amounts of dead and down woody fuels. The understory is densely populated with intermediate size conifers. A wildfire carried by these fuels would be intense enough to cause crowning (fire moving from the understory to the tree crowns), fire spotting ahead of the main fire and rapid rates of spread during high winds. Large stand replacing fires can be expected.

- **Fuel Model-2** is characterized by poorer timbered sites and young plantations with grass and brush where surface fires can spread easily with pockets of fuels generating high heat intensities.

- **Fuel Model-9** is characterized by closed-canopy conifer stands (Timber Condition Classes 3N, 3G, 4N, and 4G) with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels that create high fire intensities during surface fires that can easily spread through the understory to the crowns of the dominant conifers.
Fire occurrence has been very low in the Elk Flat LSR, with lightning caused fires accounting for 92 percent of the recorded occurrences. However, fire hazard/risk in the 1999 LSRA was determined to be moderate/moderate due to several large pockets of standing dead trees. Because of the ongoing western pine beetle outbreak, a higher level of snags than would normally occur under a natural fire regime developed throughout most of the project area. Existing snag estimates are 10 snags 20 inches DBH per acre. Some of these snags have already fallen and become down wood, and snags will continue to fall over the next few years without treatment. While snags and large down logs are an important habitat component in the project area, they are also a high fire hazard at the current densities. Widespread high concentrations of snags and down wood create a fuel hazard. Extensive dense fuels increase the risk of undesirable high intensity fire that could kill adjacent residual trees as well as newly regenerating stands growing up through the dead and down trees.

With the current and projected fuel loads, the risk from potential for human caused fire starts has increased, notably along roads. Additionally, the low level of recent timber-stand management activities such as thinning to reduce forest stand density, has resulted in overcrowded stands with slowed tree growth and poor vigor.

The recent insect-caused mortality compounds the current hazardous fuel conditions. Without treatment, these areas of dead and dying trees will add significantly to the potential fire behavior hazard. Once the trees have fallen, surface fuel loadings are estimated to exceed 100 tons per acre in the mortality pockets. These areas would be characterized as a Fuel Model 13. Appendix B of the Fireline Handbook (NWCG, 2006) describes fire activity in Fuel Model 13 as:

“Fire is generally carried by a continuous layer of slash. Large quantities of greater than 3-inch material are present. Fires spread quickly through the fine fuels and intensity builds up as the large fuels start burning. Active flaming is sustained for long periods and a wide variety of firebrands can be generated.”

A wildfire in these pockets with high fuel loading would be a high intensity. This may require firefighters to back off to an area where intensity will be less. Equipment would have a difficult time working in these areas, making the tactic of creating control lines with dozers unlikely.

With the existing conditions and ongoing mortality, portions of the project area are expected to experience passive crown fire and flame lengths greater than 4 feet. This would not allow ground forces to directly attack the flanks or head of the fire. Equipment and/or aircraft would be needed to manage a fire under these conditions. Modeling indicates up to 40% mortality from a wildfire in the natural stands, under 97th percentile weather conditions. With these conditions, fire managers are limited in the tactics that would be effective. Potentially, this could impact adjacent landowners, as a fire that starts within the project area could move onto private lands.

While fire modeling does not predict a running crown fire, the predicted high heat and potential for torching and spotting in the heavy mortality areas presents a risk to current and developing late-successional habitat, adjacent private lands and WUI. Without action, the mortality will continue to increase and spread throughout the project area, contributing to higher levels of standing and dead fuels and increasing the risk of high severity, stand-replacing fire.

2. Accelerate Development of Late-Successional and Old-Growth Forest Characteristics (LSRA Objective II) and Promote Late-Successional Habitat Connectivity (LSRA Objective IV)

Need for Action

Action is needed because the existing conditions will delay or prevent development of late-successional forest in early and mid-successional forested stands in the project area. The same conditions that affect successional development reduce the value of these forests for connectivity to existing late-successional forest.
**Background**

Development of old-growth forest characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition are a primary objective in LSR. Some of the mid-successional forest is already providing components of late-successional forests. Most of the mid-successional forest in natural stands provides habitat that is utilized by a late-successional dependent species (NSO, northern goshawk, fisher, rare mosses). Restoration treatments in early-successional forests can accelerate development of some of the structure and composition of late-successional forests (NWFP, 1994 pp. B-6). The NWFP standards and guidelines (p. B-1) encourage accelerating development of overstocked young plantations and early-successional forests (p. B-5) into stands with late-successional and old-growth forest characteristics.

While the LSRA describes that plantations are important in the development and sustenance of late-successional habitat and associated species (p. 172), the plantations in the project area are predominantly a monoculture of ponderosa pine which contribute little current habitat value for late-successional species. The stand and species composition of the early- and mid-successional stands (both natural and plantations) are critical factors to consider when assessing current and future potential habitat suitability and value for these species. With treatment, these stands may support late-successional forest conditions over the long-term, and potentially succeed and replace current late-successional stands that will fail (p. 173). In addition, as described in the LSRA, emphasis should be placed on ensuring early successional forests, particularly plantations, toward late-successional conditions that can provide additional support to prey base and foraging habitats for the fisher and northern goshawk, and dispersal habitat for the northern spotted owl.

The Forest Plan (pp. 4.81, 4.85) also directs managing younger to mature forest stands (in LSR) to replace older dead and dying stands as they no longer are suitable for old-growth ecosystem dependent organisms. The LSRA identifies Elk Flat LSR as a priority for promoting development of late-successional forest (LSRA p. 178) and notes the importance of maintaining young plantations as healthy and fast growing. Stocking levels and fuel accumulations should be at levels that reduce the likelihood of loss to catastrophic fire and that encourage the growth of large trees (LSRA pp. 162-163). Forest Plan direction includes providing connecting travel corridors for wildlife species, particularly late-successional dependent species, by using Riparian Reserves and silvicultural prescriptions (p. 4.14), and maintaining or improving soil productivity (p. 4.5). The LSRA describes connectivity of early and mid-successional habitat (pp. 181-182) as:

a. Areas of early- and mid- successional forest adjacent to "isolated" stands of late-successional habitat that will respond to treatment in order to promote greater connectivity and reduce fire hazards throughout LSR.

b. Areas of early- and mid-successional forest that coincide with landscape features that may be important to dispersing animals.

**Desired Condition**

The desired condition is to achieve and maintain individual tree growth, health and resilience of contiguous early and mid-successional pine and mixed-conifer habitat across the Elk Flat LSR and adjacent matrix lands to foster connectivity and develop late-successional habitat. Connectivity provided by Riparian Reserves is also important and described starting on page 34.

**Existing Condition**

Early and mid-successional forest in the project area totals approximately 1,500 acres\(^\text{16}\). Most of the mid-successional forest consists of dense, overstocked stands. Many of these stands support density levels that are near or exceed site capability because they are often slow growing and lacking stand vigor. Growth

\(^{16}\) This does not include Elk Flat, which is early seral, but not a forest type.
projections indicate potentially high levels of mortality with associated surface and standing dead fuel increases that can add to uncharacteristic fire behavior and effects. Under the current conditions of increasingly high density and competition for resources, tree growth slows, tree vigor declines and attainment of late-successional status and quality of connectivity is decreased, delayed or prevented.

The practice of “brush to trees” windrowing\textsuperscript{17} in the 1950’s through the 1970’s plowed brush fields into windrows, displacing from four to eight inches of topsoil, followed by conifer planting. Topsoil was scalped to tear out brush and to remove duff and seeds to expose bare soil for planting. Windrowed brush was burned, leaving large rows of topsoil rich in soil organic matter. The loss of soil productivity between the windrows directly affects site productivity and sustainability resulting in reduced or delayed tree and stand development.

3. Restore Meadow Habitat in Elk Flat

\textbf{Need for Action}

A need exists to restore the natural opening and dry meadow ecosystem at Elk Flat. Elk Flat appears to be in a drying phase which is allowing tree encroachment to occur. A high water table supports meadow vegetation and discourages tree growth. When the water table is lower, trees can out-compete meadow vegetation because of their deeper roots. Currently, the water table is greater than one meter below the ground surface in most years, so this meadow area is probably best classified as a dry meadow/grassland area with conifer encroachment (Weixelman, 2015). Specifically, the following processes need restoration or application to maintain the dry meadow ecosystem:

1. Restoration of early seral vegetative conditions that are more reflective of those before fire suppression; and restoration of herbaceous species that would maintain sufficient sod and root densities to discourage tree establishment and keep the area open.

2. Re-introducing fire as a disturbance element that contributes to maintaining the dry meadow vegetation conditions.

3. Restoration of the natural water table to encourage and support meadow vegetation and discourage tree encroachment. Water table restoration is further described in Purpose and Need #5 below (see p. 34).

\textbf{Background}

Elk Flat is a natural opening, a dry meadow (Weixelman, et al., 2011) and the outwash plain for Swamp Creek. Openings were probably maintained in the past by outwash and mudflow events. Although the frequency and duration of these events is unknown, soil pits show a wide range of stratification indicating recurring outwash was deposited.

The fire interval and intensity may have been very different between the surrounding forest and Elk Flat. There is little physical evidence on the role of fire in maintaining the open condition; however, the meadow edges probably shared the same fire interval as the surrounding conifer forests and this may have helped limited conifer encroachment. Nineteenth-century historical anecdotes indicate that Elk Flat was about three to four miles wide and without trees (USDA-FS, 2011 p. 99). A range of fire intervals and intensities would have depended on the occurrence of fuels. Lighter fuels, grasses and forbs of the meadow interior would have likely supported low intensity surface fire that would contribute to maintaining the opening.

Elk Flat meadow contains deep soils formed in glacial outwash and mudflows overlain by several feet of the more recent outwash deposits (USDA-FS & USDA-SCS, 1983). Soils are deep and somewhat excessive to

---

\textsuperscript{17} Windrowing is a site preparation method in which topsoil is scalped and piled. It was used in the past prior to tree planting as a way to remove competing vegetation.
well-drained. Due to the deep soils overlain by outwash, a seasonal water table elevation sufficient to support a high density of grasses and upland sedges probably maintained enough sod and root densities to discourage tree establishment and keep the area open. In the past during successive high water years, there may have been shallower water tables, thus increasing grassy cover, and during drier periods lowering water tables and reduced grassy cover (Weixelman, 2015).

Within the project area, 353 acres of Elk Flat meadow are in LSR allocation, with the remaining 378 acres in matrix with Commercial Wood Products (CWP) emphasis. Forest Plan Standard and Guidelines provide for maintenance of at least five percent of each timber type/seral stage (p. 4.14).

**Desired Conditions**

The Forest Plan directs that management of natural openings will be determined at the project level, consistent with desired future conditions (p. 4.14). In the Forest Plan supplemental management direction for Management Area 2 (p. 4.81), Elk Flat meadow is specifically identified for management of early seral stage vegetation (WHR Seral Stage 1, Table 4-3). Forest goals that contribute to identification of the desired future conditions in the Elk Flat meadow include:

- maintaining a rich diversity of plants, fish, and wildlife and maintaining the diversity and quality of habitats that support viable populations of plants, fish, and wildlife (p. 4.4).\(^{18}\)

- restoring fire to its natural role in the ecosystem when establishing the desired future condition (p. 4.4).\(^{19}\) maintaining natural wildlife species diversity by continuing to provide special habitat elements within the Forest’s ecosystems (p. 4.6).

The LSRA (p. 205) lists protection and improvement of meadow areas as the desired condition and neutral to the objectives of LSR. The Edson WA identified opportunities to restore the distribution, size and functions associated with wet and dry meadows, including Elk Flat (p. 116) and to evaluate the potential for maintaining meadows through reintroduction of fire and vegetation management (p. 105).

Low intensity surface fires would not necessarily produce scarring on the larger trees or produce significant charcoal in the soil layers; it is possible that low intensity surface fires maintained the open nature of the meadow in the past (Weixelman, 2015). The best evidence available that demonstrates the size of the Elk Flat opening before the control of fires are 1944 aerial photographs (see Figure 12). The desired condition is:

\(^{18}\) Elk Flat does not provide fish habitat, but it does contribute to diversity of plants and wildlife.

\(^{19}\) While it is suspected that fire did not maintain the habitat in Elk Flat, returning fire to the landscape as an agent that helps maintain the early seral vegetation is consistent with the Forest Plan goals.
1. The early seral area of Elk Flat is restored to its historic size as evident in the 1944 photographs. Scattered conifers are a natural component of the meadow. The largest trees are retained, primarily the predominants that established prior to 1944 and within LSR, those with late-successional characteristics (see Figure 11).

2. Fire is re-introduced to act as a natural disturbance agent and to promote conditions more reflective of a natural fire regime prior to fire exclusion.

**Existing Conditions**

Conifer encroachment is diminishing the dry meadow area at Elk Flat. Based on 1998 aerial photography analysis, the extent of the meadow at Elk Flat was less than 50% of its extent in 1944 (USDA-FS, 2011 p. 69). The photo comparison below shows 2012 and 1944 aerial photography and demonstrates continued decline of meadow area from encroaching conifer (see Figure 12).

The meadow at Elk Flat is predominantly comprised of herbaceous plants and perennial grasses. Remnant islands of conifer trees (primarily ponderosa pine, but some white fir and incense cedar) are present, and young regeneration and stringers from these islands and the adjacent forest stands are encroaching on the meadow. Rapid conifer establishment in the meadow is evident where dense even-aged dog-haired stands of ponderosa pine regeneration line the meadow periphery (see Figure 13) and the stream channels.
Hydrologic conditions also influence the existing condition at Elk Flat. Due to the current gully confinement, and lower seasonal water table, Swamp Creek is no longer able to hydrate the meadow. However, during periods of snowmelt and rainfall, relict multiple channels on the meadow experience minor flooding and transport sand and gravels, which is a minor contribution to the larger-scale disturbance required to maintain the natural opening.\textsuperscript{20} Hydrologic function restoration is discussed in Purpose and Need #5.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image13}
\caption{Figure 13. Young Stands and Stringers of Encroaching Conifer at Elk Flat Meadow with Interspersed Predominant Ponderosa Pine}
\end{figure}

4. Retain and Enhance Hardwoods as a Stand Component at Density Levels Commensurate with Development of Late-Successional Stands.

\textit{Need for Action}

The need exists to assure hardwoods thrive and remain in stands at naturally occurring levels throughout the Elk Project area.

\textit{Background}

The Forest Plan identifies hardwoods as having high value to wildlife for foraging, nesting, denning, resting and shelter, as well as providing habitat for prey species. Acorn production is especially important as a food source (p. 3.25). The Edson WA describes aspen as a keystone species, vital to maintaining biodiversity (p. 68), and identifies hardwood decline as a concern for vegetation and forest resilience in the watershed (pp. 103, 108, 120).

Without disturbance, forest stands continue to follow a process of natural succession in which encroaching conifers establish in the understory, excluding the shade-intolerant hardwoods and eventually fully occupying the sites. Conifer species, particularly white fir establishing in the understory, increasingly dominate the overstory canopy, overtop aspen and oak, and successfully out-compete hardwoods for available sunlight, water and nutrients. The LSRA notes hardwoods are a desired component (p. 162) in existing plantations.

\textsuperscript{20} Restoring the full hydrology would require upper watershed restoration of road drainage. This is outside the scope of this project and is recognized as needing further consideration in the Edson WA (USDA-FS, 2011).
Hardwood groups and individuals should be retained and managed as stand components at appropriate levels for the development of late-successional stands.

**Desired Conditions**

Forest Plan goals that contribute to identifying the desired future conditions for hardwoods in the project area include:

- maintaining a rich diversity of plants, fish, and wildlife and maintaining the diversity and quality of habitats that support viable populations of plants, fish, and wildlife (p. 4.4).

- maintaining natural wildlife species diversity by continuing to provide special habitat elements within the Forest’s ecosystems (p. 4.6).

Additionally the Forest Plan directs that within LSR, hardwoods should be maintained at naturally occurring levels and enhanced (Forest Plan pp. 4.42, 4.44). Within Matrix CWP emphasis they are sustained on a landscape basis consistent with the desired future conditions. The desired condition in the McCloud Flats Management Area is to maintain hardwoods as a stand component where they exist (Forest Plan p. 4.82).

The desired condition for hardwoods is groups and individual hardwoods restored to naturally occurring levels. Openings and canopy gaps would be restored to the historic size and conditions that reflect a natural fire regime prior to fire exclusion. Aspen stands would be at a sustainable level on a landscape basis and aspen would be encouraged to reclaim sites it historically occupied.

Figure 14 shows a previously treated area (North Flats project), located in the southern portion of the project area with released oak representing the desired condition.

**Existing Conditions**

Aspen (*Populus tremuloides*) and California black oak (*Quercus kelloggi*) occur as a scattered, minor vegetation component within the project area, generally in the understory at reduced abundance and decreased vigor. Fire exclusion has allowed white fir understories to become established in many stands. As white fir develops, it eventually overtops and shades out hardwoods (USDA-FS, 2011 p. 37).

5. **Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries.**

**Need for Action**

A need exists to improve and maintain Riparian Reserve function by raising water table elevation, reconnecting floodplains to the stream channel, and promote the
development of riparian vegetation along Ash Creek and Swamp Creek to increase streambank stability (USDA-FS, 2011a p. 106). Specifically, a need exists to:

- **Riparian Vegetation** - Improve conditions that favor the growth of riparian vegetation, and restore streamflow and vegetation conditions to support establishment of riparian vegetation within the Riparian Reserves associated with Ash and Swamp Creeks and their tributaries. Riparian vegetation is scattered along Ash Creek and limited to areas where sunlight has reached the forest floor. Understory vegetation is nearly absent in the dense stands and there is a need to increase exposure to sunlight to promote riparian plants within the Ash Creek Riparian Reserve.

- **Water Table** – Increase and maintain water table elevation. Although intermittent stream flow is an inherent background characteristic for both Ash Creek and Swamp Creek, conditions could improve that would incrementally raise water table elevation, leading to increased water storage and flow duration.

- **Channel Banks** - Strengthen channel banks. Banks are more susceptible to erosion in the project area than the channel upstream. In contrast, abundant riparian vegetation and in-stream bedload structure demonstrate active processes of channel evolution that are deficient within the project area.

- **Road Interaction** - Reduce road interactions with stream channels. The compacted road surfaces concentrate surface flows, increase stream power and increase erosive energies flowing into channels. In Elk Flat, old road crossings and unauthorized routes capture streamflow to Swamp Creek resulting in channel entrenchment, headward erosion into the meadow and subsequently lowering the water table.

- **Floodplain Restoration** – Reduce overland flow from adjacent compacted surfaces such as old landings and unauthorized routes, and restore floodplain function at existing previously used landings on floodplains. These features alter the flood topography, do not support hydrologic function and prevent attainment of ACS objectives. Restoring floodplain topography is needed in these areas to restore floodplain processes and functions and associated water table elevation.

- **Woody Debris** - Increase instream channel structure. Excessive inputs of large wood from whole tree failure create log-jams that obstruct the channel and cause widening. There is a need to moderate the rate of large woody debris input to incremental, to support channel structure and allow channels to detain sediment load, construct banks and facilitate floodplain interaction.

- **Habitat and Natural Corridor** - There is a need to meet the Forest Plan desired future condition for Riparian Reserves to meet dispersion habitat requirements for the NSO and other late-successional dependent species such as fisher and northern goshawk (Forest Plan p. 4.80), as well as appear as natural corridors throughout the Matrix (Forest Plan p. 4.81). Past landings reduce floodplain function and are detrimental to the appearance and function of a natural corridor.

**Background**

The Forest Plan and ACS Objectives (p. 4.53) provide objectives that watersheds need to maintain or improve their processes and functions at a 5th field watershed scale. Additionally the Edson WA identified Riparian Reserve habitat improvement opportunities through improved stand condition and reduced fuels, and reduced road density in close proximity to riparian and aquatic habitats (p. 124).

**Desired Conditions**

The desired condition is a restored hydrologic environment within the project area in support of the ACS objectives as listed on page 4.53 of the Forest Plan. The desired condition is to meet or not prevent attainment
Elk LSR Enhancement Project

of all nine ACS objectives. The following ACS objectives highlight the greatest difference identified between the existing condition and the desired condition:

ACS Objective #4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

ACS Objective #7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

ACS Objective #8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, channel migration, and to supply amounts and distributions of coarse woody debris (CWD) sufficient to sustain physical complexity and stability.

ACS Objective #9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Existing Conditions

There are only intermittent channels and no perennial streams in the project area. Ash Creek is the dominant channel, flowing through the project and transporting more water more frequently than any other intermittent channel. Swamp Creek is an intermittent channel that carries seasonal or stormflow of very short duration with a substantial sediment load. These are the most distinctive channel forms found though there are many less well-formed channels nearby as evidence of historical activity.

Upstream of the project area, abundant riparian vegetation, well-defined inner gorges and instream bedload structure demonstrate active processes of channel evolution. However, these processes are interrupted in the project area. Reaches of channel are disconnected from their floodplain. Shade from dense overstory vegetation prevents sun-loving riparian vegetation from establishing and thriving. Unauthorized routes intercept streamflow in channels and divert flow during runoff events. The hydrologic and watershed resources within the project boundary do not support ecological processes necessary to maintain properly functioning conditions. Specifically, existing conditions departing from desired conditions and outside a natural range of variability include:

- **Existing Landings from Past Activity in Riparian Reserves** reduce floodplain function and potential diversion of surface flow.

- **Unauthorized Routes** not designed and not maintained. Topography and unauthorized routes often interact with streams during flood events in the project area. Many of these routes become connected when they capture surface runoff that would otherwise infiltrate into the ground and concentrate it on the road surface. When these routes collect runoff, they often pick up and transport fine sediment and leave the winnowed coarser rock, which is then detrimental to the overall hydrology. Unauthorized routes U41N09B, U41N02YB, U41N46B, U41N13B, 41N12D, U41N10AB and U41N10AC all intercept channels in one or more locations. High road prisms may also control flow by intercepting or damming runoff while low road prisms may concentrate flow.

- **Road Interactions** - The interactions of topography, roads and streams are magnified by several roads that are in close proximity. Several sources of water that contribute flow to a given location can and does lead to flooding and sediment inputs into streams. Ash Creek receives such inputs at several
locations during moderate flow and melting events, such as the intersection of the Military Pass Road (41N19X) with 41N09 (see Figure 15).

![Figure 15. Forest Road 41N19X Surface Runoff into Ash Creek](image)

- **Hydrologic Function** - Intermittent streams, such as Ash Creek and Swamp Creek, provide considerable ecological value, especially in the absence of perennial flow, to systems dependent on them. Hydrologic processes, such as flooding, that maintained Elk Flat in the past have been disrupted by lack of connection to Swamp Creek and its intermittent channel system. Historical road systems have diverted flow from Swamp Creek, concentrating flow and eroding Swamp Creek into a gully, disconnecting it from spreading out over the meadow.

- **Woody Debris** - Woody debris recruitment is a necessary component in channels; however, input in large amounts is causing woody debris dams and channel widening. An accelerated rate of bank erosion along Ash Creek, where the accumulation of woody debris is high, diverts water around log jams (see Figure 16).
• **Riparian Vegetation** - Ash Creek lacks riparian plant communities and floodplain interaction. Scattered riparian vegetation is limited to discontinuous locations where sunlight can reach the forest floor along Ash Creek, but is absent along Swamp Creek as well as other smaller intermittent channels.

6. National Forest Transportation System (FTS) Management and Decommission Unauthorized Routes

*Need for Action*

A need exists to increase FTS efficiency and provide access to a dispersed recreation area in Elk Flat. The project Transportation Analysis Process (TAP) recommends adding approximately 0.10 miles of existing unauthorized route that is currently utilized as public access to a dispersed recreation area in Elk Flat. This segment would be added to the FTS as an open, maintenance level 2 road to provide legal motorized access (Bonivert, 2015a).

A need exists to remove several existing unauthorized routes in the project area and restore these areas to a more natural condition.

*Background*

The Record of Decision for Motorized Travel Management (MTM ROD) established the National Forest System transportation network (FTS or “system”) on the Shasta-Trinity National Forest (USDA-FS, 2010a). The MTM ROD acknowledged that unauthorized routes not added to the FTS may in the future be considered for removal from the landscape and restored to the natural condition, converted to trails, or added to the FTS in future NEPA analyses (USDA-FS, 2010a p. 4). The Pilgrim Vegetation Management Project’s Road
Analysis documents the analysis of some roads within the Elk project boundary and provides recommendations for changes to the FTS to reduce the open road density. A similar process evaluated the remainder of the system and unauthorized routes in the project area during identification of the purpose and need for action.

Roads and routes were considered for impacts to wildlife connectivity, stream channels and floodplain function within the LSR and the meadow at Elk Flat. Additionally the road system and unauthorized routes were evaluated in the context of broader FTS management with the desired and existing condition described here.

**Desired Condition**

The Forest Plan directs providing and maintaining roads per pages 4-16 to 4.17. In particular, it recommends retaining roads that will be needed for future activities (beyond one season) such as forest health, timber management, fire protection, recreation management, mining, wildlife and range. Non-inventoried roads [unauthorized routes] would be analyzed to determine whether they should be added to the transportation system or obliterated as time and funding allow.

In identifying the desired condition and the need for action, the forest-wide goals for facilities, including roads, were reviewed:

**Goal 8:** Manage the Forests' transportation system to facilitate resource management activities, protect wildlife, meet water quality objectives, and provide recreational access (page 4.4).

**Goal 9:** Provide and maintain those administrative facilities that effectively and safely serve the public and Forest Service work force (page 4.4).

The desired condition is a safe, efficient transportation system in the project area with the minimum road density needed to meet administrative, recreational, and cultural access needs while protecting natural resources (Forest Plan pp. 4.4, 4.16, 4.17). Open road density would only include FTS roads that are open to vehicle use as designated on the Forest Motor Vehicle Use Map (MVUM). Unauthorized routes not needed for the FTS system would be restored to a natural condition (USDA-FS, 2010a p. 4).

**Existing Condition**

The 18.64 miles of existing road system provides access to old landing locations, plantations and adjacent private inholdings. Maintenance levels can indicate an approximate average cost of maintenance per mile. Roads are typically closed for resource protection, cost-efficiency and to reduce open road density. Closed roads may be opened and made available for resource management as needed, then closed again. The project area contains an approximate FTS open road density of 2.72 miles per square mile.

Approximately 6.5 miles of unauthorized routes exist in in the project area. A 0.1-mile segment of an unauthorized route accesses a popular dispersed recreation area on the edge of Elk Flat meadow. Currently the route is not approved for motor vehicle use on the MVUM, preventing legal motorized access to the area.

**Proposed Action**

**Introduction and Summary**

The Proposed Action (PA) was developed to meet the purpose and need for action by moving the existing conditions toward desired conditions. The PA is briefly introduced here in Chapter 1 as a qualitative description of the types of activities proposed to achieve the Purpose and Need for Action. Chapter 2 presents the PA and alternatives to it in detail, including the connected actions, geographic locations, scale, and
timeframes of the actions along with the required Resource Protection Measures (RPMs) and Monitoring. The silvicultural prescription details and unit-specific information is provided in 0.

The interdisciplinary team incorporated guidance from the Forest Plan, the LSRA, and the Northwest Forest Plan along with management recommendations from the Edson and Mt. Shasta WAs, the National Fire Plan and the Forest’s Fire Reference System in developing the PA. The PA is an incrementally modified version of the original Proposed Action as presented in public scoping and the notice of intent. The original PA was dropped from detailed consideration (see p. 119). The incremental changes to the PA are listed in Appendix G. This Modified PA is presented as Alternative 1.

The PA falls into five broad categories that may contain overlapping treatments:

1. **Forest Restoration Treatments** – Thinning, with site-specific prescription elements, reforestation and adaptive management strategies.
2. **Fire Restoration and Fuels Reduction Treatments** – Piling, pile burning and underburning.
3. **Meadow Restoration** – Meadow vegetation enhancement, with reintroduction of fire (underburning) and restoration of hydrologic function through road decommissioning and recontouring.
4. **Hydrologic Function and Soils Restoration** – Floodplain recontouring, decommissioning unauthorized routes that intersect stream channels, forest restoration (thinning and revegetation in the Riparian Reserves), fire restoration (underburning in Riparian Reserves). Soil restoration would be completed through windrow respreading.
5. **Transportation System Management and Decommissioning of Unauthorized Routes** – Adding a road to the FTS and decommissioning unauthorized routes.

Table 6 summarizes the Proposed Actions that respond to the Purpose and Need for Action, with discussion following.

**Table 6. Introduction of Proposed Action Treatments in Response to the Purpose and Need**

<table>
<thead>
<tr>
<th>Purpose and Need Objectives</th>
<th>Proposed Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the risk of losing existing and developing late-successional habitat structure from stand density, drought, disease, insect and fire-related mortality.</td>
<td>Forest and Fire Restoration and Fuels Reduction Treatments</td>
</tr>
</tbody>
</table>

---

21 Appendix A (Unit-Specific Information, Treatments and Road Actions), Appendix C (Standard Operating Procedures and Best Management Practices) and Appendix D (Maps) provide more detailed information about the Proposed Action.

22 (Forest Plan, 1995), (LSRA, 1999), (NWFP, 1994 p. Attch. B), (USDA-FS, 2011), (USDA-FS, 2012), (USDA & USDI, 2000), (USDA-FS, 2015). The proposed action is also designed to be consistent with applicable Recovery Actions (10 and 32) and the overall intent of the Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS, 2011) and comply with all law and policy. Best available science was incorporated in the design of the Proposed Action.
<table>
<thead>
<tr>
<th>Purpose and Need Objectives</th>
<th>Proposed Action</th>
</tr>
</thead>
</table>
| **Insect and Disease Conditions**  
Reduce the spread of black stain and *Heterobasidion* root disease and associated mortality. | Forest Restoration - Natural Stand and Plantation Thinning to promote resilience and treat insect and disease centers through:  
- group selections to remove host species for *Heterobasidion* and blackstain.  
- removal of affected trees and buffering to break up root-root contact and increase sunlight on forest floor to treat blackstain.  
- reforestation with non-host species in the group selections and interplanting to break up disease centers. |
| **Stand Composition, Structure and Density**  
Emphasize maintenance, protection and enhancement of the forest vegetation conditions and elements that serve as suitable habitat for late-successional dependent species, and more open stands for late-successional ponderosa pine. | Forest Restoration - Natural Stand Thinning to decrease density with:  
- variable density thinning from below.  
- biomass thinning with adaptive management to decrease density in the understory.  
- radial thinning to preserve large legacy pine.  
- unthinned patches to promote heterogeneity.  
- group selections to promote heterogeneity.  
- habitat Rest/Roost Clumps to promote and preserve habitat elements. |
| **Fire Regime, Fuel Loading and Fire Behavior**  
Restore forest stand conditions to maintain ladder and surface fuels at levels that allow for return of a natural fire regime to the landscape and more effective suppression when it is necessary. | Forest Restoration - Natural Stand and Plantation Thinning with:  
- biomass thinning to reduce fuel ladders.  
- salvage Adaptive Management to treat additional pine mortality in limited stands that would contribute to fuel loading.  
*Fire Restoration and Fuels Reduction*  
- machine pile and pile burn to treat high concentrations of down fuel to allow prescribed and natural fire to play a more natural role in the environment.  
- underburn to treat fuels and reintroduce fire to restore the natural fire regime. |

**Secondary Purpose and Needs**

**2. Accelerate Development of Late-Successional and Old-Growth Forest Characteristics and Promote Late-Successional Habitat Connectivity**

Correct conditions that delay or prevent development of late-successional forest and reduce value for connectivity to existing late-successional forest.  
Forest and Soils Restoration Treatments  
*The actions that meet the P&N for risk reduction also accelerate meeting this P&N. Additionally the following specifically meet P&N #2.*

Pine Overstory  
Promote the healthy growth and development of a pine overstory by reducing density and retaining the healthiest trees, while retaining and promoting a mix of species where they occur.  
Forest Restoration – Plantation thinning to reduce density and retain stands and accelerate growth with:  
- interplanting to promote heterogeneity.  
- group selection and reforestation to promote heterogeneity.  
*Forest Restoration – Radial thinning around legacy pines in natural stands and plantations*

Soil Productivity  
Restore soil productivity in previously windrowed plantations.  
Soils Restoration  
- windrow respreading to restore topsoil distribution to restore fertility.
<table>
<thead>
<tr>
<th>Purpose and Need Objectives</th>
<th>Proposed Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. Restore Meadow Habitat in Elk Flat</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Restore the dry meadow ecosystem at Elk Flat.</strong></td>
</tr>
<tr>
<td>Early Seral Restoration</td>
<td><strong>Forest, Meadow, Fire Restoration and Fuels Reduction, Hydrologic Function Restoration.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Meadow Restoration</strong></td>
</tr>
<tr>
<td></td>
<td>• meadow enhancement treatment to remove conifer encroachment.</td>
</tr>
<tr>
<td></td>
<td><strong>Forest Restoration</strong></td>
</tr>
<tr>
<td></td>
<td>• thinning with meadow enhancement to feather meadow enhancement treatment into adjoining stands.</td>
</tr>
<tr>
<td>Meadow Fire Regime Restoration</td>
<td><strong>Fire Restoration</strong></td>
</tr>
<tr>
<td></td>
<td>• underburning.</td>
</tr>
<tr>
<td></td>
<td><strong>Hydrologic Function Restoration</strong></td>
</tr>
<tr>
<td></td>
<td>• decommission unauthorized routes, which capture and concentrate runoff, causing meadow and channel erosion, to improve groundwater retention.</td>
</tr>
<tr>
<td></td>
<td><strong>Hydrologic Function Restoration</strong></td>
</tr>
<tr>
<td></td>
<td>• contour floodplain geometry in Elk Flat Riparian Reserves where needed along decommissioned unauthorized routes and old skid trails to restore natural flooding between floodplains and channels to improve sheetflow, infiltration and groundwater storage.</td>
</tr>
<tr>
<td><strong>4. Retain Hardwoods as a Stand Component at Density Levels Commensurate with Development of Late-Successional Stands</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Assure hardwoods thrive and remain in stands at naturally occurring levels.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Forest, Meadow and Fire Restoration and Fuels Reduction Treatments and Aspen Restoration Adaptive Management</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Forest Restoration - Thinning with:</strong></td>
</tr>
<tr>
<td></td>
<td>• oak release to decrease conifer encroachment.</td>
</tr>
<tr>
<td></td>
<td><strong>Release and Restore Aspen Clones.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Forest Restoration – Thinning with:</strong></td>
</tr>
<tr>
<td></td>
<td>• aspen release through conifer removal.</td>
</tr>
<tr>
<td></td>
<td><strong>Meadow Restoration-meadow enhancement removes conifer including around aspen in Elk Flat meadow.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Aspen Restoration Adaptive Management</strong></td>
</tr>
<tr>
<td></td>
<td>• aspen restoration adaptive management — fire or mechanical stimulation of suckering if initial release not effective.</td>
</tr>
<tr>
<td></td>
<td>• browse fencing will protect young aspen shoots if monitoring shows it is needed.</td>
</tr>
<tr>
<td></td>
<td><strong>Fire Restoration</strong></td>
</tr>
<tr>
<td></td>
<td>• underburning which may favor retention of aspen in stands by encouraging a more open understory and stimulate suckering in aspen.</td>
</tr>
<tr>
<td><strong>5. Improve streamflow and vegetation conditions within Riparian Reserves associated with Ash and Swamp Creeks and their tributaries</strong></td>
<td></td>
</tr>
<tr>
<td>Purpose and Need Objectives</td>
<td>Proposed Action</td>
</tr>
<tr>
<td>----------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Vegetation in Riparian Reserves</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Improve conditions that favor the growth of riparian vegetation.| Forest Restoration Treatments:  
• thinning in Riparian Reserves to promote sunlight favoring riparian plant reproduction.  
• reforestation – planting/seeding riparian and upland (mesic) species that support riparian function. |
| Improve the connectivity and natural appearance of riparian corridors. | Fire Restoration and Fuels Reduction Treatments:  
• underburning in Riparian Reserves to increase sunlight to improve growing conditions for riparian species. |
| **Streamflow**                                                  |                                                                                   |
| Maintain or improve water table elevation and remove road runoff interactions with channels. | Decommission Unauthorized Routes:  
• Decommission unauthorized routes that concentrate runoff directly into channels and cause erosion to stream channels, restoring processes leading to more natural groundwater storage by decreasing water diversions. |
| Restore floodplain function, drainage network connectivity and natural contours. | Hydrologic Function Restoration:  
• Contour floodplain geometry and old landings in Riparian Reserves where needed to restore natural flooding between floodplains and channels, improving sheetflow and infiltration leading to restoring of more natural groundwater storage processes in the floodplains. |
| **Streamflow**                                                  |                                                                                   |
| Strengthen channel banks.                                       | Forest Restoration Treatments:  
• thinning in Riparian Reserves to improve growing conditions for sunlight-dependent riparian vegetation to strengthen channel banks and to improve forest stand health to a condition that can more naturally meter woody material input into the channel and instream structure.  
• reforestation – planting/seeding riparian species to stabilize stream banks. |
| Increase instream structure.                                    | Fire Restoration Treatments:  
• underburning in Riparian Reserves to enhance growing conditions for riparian vegetation which will strengthen stream banks. |
| 6. **National Forest Transportation System (FTS) Management and Decommissioning of Unauthorized Routes** |                                                                                   |
| Remove unauthorized routes and restore to the natural condition. |  
• decommissioning unauthorized routes. |
| Meet the administrative, recreational, and cultural access needs. |  
• adding 0.1 miles of existing unauthorized route segment to the system to access the dispersed recreation site at Elk Flat. |

The PA includes Resource Protection Measures (RPMs) that set site-specific requirements during implementation. Connected Actions are not needed to meet the Purpose and Need for Action, but needed to implement the PA. They include actions such as road and landing work needed for access and hauling of timber products, fireline construction, borate fungicide stump treatments to inhibit the spread of *Heterobasidion* root disease, hazard reduction and danger tree felling, timber hauling, legal compliance processes or permits, and administrative actions. RPMs and Connected Actions are described in Chapter 2.
Decision Framework

After reviewing this environmental impact statement and supporting documents, and considering all public input on the project, the Forest Supervisor of the Shasta-Trinity National Forest will decide whether to implement the Proposed Action as described, select another action alternative that meets the purpose and need, or take no action. The decision would be in accordance with Forest Plan goals, objectives, and desired future conditions.

If an action alternative is selected, the decision would specify:

a. When proposed activities could begin and whether there are any time restrictions,

b. How roads in the project area would be managed,

c. What mitigation and monitoring requirements would take place.

Public Involvement

Under 36 CFR 215, the Notice of Intent (NOI) was published in the Federal Register on February 28, 2013.23 The NOI asked for public comment on the proposal by April 1, 2013 (USDA-FS, 2013). In addition, as part of the public involvement process, the agency prepared a scoping document that was mailed to interested individuals, organizations and agencies on February 14, 2013 (USDA-FS, 2013b). A Notice of Intent was published in the Redding Record Searchlight on February 27, 2013 and March 3, 2013. Public meetings were held March 5 and March 26, 2013 in McCloud and Mt. Shasta. The Forest Service received 11 comment letters or emails. Appendix B summarizes the scoping effort, results and responses to scoping comments.

Outside of the formal scoping period, the Forest has reached out since 2010 through various avenues to the public, other agencies, and Tribes for input:

- Schedule of Proposed Actions (SOPA) – Status and basic information about the Elk project has been continually listed in the Forest’s SOPA since January 2010 (USDA-FS, 2010-2015).

- Field Trips – As a potential stewardship contract project, the proposed action was developed collaboratively (USDA-FS, 2008). The Elk Late Successional Reserve Enhancement Project Stewardship Collaborative Working Group hosted by the Shasta Valley Resource Conservation District (RCD) conducted two field trips to the project area in 2012 for stewardship collaboration feedback during project development. Working Group members represent various agencies, organizations, neighboring landowners and Tribal governments with a stake in implementation of a stewardship project in the area. Field trips took place on July 26 and August 9 and project feedback was collected and considered during development of the Proposed Action (RCD, 2012).

- Tribal Consultation – Tribal Consultation information is provided in Chapter 3 (see p. 245).

- FWS Consultation – FWS consultation is summarized in the Chapter 3 wildlife section and detailed in Appendix E).

- Shasta-McCloud Management Unit Open Houses –Elk Project information was made available along with the opportunity for discussion at annual open houses in 2014 (February 5 and 6), 2015 (February 10 and 12), and 2016 (March 2 and 3) in McCloud and Mt. Shasta.

23 Subsequent to scoping, the regulations changed making the project subject to 36 CFR 218, Subparts A and B. Pursuant 36 CFR 218, only those who submit timely project-specific written comments regarding a proposed project or activity during a public comment period are eligible to file an objection. Individuals or representatives of an entity submitting comments must sign the comments or verify identity upon request.
Issues

The project’s interdisciplinary team (IDT) sorted the issues into two groups: key and non-key issues. The IDT identified key issues as those directly or indirectly caused by implementing the proposed action. Non-key issues were identified as those that are: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…” Appendix B provides the comments. The IDT identified the following key issues. Issues are paraphrased from the sometimes lengthier or duplicative comments.

Issue 1 – Large Trees and Snags

Large tree and snag removal and group selection logging directly harms forest health and late-successional ecosystems in Late-Successional Reserves, Riparian Reserves and Critical Habitat; prevents rather than facilitates forest succession processes; and is not consistent with the Northwest Forest Plan.

Discussion and Indicators

While the commenter did not define “large tree,” two alternatives are responsive to the issue of harvest tree size selection. Alternative 6-Limit Harvest to Trees Less than 10 Inches in Diameter, suggested by a commenter, limits tree removal to those under 10 inches DBH and is described on page 120. It is eliminated from detailed study because modeling the stands shows that while it would reduce fuel ladders in the short-term, it would not meet the need to reduce the risk of late-successional habitat loss due to overstocking that is ongoing in the project area, nor would it sufficiently reduce existing standing and dead fuels. Similarly, Alternative 8-Limit Harvest to Trees Less Than 20 Inches in Diameter within the Elk Flat Late-Successional Reserve, described on page 122, is responsive to this issue. This alternative was dropped from detailed consideration because preliminary modeling showed it would not meet the purpose and need for action for the same reasons as Alternative 6, with the exception that it would still meet the meadow restoration purpose and need since Elk Flat meadow is in Matrix.

The discussions for Alternatives 6 and 8 provide rationale for why these alternatives were dropped from detailed consideration. The Modified Proposed Action is summarized as it relates to larger trees and snags and the corresponding effects on forest health, late-successional ecosystems in the Elk Flat LSR, designated critical habitat for NSO, successional processes and compliance with the Northwest Forest Plan. Chapter 3 (starting p. 128) provides the effects analysis related to this issue. Indicators and measures specific to effects to large trees and snags are:

- number of trees greater than 24 inches DBH immediately post-treatment and projected in 20 years based on comparative modeling of the alternatives,
- number of snags greater than 20 inches DBH projected in 20 years based on comparative modeling.

Issue 2 – Road Construction

Road construction directly harms forest health and wildlife and results in long-term impacts to soil health and productivity.
Discussion and Indicators

This issue is interpreted to pertain only to temporary road construction because the Modified Proposed Action (Alternative 1) does not include new permanent road construction. Alternative 2 (considered in detail) and Alternative 9 (considered but not in detail) respond to this issue.

Alternative 9 - No New Temporary Road Construction, discussed on page 122, was not considered in detail due to concerns with project feasibility, potential environmental harm, and meeting Forest Plan Visual Quality Objectives. The discussion for Alternative 9 provides rationale for why this alternative was not considered in detail.

Alternative 2 - No New Temporary Road Construction Other than Those Required for Landing Use/Access limits rather than eliminates new temporary road construction.

Chapter 3 (starting pp.217 and 234) provides the effects analysis related to this issue. Indicators specific to road impacts are:

- miles of new temporary road construction,
- total open road density post-implementation in comparison to No Action,
- miles of existing unauthorized route decommissioning, and
- acres meeting soil quality standards post-implementation.

Forest Transportation System roads are not considered within the soils resource under the Forest Plan (pp. Appdx. O-2).

Issue 3 – Critical Habitat

Treatments within designated critical habitat for the northern spotted owl violate the 2011 Revised Recovery Plan and the 2012 Final Critical Habitat Rule for the Northern Spotted Owl.

Discussion and Indicators

Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl is responsive to this issue and is considered in detail. As Recovery Plans are not regulatory, they cannot be violated. However, as described earlier in this Chapter, Forest Plan standards and guidelines direct that the Forest maintain or enhance habitat for threatened, endangered, and sensitive (TE&S) species consistent with individual species recovery plans (p. 4.30).

Emphasizing the protection and enhancement of the forest vegetation conditions and elements that serve as suitable habitat for late-successional dependent species (including the NSO) is integral to the Purpose and Need for Action and Forest Plan management direction. The predicted effects on NSO, all suitable habitat, dispersal habitat as it relates to connectivity, and designated critical habitat are analyzed for all alternatives considered in detail to measure the achievement of the Purpose and Need. This information is summarized in Chapter 2 (Table 29, p. 97) and in Chapter 3 in the Wildlife section.

The indicators specific to this issue are as follows:

- acres of critical habitat, per primary constituent element, maintained/benefitted in NSO core areas, home ranges and the project area,
- acres of critical habitat, by primary constituent element, degraded, downgraded or removed through treatments in NSO core areas, home ranges and the project area,
- acres of suitable and dispersal habitat projected in 20 years within critical habitat, and

---

24 One existing FTS road will be reconstructed.
d. acres of capable habitat projected within 20 to 30 years within critical habitat.

These issue indicators are used to measure the scale of how the alternatives considered in detail meet the management guidance, and the special management considerations for critical habitat subunit ECS-3, in the 2012 Final Critical Habitat Rule for the Northern Spotted Owl.

**Issue 4 – Mushroom Collection in Elk Flat**

*There will be negative impacts to Boletus mushroom growth and collection activities within Elk Flat.*

**Discussion**

Alternative 5, No Treatments in Elk Flat Meadow, described on page 119 is responsive to this issue. It is not considered in detail because it would not meet the Purpose and Need for Action of meadow restoration in Elk Flat. The discussion for Alternative 5 provides rationale for why this alternative was not considered in detail and summarizes the protections integrated into the Modified Proposed Action pertaining to edible mushrooms.

Chapter 3 provides the analysis of effects to edible mushrooms (specifically *Boletus* habitat) in Elk Flat, for all alternatives considered in detail, and as compared with the no action alternative (see discussion starting on p. 194).

**Issue 5 – Machine Piling**

*Machine piling has disproportionately harmful impacts on watershed and soil resources.*

**Discussion and Indicators**

Alternative 7-Eliminate the Use of Machine Piling within Treatment Units and Substitute Hand Piling, described on page 121, responds to this issue but was not considered in detail because it is not supported by the local monitoring data and best available science for soil types within the project area. The discussion for Alternative 7 provides rationale for why this alternative was not considered in detail and summarizes the protections integrated into the Modified Proposed Action pertaining to preserving soil productivity.

Chapter 3 provides the analysis of effects to the soil resource for all alternatives considered in detail and as compared with the no action alternative (see discussion starting on p. 217). Indicators for this issue include:

  e. acres of machine piling, and
  f. attainment of soil quality standards post-implementation.

Additionally, at the watershed scale, both qualitative and quantitative (Equivalent Roaded Area) analyses include disturbance from machine piling by alternative. Each action alternative is compared to the No Action alternative (see discussion starting on p. 201).

**Other Related Efforts**

There are no related actions that will affect the Proposed Action or Purpose and Need for Action.
Chapter 2. Alternatives, Including the Proposed Action

Chapter 2 describes the Proposed Action and compares the alternatives to the Proposed Action considered for the Elk project. It includes a description of each alternative considered. The Proposed Action in Chapter 2 is a description of how, how much, and where actions would be implemented.

Alternatives are presented as either “Alternatives Considered in Detail” (starting with Alternative 1 on p. 59) or as Alternatives Considered but Eliminated from Detailed Study (starting p. 84). The alternatives are presented in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. The Comparison of Actions - Alternatives (p. 79) provides tables comparing the alternatives by the principal actions.

Table 29 (p. 97) summarizes the Chapter 3 analysis of effects to resources, effects related to the Purpose and Need for Action, and effects pertaining to the key issues.

Description of Actions

All action alternatives include the following actions, but differ in quantity and spatial application of these actions. General descriptions of the actions, and their tie to the Purpose and Need for Action, are provided below. Appendix A provides detailed information as needed. Resource Protection Measures (RPMs) common to action alternatives are listed starting on page 84, required monitoring on page 93, and standard operating procedures in Appendix C.

Vegetation manipulation and fuels treatments are proposed in concert and are developed consistent with the guidance in management direction and other informing sources to best address the Purpose and Need for Action. Processes that historically created late-successional and old-growth ecosystems include (NWFP pp. B-2): tree growth and maturation; death and decay of large trees; low to moderate intensity disturbances (such as fire, wind, insects and disease as described) that create canopy openings and gaps in various strata of vegetation; establishment of trees beneath the maturing overstory trees either in gaps or under the canopy; and closing of canopy gaps by lateral growth or growth of understory trees (LSRA p. 162). These processes result in forests moving through different stages of late successional and old-growth conditions that may span several hundred years.

Forest Restoration Treatments

Forest restoration treatments include thinning and reforestation. Variations and prescription elements are based on site-specific conditions.

Thinning

Thinning is the selective removal of certain trees to manage overcrowding while retaining desirable attributes such as large trees and species and structural diversity. Thinning promotes the survival and health of larger overstory trees while maintaining and developing a variety of habitat conditions within the stands. Thinning reduces individual tree stress by freeing up resources, such as water, nutrients and available sunlight for the remaining trees to increase their resilience to drought, disease and insect impacts. Thinning also reduces live ladder and canopy fuels, increasing a stand’s resilience to high severity wildfire effects.

Thinning is divided broadly by whether the stand is natural or a plantation. Thinning of natural stands responds primarily to Purpose and Need #1 - Risk Reduction in Early, Mid and Late-Successional Habitat and Increased Stand Resilience to Disturbance. Plantation thinning responds primarily to Purpose and Need #2 - Accelerate Development of Late-Successional and Old-Growth Forest Characteristics and Promote Late-Successional Habitat Connectivity.
Variable density thinning would accomplish thinning treatments for natural stands and some older plantations. Variable density thinning does not include a singular density target, rather it retains a range of densities by including unthinned patches (also referred to in some literature as skips), areas of heavy thinning or small openings (radial release of pine and black oak, gaps, or group selections), and thinning within a target basal area range elsewhere within the stand.

Thinning prescriptions were specifically developed to reduce the risk of losing, and developing, habitat for late-successional species, increase conifer species diversity in plantation areas and natural stands, treat black stain and *Heterobasidion* root disease, and reduce the risk of developing future extensive mortality areas. Proposed thinning prescriptions reduce stand density, break up fuel continuity, promote the healthy growth of residual trees, and promote species and structural diversity. Residual basal area targets and tree selection criteria retain canopy cover and habitat elements while addressing the current unsustainable stand densities.

Generally, thinning would leave the largest trees that are expected to survive long term into the future, with exceptions for species diversity. Trees to be removed would primarily be midstory intermediate and smaller co-dominant trees (exceptions may occur in radial thinning and group selections – see below), particularly the shade tolerant white fir that has grown up through the understory over the last several decades. For example, in some cases white fir that are larger in relation to adjacent healthy trees of other less common mixed conifer species such as Douglas fir and incense cedar would be removed to promote species diversity.

Thinning would retain and promote late-successional habitat structures and features while reducing stocking, treating fuels, and promoting the survival of pine while maintaining a mix of tree species. Stand variability is important for providing habitat. Variable density thinning (see discussion under below), along with other silviculture prescription elements are designed to support and develop late-successional habitat through promoting structure heterogeneity, while addressing undesirable (unsustainable) stand densities and excess fuels.

**Prescription Elements**

Specific elements of the thinning prescriptions would be applied in thinning units based on site-specific conditions including:

**Tree Selection**

Tree selections will be made per the general marking guidelines as described starting page A-16 and as applicable for the stand conditions in the treatment unit. Predominant trees are retained across all prescriptions.

**Unthinned Patches**

Whether natural stand or plantation, the thinning units within LSR allocation will have unthinned patches (UTPs) to retain variable conditions and stand elements that promote structural heterogeneity for wildlife and contribute to late-successional forest values. The UTPs would vary in size and placement, but typically range between 12 and 50 percent of the unit acreage, depending on stand conditions. The UTPs would be selected by identifying the best available NSO or fisher habitat elements within natural stands, or the best available areas within plantations that may contribute to these, and other late-successional associated species habitat. Snag retention areas would comprise UTPs in units with high mortality when other valuable features are not available to retain. See Appendix A page A-18 for more information on UTP designation and Table Appendix A-2 on page A-6 for unit-specific UTP acreage.

**Habitat Roost/Rest Clumps**

As available, six roost-rest clumps per acre dispersed throughout the unit boundary would be retained. Habitat roost-rest clumps are distinct groups of tightly spaced overstory trees and snags, often with late-successional characteristics and with smaller (less than 10-inch size class) shade tolerant trees growing underneath. These
clumps can range from a tight group of 3 to 6 trees or snags to 1/10 of an acre. See Appendix A page A-19 for more discussion.

**Radial Release of Predominant Pine**
Radial thinning around a maximum of two predominant pine per acre, except unit 157 which is four pine per acre, would be implemented where it would have the greatest beneficial effect on predominant pine that are relatively healthy but crowded by advanced second growth trees. Radial thinning generally removes smaller diameter trees within a 50-foot radius of the bole except for other predominant trees of any species. Radial thinning would reduce density, remove fuels and promote tree vigor and long term survival of these larger older trees. See page A-19 for more discussion on radial thinning and Table Appendix A-2 on page A-6 for unit-specific radial release information. Some of the trees removed may be from the dominant crown class surrounding a predominant pine.

**Group Selections**
Group selections (ranging from <1 to 2 acres, depending on conditions) would be placed in two natural stands where *Heterobasidion* root disease has been observed in dense, homogeneous white fir; and in six older ponderosa pine plantations. The groups in the natural stands would be reforested with pine, and those in the plantations would be reforested with a mix of species. This treatment would facilitate development of more diverse and resilient stands in the older plantations, introducing a varied mix of species and a new age class; and contribute to pine regeneration in the two natural stands where pine is dying or has died out. Some dominant trees may be removed in group selections.

**Biomass Thinning**
Biomass-sized trees (4 to 9.9-inch DBH) would be mechanically thinned on a prescribed spacing, or to a prescribed basal area, in those natural and plantation thinning units that have a biomass thinning component as listed in Table Appendix A-2 on page A-6. Biomass material that is thinned would either be removed from the unit or left on site, such as when thinning is accomplished by mastication. Masticated material would remain on site until to decay or be treated with prescribed fire.

**Oak Release**
The oak release treatment removes adjacent conifers in an egg-shaped clearing with the long side to the south of the oak tree (see diagram Figure Appendix A-1 on p. A-21). Predominant trees and dominant trees that have late-successional characteristics and healthy sugar pine would not be removed. In NSO Critical Habitat, oak release would additionally retain any 24 inch and larger Douglas-fir, sugar pine or incense cedar.

**Aspen Release**
To help restore aspen it would be released by removing conifer encroaching within 150 feet. If predominant conifer or healthy sugar pine larger than 10” DBH are present, up to 10 conifer per acre would be retained within the 150 foot area (see p.A-21). All predominant conifer would be retained even if in excess of 10 trees per acre.

**Plantation Thinning**
Plantation thinning reduces stand density, breaks up fuel continuity and promotes the healthy growth of residual trees as well as species and structural diversity. Plantation thinning removes trees (other than large predominant pine) that have been successfully attacked and are dying or likely to die when they are not needed to meet wildlife snag retention needs. See the detailed description starting on page A-21.
Older Plantation Thin – Plantations 40 Years or Older

The older pine plantations would be thinned to an average of 80 to 100 square feet of basal area to reduce stand density and retain the largest healthiest pine; however, some areas would have a higher basal area retained based on site-specific conditions. The older plantation thinning treatment varies by site specific features such as bordering the Elk Flat meadow or the presence of black stain or western pine beetle and in some cases also includes interplanting to address past and ongoing mortality, stocking deficiencies and to promote species diversity. (See the Reforestation section below for information about planting the group selections.)

Young Plantation Thin – Plantations Younger than 40 Years

Young plantation thinning reduces density for plantation development, removes ladder fuels and retains and promotes species diversity. Young plantation thinning would thin trees 4 inches DBH and larger to 75 to 100 TPA depending on site specific conditions while retaining the healthiest largest trees. Thinning would remove ladder fuels and promote species and structural diversity.

Thinning of Natural Stands

Variable density thinning in 60 to 120 year old natural stands consists of applying a target basal area to each stand varying between 125 to 175 square feet per acre, but may be higher or lower as listed in Table Appendix A-2 starting on page A-6. Variations in treatment elements are based on site-specific characteristics such as stand type and predominant species, northern spotted owl and fisher habitat, the presence of aspen, oak or insect or disease activity. Thinning of natural stands retains some lower and mid story trees and higher densities in mixed conifer and white fir dominated stands as compared to ponderosa pine-dominated stands. Higher densities in the vicinity of roost/rest clumps would be retained. Other variations include favoring or cultivating species that are more valuable to NSO and fisher habitat such as Douglas-fir, California black oak, sugar pine and incense cedar; creating small (average 1/10th to 1/4th acre) gaps in white-fir dominated areas to develop structural heterogeneity and encourage understory development; and radial thinning to protect legacy sugar and ponderosa pine. Stand resilience, habitat function and diversity would be provided through retention of a fairly closed overstory and understory; by retaining predominant and most dominant overstory trees that contribute to current habitat function and future snag and down log recruitment; by creating more fine scale, within-stand heterogeneity through small openings; and by retaining dense stands (UTPs) and habitat clumps which will result in higher-than-target basal areas in some areas. See A-16) for a description of tree selection criteria.

Stands 152-1, 153, 155, 157, 158 and 159 would have radial thinning around legacy, predominant ponderosa and sugar pine on up to two pine per acre (and four pine per acre in unit 157), and two stands would have <1 to 2-acre group selections placed where Heterobasidion has infected white fir (units 152-1 and 160). Refer to Appendix A for other prescription elements or subtreatments in natural stands (aspen and black oak release, small gaps in white fir).

Reforestation

Reforestation through planting of seedlings would promote stand resiliency by planting a mix of species that include non-host trees for black stain and Heterobasidion root disease and help assure pine reestablishment in areas where it is lacking. Hand planting would be conducted in mortality openings (Interplanting) and in group selections (Planting Group Selections) where natural regeneration is not expected to sufficiently establish within five years of thinning or fuels treatments or where a mix of tree species is desired to promote diversity or certain species are not expected to establish naturally.

Openings created by mortality pockets between one and two acres would be evaluated post-treatment for interplanting needs. All group selections regardless of size, and openings created by mortality pockets two
acres or larger would be planted. Table Appendix A-2 (starting p. A-6) lists approximate acres of group selections and mortality openings in applicable units.

Mechanical site preparation would be implemented as needed in larger openings (generally more than five acres) to remove competing understory vegetation, such as grass, prior to planting. Mechanical site preparation is typically completed with a small tractor with a wildland rototiller or drum masticator. Where mortality openings are smaller (generally less than five acres) and less contiguous, site preparation would be conducted as needed by hand scalping using hand tools. No mechanical site preparation for reforestation would occur in Riparian Reserves.

Planting in areas generally five acres or larger would occur in a pattern of widely spaced clusters or groups of three to five seedlings, otherwise known as cluster planting, for a total of approximately 250 trees per acre, to establish seedling dominance in the vicinity of the cluster. Excess smaller saplings adjacent to the dominant conifers within the clusters may be removed during post-planting monitoring and release treatments. Smaller openings, generally less than 5 acres, would be planted with up to approximately 150 trees per acre scattered as individuals throughout the planted area.

See Appendix A page A-27 for more information on reforestation.

Forest Restoration Adaptive Management

Aspen Restoration Adaptive Management
If aspen release monitoring indicates clumps or stands are not actively suckering within three years of conifer removal, underburning or mechanical soil disturbance treatments (disking) may be used to stimulate suckering. If aspen monitoring indicates browse damage at a level that may prevent achievement of healthy aspen establishment, the appropriate type and size of fencing would be installed and removed when no longer necessary. See pages A-21 for more information.

Salvage Adaptive Management
Under adaptive management, in the event conditions deteriorate further post-decision and post-marking, removal of dead and dying pine trees may occur in conjunction with harvest in 19 treatment units (listed in Table Appendix A-2) to reduce the risk to the LSR posed by higher levels of standing and down fuels. Areas would typically be within or adjacent to larger existing pine mortality areas, which are the result of overstocking, insect or disease problems. The RPMs for snag retention and down wood would still apply.

Biomass Adaptive Management for Changed Market Conditions
Biomass (4 to 9.9 inch DBH) material would be mechanically thinned on a prescribed spacing, or to a prescribed basal area, in those thinning units that have a biomass thinning component (as listed in Table Appendix A-2 on p. A-6). Depending on the market conditions at the time of implementation, material that is 4 to 6.9 inches DBH may not be mechanically thinned and removed, but instead would be treated on site with a combination of mechanical treatments, hand thinning or thinned through the use of prescribed fire during the underburning operations. Modifications to the limits of acceptable mortality for this size class during underburning under adaptive management are defined in the RPMs (see RPM 24).

Forest Restoration Connected Actions
The following connected actions would be necessary to implement the vegetation treatments described above. Road actions including connected actions to vegetation treatments are described separately starting on page

---

\footnote{25 If feasible, materials may be removed as merchantable material along with the products from the thinning, however, the objective is risk reduction.}
57. Hazard reduction in heavy mortality areas along some roads and property lines, including some areas within thinning units, is connected to fuels and other various actions including thinning, and is described separately on page 59.

**Borate Fungicide**
Borate fungicide such as Sporax® or Cellu-Treat® would be applied to stumps over 14 inches in harvested areas within 4 hours of harvest to prevent the spread of *Heterobasidion annosum*.

**Release of Reforested Areas**
Reforestation treatments would be monitored for the need to control competing vegetation such as grasses, forbs, brush and dense naturally seeded in conifers from the surrounding stand (typically white fir in an area where ponderosa pine is being reestablished) that could inhibit the survival and growth of desirable seedlings. Hand or mechanical cutting of competing vegetation may be implemented within the first one to five years following reforestation, depending on monitoring results. Hand treatments would be most anticipated in the areas of less than five acres where mechanical site preparation was not utilized.

**Fire Restoration and Fuels Reduction Treatments**
The following fuel reduction treatments would contribute to meeting the desired condition for fire and fuels for Purpose and Need #1 (see p. 24). Detailed information is provided in Appendix A starting on page A-29.

**Underburn**
Underburning or broadcast burning (burning in a stand with little or no overstory, such as the meadow restoration units) involves a prescribed burn utilizing a low to moderate intensity fire, often under a timber canopy.26 Due to the high degree of departure from the natural fire regime, one burn entry in the entire project area is unlikely to achieve the objective of returning the natural role of fire to the landscape. Instead, incremental underburns within logical burn blocks, repeated every 5 to 10 years, would be implemented in order to burn the entire project area up to three times. The entire area would not be burned in any one year, contributing to a diverse mosaic of treated area conditions. All underburning objectives and RPMs would apply for each entry. The underburning treatments would require the following connected actions:

- Heavy concentrations of natural or activity-generated coarse woody debris would be machine piled and piles would be burned as a pretreatment before underburning to limit adverse fire severity effects to wildlife habitat and overstory trees.

- Natural and activity-generated fuels would be ignited by ground crews or aerial ignition and burned with a low to moderate intensity surface fire, creating a mosaic of vegetative retention.

- Naturally ignited fires moving across the project area could accomplish second and third entry underburning objectives.

**Machine Pile and Pile Burn**
Where there are heavy concentrations of coarse woody debris, typically more than 40 tons per acre, machine piling and burning of some piles would be utilized as a pretreatment before underburning. The pre-treatment would reduce excess fuels in order for underburning to safely meet the acceptable mortality levels (see RPM 24) and limit adverse effects to overstory trees and wildlife habitat.

---

26 The terms “underburning” and “broadcast burning” may be used interchangeably in this document and the project record in general.
• Treatment-generated and natural fuels in excess of desired retention levels will be piled with mechanized equipment such as an excavator or tractor with a mounted brush rake or grapple designed to minimize soil disturbance.

• Piling will focus on the high fuel load/mortality pockets and machine piling passes will be limited to the extent needed to reduce fuel loads to the levels described in the resource protection measures.

• There will only be one piling entry into units.

• Treated areas will not be rigorously cleaned of slash material, and duff materials will be largely left in place for soil cover and erosion protection consistent with Forest Soil Quality Standards (Forest Plan p. Appdx. O), RPMs and BMPs.

• Piles will be burned when there is low fire danger and per the project burn plan, which is designed in compliance with the RPMs.

Fuels Modifications for Site-Specific Conditions

**Extensive Mortality Area (EMA)**

An approximate 79-acre area of contiguous pine mortality within five units where hazardous conditions from the numerous snags presents a safety concern to project implementers, the general public and more critically, an increased risk to adjoining stands in the LSR. To reduce the risk, the Extensive Mortality Area would be burned (see discussion of underburning above) to reduce heavy fuels, most likely utilizing aerial ignition techniques since it is unsafe to put firefighters on the ground or conduct other machine-based fuels reduction within this area. It is anticipated that burning the EMA would achieve a 70-80% reduction in the snags with an expected 20% low intensity, 50% moderate intensity, and 30% high intensity burn. The Extensive Mortality Area fuels subunit overlays the underlying thinning units, however, no thinning will take place within it.

**Fuels Connected Actions**

The following connected actions would be necessary to implement the fuels treatments described above. Hazard reduction in heavy mortality areas along some roads and property lines, including some areas where fuels actions take place, is connected to the fuels actions, as well as the vegetation actions, and is described separately on page 59.

**Fireline Construction**

Control lines to prevent prescribed fire from entering private lands or to manage prescribed fire within the project area would be constructed by hand crews or small to medium crawler tractors where existing barriers are not available. Rehabilitation of control lines post-burning includes dragging the bermed material, brush, and small trees back over the line. See page A-29 for more detail.

**Meadow Restoration**

Meadow restoration includes a combined suite of actions of meadow enhancement treatment, aspen release and aspen restoration adaptive management, underburning in the meadow, hydrologic function restoration at Elk Flat, and meadow restoration connected actions.

**Meadow Enhancement**

Thinning for meadow enhancement within and surrounding Elk Flat is different from thinning a forested stand in that there is no target density level such as a desired basal area or spacing. Rather than manage for a forested stand, the intent is to create conditions more reflective of those found historically; namely few
scattered pine within an otherwise open meadow. A tree’s size, age and position – both within the meadow and in relation to adjacent trees, are considerations when selecting trees for retention or removal.

Predominant trees and dominant trees with late-successional characteristics would be retained. All other trees that have grown into and along the meadow edges would be removed. There is extensive pine regeneration (seedling to pole-sized trees) in the forested islands and stringers in the meadow, and along the meadow’s edge, along with 11-20+” DBH trees, and scattered predominant and dominant trees. A basal area of approximately 60 square feet per acre of the largest diameter trees would be retained where the meadow transitions into natural stands and young plantation stands along the edge. This thinning prescription would create a ‘feathered’ effect of few trees within the meadow, transitioning to an open forest stand along the meadow’s edge. In young plantations within 100 feet of the meadow’s edge, young plantation trees would be thinned to a lower basal area/trees per acre to achieve the ‘feathered’ effect (see description in Young Plantation thinning in Appendix A starting on page A-22).

Aspen Release and Aspen Restoration Adaptive Management in Elk Flat
Aspen encountered in Elk Flat meadow would be released by conifer removal consistent with the meadow enhancement prescription for conifer removal.

Broadcast Burning in the Meadow
Prescribed burning would be utilized every five to ten years after initial treatments to maintain the meadow as described for underburning (below), mimicking the effects of a historic natural fire regime and serving as an important tool in restoring and enhancing ecological function and processes by promoting soil nutrients, grass and forb regeneration. As described above for the natural stands and plantations, the meadow area (including unit 401 to the south) would be burned up to three times. While prescribed fire would be employed across Elk Flat, it is recognized that vegetation varies; some areas of the meadow will carry fire readily while other areas may not. Prescribed burning is described below in “Underburn”.

Hydrologic Function Restoration at Elk Flat
Within Elk Flat meadow, hydrologic function would be restored through the decommissioning of unauthorized routes as described in Hydrologic Function actions below, to restore overland flow and infiltration in the floodplains to restore groundwater storage to a more natural condition.

Meadow Restoration Connected Actions
Meadow restoration treatments would include the connected actions for road maintenance and borate fungicide described under Forest Restoration above.

Hydrologic Function and Soils Restoration

Stream Flow, Water Table Elevation, and Riparian Vegetation Restoration
The following hydrologic and Riparian Restoration actions meet the Purpose and Need of improving streamflow, water table elevation and vegetation conditions within Riparian Reserves associated with Ash and Swamp Creeks and their tributaries (also see p. 34 and Appendix A starting on p. 211):
• Recontouring - The Ash and Swamp Creek floodplains would be recontoured to restore portions of reaches previously disturbed in past activities. Heavy equipment would recontour existing landings, skid trails and unauthorized routes. Low profile/embedded woody debris structure would be added by burying woody debris on the floodplain and in dry channels to add surface roughness in recontoured areas.

• Decommissioning - Unauthorized routes and old landings that interact with creeks and divert or capture runoff or prevent floodplain function would be decommissioned to a natural grade to help promote infiltration, natural water table elevation and floodplain function of Ash and Swamp Creek.

• Riparian Revegetation - Restored, recontoured and thinned areas within Ash Creek Riparian Reserves would be planted with hardwood, riparian, or mesic species native to the area and most appropriate for the location to help restore riparian vegetation and strengthen streambanks.

• Thinning treatments within Ash Creek Riparian Reserves - These would retain current stand densities for terrestrial shading and thermal regulation in some locations and in other locations, reduce densities and shade to promote development of riparian understory, stream bank stabilizing vegetation such as willow and near-stream shading (Gregory, et al., 1991).

Windrow Respreading
Windrows would be respread using equipment such as a small tractor with a blade to redistribute top soil more evenly (P&N #2 starting p. 10).

Transportation System Management and Road and Landing Actions
The following road actions respond to the Purpose and Need for action directly or are connected actions necessary to implement treatments to meet the Purpose and Need for Action, or both. Existing FTS roads, existing routes and temporary roads would provide access for harvest operations. Most roads are suitable for hauling forest products with pre-haul maintenance. Appendix A provides road-specific information in Table Appendix A-5 on page A-36.

Addition to the FTS
A 0.10 mile segment of unauthorized road U41N10A in Matrix land allocation would be added to the system as a maintenance level 2 road, and maintained under all action alternatives. The road will remain open after completion of the project. As noted in the Purpose and Need (See #6 on page 38), road U41N10A is needed for current and long-term management objectives as recommended by the Travel Analysis Process completed for the Elk Project (Bonivert, 2015a p. 14).

Transportation Connected Actions

Maintenance
Roads used in implementation of the project would be actively maintained to standard during use. Maintenance activities can include grading, resurfacing, culvert cleaning, hazard tree removal, snow plowing, and slide removal (36 CFR 220.6(d)(4)) as well as dust abatement as needed. Roads requiring additional actions such as reconstruction or closure would also be maintained. Also see Appendix A starting page A-39.

Reconstruction
One road, the 41N01YB, totaling approximately 0.27 miles, is proposed for reconstruction entailing clearing and brushing, and surface reconditioning. The work required to restore 41N01YB will focus on restoring the road to usable condition. No surface upgrades are proposed. Also see Appendix A page A-39.
Closure

Maintenance level 1 (see footnote 112 on page A-38 for explanation of Maintenance Levels) roads would be temporarily opened for access to treatment units, then at completion of the project, reclosed to vehicular traffic by blocking the entrance utilizing installation of an earthen berm, a guardrail barricade or natural obstacles with consideration for cost, effectiveness and resource protection. A detailed description of closure is provided in Appendix A on page A-42.

Temporary Roads and Landings

Temporary roads in thinning and meadow enhancement units across the project area would be used or constructed to provide access for harvest operations. To avoid new disturbance and as feasible, unauthorized routes would serve as temporary roads rather than constructing new temporary roads when feasible. Sections of unauthorized routes used as haul routes would be improved for equipment access and hauling as needed. Once project operations are completed temporary roads would be decommissioned. Given the generally flat terrain, temporary roads would require minimal construction measures. The need for more extensive work such as cuts and fills or drainage structures is very limited. Table Appendix A-5 lists unauthorized routes that would be available for use as a temporary road and then decommissioned at the end of the project. As described in RPM 16 on page 86, temporary roads will be kept to a minimum, and will be routed through non-late-successional or low quality late-successional habitat where possible.

Landings averaging approximately 0.75 acres would be used or constructed to facilitate the transfer of materials from treatment units to trucks for hauling. All new landing locations would be preapproved. Existing landings would be utilized when operationally feasible and if in compliance with RPMs; legacy landings in Riparian Reserves will not be utilized and all new landings will be constructed outside of Riparian Reserves. Landings and skid trails would be decommissioned when no longer needed for the project (see Decommissioning below).

Also see RPMs 13 on page 86, 14 on page 86, 15 on page 86, 45a on page 93, and more detail in Appendix A page A-39.

Decommissioning

Existing unauthorized routes including those unauthorized routes used as temporary roads, new temporary roads, landings and main skid trails would be decommissioned at the completion of the project.27 Decommissioning typically involves physically blocking the entrance at a minimum to allow natural revegetation, and may also include ripping to promote natural revegetation and restoration, and water bars to prevent erosion when necessary, including the necessary cleanup work. Decommissioning of existing unauthorized routes helps implement the Purpose and Need for Action (See #6 on page 38), while the construction, use and decommissioning of new temporary roads is necessary to implement the Proposed vegetation treatment actions and protect the resources. The extent of decommissioning activities would be contingent on the extent of construction disturbance. Typically, the entrance would be blocked, drainage patterns restored and the temporary road surface disturbed to break down compaction and allow the reestablishment of vegetation. Decommissioned roads and routes do not receive maintenance. A detailed description of decommissioning is provided in Appendix A on page A-42.

27 The Forest Plan directs the dedication of no more than 20 percent of the land harvested by uneven-aged systems be dedicated to non-productive purposes such as roads, trails, landings, etc. Appendix O defines detrimental soil disturbance for compaction as porosity less than 90 percent of the total porosity found under undisturbed or natural conditions.
Other Connected Actions

Hazard Reduction
Snags that pose a hazard to the public or operations may be felled throughout the project area, consistent with Forest Service policy on danger trees. The Hazard Reduction treatment area is delineated on the fuels treatment maps for those areas likely to require considerable snag felling due to the current high number of snags and safety concerns. Hazard reduction is a connected action to the vegetation and fuels treatments described above, to increase safety during implementation near roads or property lines. Hazard Reduction areas are identified within 150 feet of some system roads and 300 feet of private property in units 158, 159, 162, 175, 176, 179, 204 and 206. Felled snags would be removed as sawlogs or biomass material if feasible, through machine piling and pile burning, or would be left to meet coarse woody debris requirements. Coarse woody debris would be retained at levels described in RPM 40. Hazard Reduction treatment is not listed separately in Table Appendix A-2 but is part of the treatments described.

Implementation and Compliance Requirements
Implementation would require numerous routine connected actions such as a burn permit and smoke management plan in compliance with Siskiyou County regulations, a California Water Quality Control Board Conditional Waiver of Waste Discharge (CVRWQCB, 2010), routine contract administration for elements of the proposed action completed through various contractual mechanisms and hauling of harvest material to mills and cogeneration facilities. All connected actions not specifically detailed in the discussions above are standard operating procedures.

Alternatives Considered in Detail, Resource Protection Measures and Monitoring
The proposed action as scoped in February 2013 and described in the Notice of Intent (NOI) (USDA-FS, 2013) was incrementally modified by corrections incorporated to address rapidly changing conditions in the project area, ongoing tribal and federal agency consultation, typographical errors in the scoping materials, and refinement or clarification of the descriptions of actions. This modified Proposed Action is considered in detail as Alternative 1. Additionally, the No Action Alternative (Alternative 4), and two action alternatives (Alternative 2 – No New Temporary Road Construction, and Alternative 3 – No Treatments in Natural Stands in Northern Spotted Owl Critical Habitat) were developed in response to the key issues raised during scoping and are considered in detail.

Alternative 1 - The Modified Proposed Action
The Modified Proposed Action (Alternative 1) and the Alternatives to it are described here and summarized starting on page 79.

Alternative 1 is the Modified Proposed Action and the Agency Preferred Alternative. The proposed treatments would be implemented through a combination of commercial and non-commercial thinning using mechanical and hand methods. In addition to thinning activities, existing natural and activity generated fuels within the entire project area would be treated with a combination of machine piling and burning given the size and amount of existing and expected future down fuel, hand piling in sensitive areas such as EEZs or historic properties as needed, (see RPMs 1c and 11) lop and scatter, or underburning (or any combination thereof) to

---

28 All timber sales that may have the potential to impact water quality are evaluated, identified and monitored and reported by the forest service and the state under a Conditional Waiver of Waste Discharge Requirements to assure BMPs are applied to prevent impacts to water quality (CVRWQCB, 2010).
meet the desired condition for fuel load objectives and begin the process for returning natural fire to the landscape.

Forest Restoration and Meadow Enhancement Treatments

Table 7 on page 61 summarizes the Alternative 1 Forest Restoration treatments listed below. Also see the description of forest and meadow restoration treatments starting on page 49. The restoration of the natural fire regime and hydrologic functions for Meadow Restoration are included in those sections below. This section includes the Meadow Enhancement portion of Meadow Restoration.

Thinning

Alternative 1 thins approximately 2,190 acres of units in which approximately 1,859 acres are treated (thinning treatments occur within the unit boundaries but not in the unthinned patches that are also within the unit boundaries, therefore thinning treatment acres or harvest acres are less than unit acres) as follows:

- Natural Stand Thinning – Alternative 1 applies natural stand thinning to 1,526 unit acres in which 1,273 acres outside of the UTPs will be treated. See the description of Natural Stand Thinning starting on pages 52 and A-25.

- Plantation Thinning – Alternative 1 applies plantation thinning to 664 unit acres in which 584 acres outside of UTPs will be treated. Within these acres, 344 unit acres (303 treatment acres) apply to older plantations, and 320 unit acres (281 treatment acres) applies to younger plantations.

Table 7 on page 61 further breaks down the natural and plantation thinning by prescription elements. Table Appendix A-2 (starting p. A-6) lists each unit including all thinning units by alternative. The site-specific prescription elements are also listed, and implemented as the site-specific conditions within the units are encountered.

Meadow Enhancement

Alternative 1 treats the 518-acre unit 402 with the meadow enhancement prescription described on page 55. Within the 518 acre unit, 379 acres include harvest activities. Additionally, 56 acres of young plantation thinning at the edge of the meadow also include an altered thinning prescription within 100 feet of the meadow as described on page A-22, to feather the meadow enhancement into the plantation.

Unit 401, treated under the Pilgrim project in 2012\footnote{The Pilgrim Vegetation Management Project (FSEIS ROD January 10, 2011) dry meadow restoration described in the Pilgrim FSEIS (January 2010) has not been fully completed. Thinning was completed in 2012 however the prescribed basal area of 80 ft²/acre was not met over the entire unit and some, primarily intermediate trees contribute to a higher basal area than desired. Removal of all trees under 14” DBH was also not completed; instead they were thinned to a set spacing. Additional thinning in unit 401 to fully implement the Pilgrim prescription will occur under the Pilgrim Record of Decision. The Pilgrim Project prescribed 25 acres of underburning in unit 401 which has not been completed. The Elk project underburns the full 147-acre unit boundary to more fully meet meadow enhancement desired conditions, and the the underburning is analyzed in the Elk Project.} will also receive underburning under the Elk project to further enhance meadow characteristics and is included in the Project area. Unit 401 underburning acres are included in the underburning-only units described below.

Adaptive Management Strategies

- Biomass Adaptive Management for Changed Market Conditions - Biomass (4 to 9.9-inch DBH) material will be mechanically thinned on a prescribed spacing, or to a prescribed basal area, in those
units that have a biomass thinning component (as listed in Table Appendix A-2). Depending on the market conditions at the time of implementation, material that is 4 to 6.9 inches DBH may not be mechanically thinned and removed, but would be treated on site with a combination of mechanical treatments, hand thinning or thinning through the use of prescribed fire. Modifications to the limits of acceptable mortality for this size class during underburning under adaptive management are defined in the RPMs (see RPM 24, Table 28, p.88).

- Salvage Adaptive Management - Alternative 1 applies salvage adaptive management to 811 acres in 19 units as listed in Table Appendix A-2. Additional dead and dying pine trees may be salvaged during harvest operations as approved by the Forest Service if mortality expands between the unit layout and when a unit is closed during operations.

- Aspen Restoration Adaptive Management - As described on pages 53, and A-28, Alternative 1 releases aspen whenever it is encountered in a thinning or meadow enhancement unit through application of the marking guidelines. Thinning units 157, 175 and 402 are known to contain aspen. Under adaptive management, if aspen monitoring fails to show a positive establishment within three years then underburning or soil disturbance would be utilized to stimulate suckering.

Table 7 summarizes Alternative 1 vegetation restoration treatments. Part I of the table lists the unit acres, unthinned patch acres (within the units) and the remaining acres, which are thinned or receive meadow enhancement conifer removal. Those acres within units receiving thinning or meadow enhancement are listed as “harvest acres”. Thinning is divided into natural stands and plantations. Within each of these categories, the table further groups treatments by prescription elements. Part II of the table summarized subtreatment acres applied under natural stand thinning, plantation thinning, and meadow enhancement. These subtreatment acres are the actual estimated acres of each subtreatment, not the unit or larger harvest acres unless noted.

Table 7. Alternative 1 Summary of Forest Restoration Treatments Including Meadow Enhancement

<table>
<thead>
<tr>
<th>Treatment Prescriptions</th>
<th>Unit Acres*</th>
<th>Unthinned Patch Acres*</th>
<th>Harvest Acres^</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thinning Units</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Stand Thinning</td>
<td>1,526</td>
<td>181</td>
<td>1,273</td>
</tr>
<tr>
<td>Thinning Only</td>
<td>350</td>
<td>40</td>
<td>309</td>
</tr>
<tr>
<td>With Group Selection, Plant Groups</td>
<td>39</td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>With Interplant</td>
<td>468</td>
<td>56</td>
<td>341</td>
</tr>
<tr>
<td>With Radial Thin</td>
<td>207</td>
<td>25</td>
<td>182</td>
</tr>
<tr>
<td>With Radial Thin, Group Selection, Plant Groups</td>
<td>108</td>
<td>13</td>
<td>95</td>
</tr>
<tr>
<td>With Radial Thin, Interplant</td>
<td>354</td>
<td>42</td>
<td>312</td>
</tr>
<tr>
<td><strong>Plantation Thinning</strong></td>
<td>664</td>
<td>80</td>
<td>584</td>
</tr>
<tr>
<td>Young Plantations (10-39 Years)</td>
<td>320</td>
<td>39</td>
<td>281</td>
</tr>
<tr>
<td>Thinning Only</td>
<td>160</td>
<td>19</td>
<td>141</td>
</tr>
<tr>
<td>With Meadow Enhancement</td>
<td>63</td>
<td>8</td>
<td>56</td>
</tr>
<tr>
<td>With Interplant</td>
<td>96</td>
<td>12</td>
<td>84</td>
</tr>
<tr>
<td>Older Plantations (40-50 Years)</td>
<td>344</td>
<td>42</td>
<td>303</td>
</tr>
<tr>
<td>With Group Selection, Plant Groups</td>
<td>59</td>
<td>7</td>
<td>52</td>
</tr>
<tr>
<td>With Radial Thin</td>
<td>14</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>With Radial Thin, Group Selection, Plant Groups</td>
<td>272</td>
<td>33</td>
<td>239</td>
</tr>
</tbody>
</table>
### Table 7 Part II – Vegetation Prescription Elements or Subtreatments - acres within units

<table>
<thead>
<tr>
<th>Subtreatment</th>
<th>Natural Stand Thinning Prescription</th>
<th>Plantation Thinning Prescription</th>
<th>Meadow Enhancement Prescription</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Selection</td>
<td>16</td>
<td>58</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Radial Thinning</td>
<td>135</td>
<td>58</td>
<td></td>
<td>193</td>
</tr>
<tr>
<td>Interplanting (interplanting within other primary treatments including reforestation of the extensive mortality area. &quot;Interplanting-only&quot; as the primary treatment is included with reforestation treatments in Table 8 below)</td>
<td>195</td>
<td>33</td>
<td></td>
<td>228</td>
</tr>
<tr>
<td>Biomass Thinning (harvest acres)</td>
<td>909</td>
<td>576</td>
<td>379</td>
<td>1,864</td>
</tr>
<tr>
<td>Aspen Release (and adaptive management restoration if needed)</td>
<td>18.0</td>
<td>0.1</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Adaptive Management Salvage (if needed to reduce risk from dead and dying pine – harvest acres of units)</td>
<td>528</td>
<td>283</td>
<td></td>
<td>811</td>
</tr>
<tr>
<td>Borax Stump Treatment (harvest acres where stumps are over 14&quot; diameter)</td>
<td>1,273</td>
<td>388</td>
<td>379</td>
<td>2,040</td>
</tr>
</tbody>
</table>

*Minor discrepancies in subtotals and totals may exist due to rounding of data.
^Units 206 (natural stand thinning) and 402 (meadow enhancement) have fewer harvest acres than the Unit acres – Unthinned Patches due to extensive mortality in 206 and Nonforested area in 402. Therefore, the total harvest acres are lower in this column than unit acres minus unthinned patch acres.

30 Unit 152-1 is the exception because the primary prescription puts it in the "Natural Stand Thinning with Radial thin, Group Selection, and Plant Groups" treatment but it also includes interplanting.

31 Acreage estimates for the subtreatments are the total accumulated when applied in smaller areas where the site-specific condition that prompts the treatment is encountered. The exception to this is harvest acres were used to estimate the biomass thinning and borax stump treatments.

32 This figure includes aspen release in association with the Meadow Enhancement Prescription.

33 Since oaks are widely scattered across a number of natural stand thinning and plantation thinning units, oak release treatment was not broken down by natural stand or plantation. See Appendix A page A-26 for a list of units known to contain oak.
Reforestation actions are described starting on pages 52 and A-27. Table Appendix A-2 provides individual unit reforestation actions. Table 8 below provides a summary of reforestation actions for Alternative 1. Reforestation acres are not spatially new areas, but reflect additional actions on acreages listed in the primary vegetation or fuels treatments. The second column displays the actual proposed site preparation, planting, and release acres within larger units (entire units are not proposed for reforestation). Site preparation and release acres indicate the areas where the need for reforestation actions would be evaluated on a case by case basis. Some machine piled units are not expected to need additional site preparation treatment and are not included in the table for site preparation.

Table 8. Alternative 1 Summary of Reforestation Actions

<table>
<thead>
<tr>
<th>Reforestation Action</th>
<th>Alternative 1 Estimated Reforestation Activity Acres within Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Preparation for Planting (Mechanical Scalp)</td>
<td>269</td>
</tr>
<tr>
<td>Hand Planting</td>
<td></td>
</tr>
<tr>
<td>Interplanting without thinning</td>
<td>10</td>
</tr>
<tr>
<td>Interplanting in thinning units in smaller mortality areas and gaps over 1 acres (as needed)</td>
<td>168</td>
</tr>
<tr>
<td>Planting group selections in thinning units</td>
<td>75</td>
</tr>
<tr>
<td>Reforestation of extensive mortality area</td>
<td>60(^{34})</td>
</tr>
<tr>
<td>Post Planting Hand Release for Growth (1 entry between years 1-5)</td>
<td>313</td>
</tr>
</tbody>
</table>

Fire Restoration and Fuels Reduction Treatments

Fuels restoration treatments and their connected actions are generally described in the Description of Actions section (starting p. 54).

- Underburning - Underburning as described (p. 54) would be completed on 3,482 acres unless restricted by RPMs. Burning will be completed when weather conditions allow for fire managers to meet the desired objectives. It is possible that it will take several years to accomplish burning across the project area. Table Appendix A-2 (starting p. A-6) lists units where underburning-only would be implemented without prior thinning. The total acres reflect underburning area, without multiplication for the potential 2 to 3 underburns every 5 to 10 years.

- Machine Piling - Machine pile and pile burn treatments would occur on up to 1,461 acres as shown in the Alternative map for fuels and described on page 54. Table Appendix A-3 list units where machine piling and pile burn treatments may occur to address potentially high fuel loading from ongoing mortality. The table lists the maximum potential piling acres (unit acres minus the unthinned patches) and the percentage and acres of each unit estimated to need piling based on field review by the fuels specialist. Monitoring would determine the actual need and extent of piling at the time of implementation.

- Extensive Mortality Area Fuels Subunit - The approximate 79-acre area of contiguous pine mortality within units 158, 163, 175, 204 and 206 as shown in the alternative map for fuels would be treated as described (see p. 55).

\(^{34}\) The extensive mortality area also covers smaller portions of several adjoining units. The planting acres in the adjoining units is included within the “interplanting” row of the table.
Table 9 below provides the summary of fuels treatments. Appendix A provides additional detail (p. A-29). The alternative maps show the fuels prescriptions.

Table 9. Alternative 1 Summary of Fuels Reduction Treatments

<table>
<thead>
<tr>
<th>Fuels Reduction Treatment</th>
<th>Alternative 1 Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Underburning</strong>&lt;sup&gt;35&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>(see description starting on pp. 54, A-29)</td>
<td></td>
</tr>
<tr>
<td>Underburn After Thinning and Meadow Enhancement Treatments</td>
<td>2,708</td>
</tr>
<tr>
<td>Underburn Prior to Interplanting in Plantations</td>
<td>28</td>
</tr>
<tr>
<td>(No Timber Harvest Proposed)</td>
<td></td>
</tr>
<tr>
<td>Underburn Only (No Timber Harvest or Planting Proposed)</td>
<td>746</td>
</tr>
<tr>
<td><strong>Total Underburning</strong></td>
<td><strong>3,482</strong></td>
</tr>
<tr>
<td><strong>Machine Pile and Pile Burn</strong></td>
<td>Maximum Estimated</td>
</tr>
<tr>
<td>(see description pp. 54, A-30 and Table Appendix A-3)</td>
<td>1,461 944</td>
</tr>
<tr>
<td><strong>Fuels Subtreatments</strong></td>
<td></td>
</tr>
<tr>
<td>The following treatments overlap other fuels treatments and are not additive</td>
<td></td>
</tr>
<tr>
<td><strong>Extensive Mortality Area</strong></td>
<td>79</td>
</tr>
<tr>
<td>(see description starting on pp. 55, A-32)</td>
<td></td>
</tr>
<tr>
<td><strong>Fuels Connected Actions (miles)</strong></td>
<td></td>
</tr>
<tr>
<td>Miles of Machine Fireline Construction</td>
<td>9.3 miles</td>
</tr>
<tr>
<td>(see description starting on p. A-29)</td>
<td></td>
</tr>
</tbody>
</table>

Road and Landing Actions

Proposed road actions are a combination of those needed to meet the Purpose and Need for Action and those needed to implement other actions (connected actions). The addition of approximately 1/10th of a mile of currently existing unauthorized route to the FTS and decommissioning of approximately 6.4 miles of existing unauthorized routes meets the Purpose and Need for Action. Some of the decommissioning of unauthorized routes also meets the Purpose and Need related to hydrology, described below. The remainder of the actions, maintenance, opening and closure, reconstruction and temporary road use and construction are connected actions. Landing construction and use is also a connected action to facilitate transportation of harvested material. Alternative 1 requires approximately 78 landings to implement the vegetation treatments. Of these, approximately 38 already exist and if operationally feasible and approved for use, would be utilized rather than constructing new landings. Existing landings were identified through a combination of aerial photography interpretation, field notes and site visitation. Actual use or construction of landings would be approved on a site-specific basis by the sale administrator specific basis as requested by the timber operator.

Table 10 provides the road and landing summary for Alternative 1. General descriptions of these actions are provided above in the Description of Actions starting on page 49. Detailed descriptions are provided in Appendix A including road-specific actions (starting page A-33 and Table Appendix A-5 and Table Appendix A-6). Refer to the Alternative 1 map for a graphic display, though this map does not display temporary roads as placement of these roads is subject to agreement with the implementation purchaser in accordance with resource protection measures.

---

<sup>35</sup> Within the constraints and guidelines detailed by the resource protection measures. There are unthinned patches that may not be burned or would have no direct ignition, and other sites that will have fire excluded within this total acreage.
Table 10. Alternative 1 Summary of Road and Landing Actions

<table>
<thead>
<tr>
<th>Road or Landing Action</th>
<th>Modified Proposed Action Alternative 1 Miles\textsuperscript{36}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forest Transportation System Actions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance Only</strong> (Roads without other actions. All road actions listed elsewhere also include maintenance. See description pp. 57, A-39)</td>
<td>14.9</td>
</tr>
<tr>
<td>LSR</td>
<td>12.9</td>
</tr>
<tr>
<td>Matrix</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Open, Use and Maintain for Project, Close in LSR</strong> (See description pp. 58, A-42)</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Reconstruct and Close in LSR</strong> (See description pp. 57, A-42)</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Add and Maintain in Matrix</strong> (See description pp. 57, A-38)</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total FTS Road Action Miles</strong></td>
<td>17.9</td>
</tr>
<tr>
<td><strong>Other Transportation Actions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Unauthorized Routes, Temporary Roads and Decommissioning</strong></td>
<td></td>
</tr>
<tr>
<td>Decommission Unauthorized Route in LSR (See description pp. 58, A-42)</td>
<td>0.7</td>
</tr>
<tr>
<td>Use Unauthorized Route as a Temporary Road then Decommission (See description pp. 58, A-39)</td>
<td>5.7</td>
</tr>
<tr>
<td>LSR</td>
<td>3.8</td>
</tr>
<tr>
<td>Matrix</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>New Temporary Road Construction then Decommission</strong></td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Total Decommissioning - Unauthorized Routes and Temporary Road Use, Construction and Decommissioning</strong></td>
<td>9.3</td>
</tr>
<tr>
<td><strong>Landings</strong></td>
<td><strong>Estimated Numbers of Landings</strong></td>
</tr>
<tr>
<td>Subtotal Estimated Existing Landings</td>
<td>38</td>
</tr>
<tr>
<td>LSR</td>
<td>31</td>
</tr>
<tr>
<td>Matrix</td>
<td>7</td>
</tr>
<tr>
<td>Subtotal Estimated New Landings (LSR)</td>
<td>40</td>
</tr>
<tr>
<td><strong>Estimated Total Landings Needed</strong> (See description pp. 58, A-39)</td>
<td>78</td>
</tr>
</tbody>
</table>

Hydrologic Function and Soils Actions

*Hydrologic Restoration*

Alternative 1 restores hydrologic function through the hydrologic actions summarized below. Where noted, the actions are not additional but provide further information as listed in other tables.

\textsuperscript{36} Rounding may cause slight discrepancies in totals.
Table 11. Alternative 1 Summary of Hydrologic Restoration Actions

<table>
<thead>
<tr>
<th>Treatment</th>
<th>RR Acres</th>
<th>RR Length (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream channel and floodplain restoration: Unauthorized Route Decommission with Recontour Stream and Floodplain</td>
<td>8.1</td>
<td>1,700</td>
</tr>
<tr>
<td>Stream Channel and Floodplain Restoration: Recontour Stream and Floodplain, Add Low Profile/Embedded Woody Debris Structure</td>
<td>7.2</td>
<td>1,569</td>
</tr>
<tr>
<td>Riparian Reserve Treatments (previously included in thinning, underburning-only, underburning, and meadow enhancement acres)</td>
<td>211</td>
<td>N/A</td>
</tr>
<tr>
<td>Riparian Reserve Revegetation</td>
<td>94.9</td>
<td>16,127</td>
</tr>
</tbody>
</table>

**Soil Restoration**

- Alternative 1 respreads windrows in older plantation units 6 and 14 for a total of 167 acres. Also see page 66.

**Other Connected Actions**

Hazard reduction would be implemented on 87 acres in units 158, 159, 162, 175, 176, 179, and 206 as described on page 58 to improve safety during implementation. Other hazard trees or snags throughout the project area may also be felled as needed for safety.

**Alternative 2 - No New Temporary Road Construction Other than Those Required for Landing Use/Access**

Alternative 2 is responsive to the issue regarding temporary road construction impacts on forest health and connectivity within the LSR. It is similar to Alternative 1 with the exception that no temporary roads would be constructed to complete project activities other than to access landings (typically a landing “driveway” is about 200 feet). Project activities would be completed utilizing the existing FTS roads and existing unauthorized routes in the project area. Alternative 1 identified the need for approximately 2.9 miles of new temporary road to complete thinning activities and no new permanent road construction was proposed. This alternative reduces the ability to mechanically treat approximately 103 acres with a corresponding decrease in needed landings. All other project design criteria, thinning and fuels treatments and road actions are the same as Alternative 1. While the total acreage between Alternatives 1 and 2 treated is the same, the difference is between the treatment types. Despite no new construction of temporary roads under Alternative 2 other than needed to access landings, the total project area would still be underburned and in accordance with RPMs. Maintenance and other actions relating to the FTS system would be the same under Alternative 2 as Alternative 1, however the maintenance would be less intensive due to reduced hauling.

**Forest and Meadow Restoration Treatments**

**Thinning**

Alternative 2 thins approximately 2,124 acres of units in which approximately 1,800 acres are treated outside of UTPs as follows:

- Natural Stand Thinning – Alternative 2 applies natural stand thinning to 1,476 (50 fewer than Alternative 1) unit acres in which 1,230 acres outside of the UTPs (43 fewer than Alternative 1) will be treated. See the description of Natural Stand Thinning starting on pages 52 and A-25.

- Plantation Thinning – Alternative 2 applies plantation thinning to 648 unit acres (16 fewer than Alternative 1) in which 570 acres outside of UTPs would be treated. Within the total thinning unit...
acres, 328 acres (16 fewer than Alternative 1) with 289 treatment acres (14 fewer than Alternative 1) apply to older plantations. Young plantation thinning is the same as Alternative 1.

Table 12 further breaks down the natural and plantation thinning by prescription elements.

**Meadow Enhancement**
Alternative 2 treats approximately 25 fewer acres than Alternative 1.

**Aspen Release**
Alternative 2 treats approximately 3.1 fewer acres with aspen release. These areas would be underburn-only.

**Adaptive Management Strategies**
Alternative 2 includes the same adaptive management strategies as Alternative 1. However, individual adaptive management actions would be reduced if they were to occur in the units where thinning was eliminated.

Table 12 summarizes Alternative 2 vegetation restoration treatments. It displays information similarly to Alternative 1.\(^{37}\) The table also shows the change in Alternative 2 for each row when compared to Alternative 1.

### Table 12. Alternative 2 Summary of Vegetation Restoration Treatments and Changes from Alternative 1

<table>
<thead>
<tr>
<th>Thinning Units</th>
<th>Unit Acres(^{a})</th>
<th>Unthinned Patch Acres(^{b})</th>
<th>Timber Harvest Acres(^{\text{**}})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt. 2</td>
<td>Change from Alt. 1</td>
<td>Alt. 2</td>
</tr>
<tr>
<td>Natural Stand Thinning</td>
<td>1,476</td>
<td>-50</td>
<td>175</td>
</tr>
<tr>
<td>Thinning Only</td>
<td>316</td>
<td>-34</td>
<td>36</td>
</tr>
<tr>
<td>With Group Selection, Plant Groups</td>
<td>39</td>
<td>no change</td>
<td>5</td>
</tr>
<tr>
<td>With Interplant</td>
<td>461</td>
<td>-7</td>
<td>55</td>
</tr>
<tr>
<td>With Radial Thin</td>
<td>207</td>
<td>no change</td>
<td>25</td>
</tr>
<tr>
<td>With Radial Thin, Group Selection, Plant Groups</td>
<td>99</td>
<td>-9</td>
<td>12</td>
</tr>
<tr>
<td>With Radial Thin, Interplant</td>
<td>353</td>
<td>-1</td>
<td>42</td>
</tr>
<tr>
<td>Plantation Thinning</td>
<td>648</td>
<td>-16</td>
<td>78</td>
</tr>
<tr>
<td>Young Plantations (10-39 Years)</td>
<td>320</td>
<td>no change</td>
<td>39</td>
</tr>
<tr>
<td>Thinning Only</td>
<td>160</td>
<td>no change</td>
<td>19</td>
</tr>
<tr>
<td>With Meadow Enhancement</td>
<td>63</td>
<td>no change</td>
<td>8</td>
</tr>
<tr>
<td>With Interplant</td>
<td>96</td>
<td>no change</td>
<td>12</td>
</tr>
</tbody>
</table>

\(^{37}\) Part I of the table lists the unit acres, unthinned patch acres (within the units) and the remaining acres, which are thinned or receive meadow enhancement conifer removal. Those acres within units receiving thinning or meadow enhancement are listed as "harvest acres". Thinning is divided into natural stands and plantations. Within each of these categories, the table further groups treatments by prescription elements. Part II of the table summarized subtreatment acres applied under natural stand thinning, plantation thinning, and meadow enhancement. These subtreatment acres are the actual estimated acres of each subtreatment, not the unit or larger harvest acres unless noted.
## Part I
### Treatment Prescription

<table>
<thead>
<tr>
<th>Part I Treatment Prescription</th>
<th>Unit Acres*</th>
<th>Unthinned Patch Acres*</th>
<th>Timber Harvest Acres**&lt;sup&gt;+&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt. 2</td>
<td>Alt. 2 Change from Alt. 1</td>
<td>Alt. 2 Change from Alt. 1</td>
</tr>
<tr>
<td>Older Plantations (40-50 Years)</td>
<td>328</td>
<td>-16</td>
<td>39</td>
</tr>
<tr>
<td>With Group Selection, Plant Groups</td>
<td>59</td>
<td>no change</td>
<td>7</td>
</tr>
<tr>
<td>With Radial Thin</td>
<td>14</td>
<td>no change</td>
<td>1</td>
</tr>
<tr>
<td>With Radial Thin, Group Selection, Plant Groups</td>
<td>255</td>
<td>-16</td>
<td>31</td>
</tr>
<tr>
<td>Total Thinning</td>
<td>2,124 Unit Acres</td>
<td>-66</td>
<td>253 Acres of UTPs in Units</td>
</tr>
</tbody>
</table>

### Meadow Enhancement Unit

<table>
<thead>
<tr>
<th>Meadow Enhancement</th>
<th>494</th>
<th>-24</th>
<th>59</th>
<th>-3</th>
<th>354</th>
<th>-25</th>
</tr>
</thead>
</table>

### Total Vegetation Treatment

<table>
<thead>
<tr>
<th>Total Vegetation Treatment</th>
<th>2,618 Unit Acres</th>
<th>-90</th>
<th>312 Acres of UTPs in Units</th>
<th>-11</th>
<th>2,154 Acres</th>
<th>-83</th>
</tr>
</thead>
</table>

## PART II - Vegetation Prescription Elements or Subtreatments - acres within units*

<table>
<thead>
<tr>
<th>Subtreatment</th>
<th>Alt. 2 Natural Stand Thinning Rx</th>
<th>Change from Alt. 1</th>
<th>Alt. 2 Plantation Thinning Rx</th>
<th>Change from Alt. 1</th>
<th>Alt. 2 Meadow Enhancement Rx</th>
<th>Change from Alt. 1</th>
<th>Alt. 2 Total Acres</th>
<th>Change from Alt. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Selection</td>
<td>16</td>
<td>no change</td>
<td>55</td>
<td>-4</td>
<td>no change</td>
<td>71</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td>Radial Thinning</td>
<td>133</td>
<td>-2</td>
<td>55</td>
<td>-3</td>
<td>no change</td>
<td>188</td>
<td>-3</td>
<td></td>
</tr>
<tr>
<td>Interplanting (Interplanting within other primary treatments, including reforestation of the extensive mortality area. “Interplanting only” is included with reforestation treatments in table below)</td>
<td>195</td>
<td>no change</td>
<td>33</td>
<td>no change</td>
<td>228</td>
<td>no change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass Thinning (harvest acres)</td>
<td>873</td>
<td>-36</td>
<td>562</td>
<td>-14</td>
<td>354</td>
<td>-25</td>
<td>1,814</td>
<td>-75</td>
</tr>
</tbody>
</table>

---

38 Unit 152-1 is the exception because the primary prescription puts it in the “Natural Stand Thinning with Radial thin, Group Selection, and Plant Groups” treatment but it also includes interplanting.

39 Acreage estimates for the subtreatments are the total accumulated when applied in smaller areas where the site-specific condition that prompts the treatment is encountered. The exception to this is harvest acres were used to estimate the biomass thinning and borax stump treatments.
Reforestation actions under Alternative 2 differ from Alternative 1 by four fewer acres of planting group selections. Table 13 provides a summary of reforestation actions for Alternative 2 and how each action differs in acres of treatment from Alternative 1.

### Table 13. Alternative 2 Summary of Reforestation Actions

<table>
<thead>
<tr>
<th>Reforestation Action</th>
<th>Alternative 2 Estimated Reforestation Activity Acres within Units</th>
<th>Change from Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Preparation for Planting (Mechanical Scalp)</td>
<td>266</td>
<td>-3</td>
</tr>
<tr>
<td>Hand Planting</td>
<td>309</td>
<td>-4</td>
</tr>
<tr>
<td>Interplanting without thinning</td>
<td>10</td>
<td>no Change</td>
</tr>
</tbody>
</table>

---

40 These acres include aspen within the meadow enhancement prescription and all thinning prescriptions.

41 Since oaks are widely scattered across a number of natural stand thinning and plantation thinning units, oak release treatment was not broken down by natural stand or plantation. See Appendix A page A-26 for a list of units known to contain oak.
Fire Restoration and Fuels Reduction Treatments

Alternative 2 increases the proportion of underburn-only to thinning treatments from Alternative 1 as described above, but otherwise underburns the same physical acres. The Extensive Mortality Area treatment remains the same. Machine Pile and Pile Burn treatments are reduced from Alternative 1 corresponding to the reduced thinning acres. Table 14 summarizes fuels restoration treatments under Alternative 2.

Table 14. Alternative 2 Summary of Fuels Reduction Treatments and Changes from Alternative 1

<table>
<thead>
<tr>
<th>Fuels Reduction Treatment</th>
<th>Alternative 2</th>
<th>Alt. 2 Change from the Modified Proposed Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Underburning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(see description starting on pp. 54, A-29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underburn After Thinning and Meadow Enhancement Treatments (unit acres – includes the unthinned patches)</td>
<td>2,617</td>
<td>-91</td>
</tr>
<tr>
<td>Underburn Prior to Interplanting in Plantations (No Timber Harvest Proposed)</td>
<td>28</td>
<td>no change</td>
</tr>
<tr>
<td>Underburn Only (No Timber Harvest or Planting Proposed)</td>
<td>837</td>
<td>+91</td>
</tr>
<tr>
<td><strong>Total Underburning</strong></td>
<td>3,482</td>
<td>No change</td>
</tr>
<tr>
<td><strong>Machine Pile and Pile Burn</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(see description pp. 54, A-30 and Table Appendix A-3)</td>
<td>Maximum</td>
<td>Estimated</td>
</tr>
<tr>
<td></td>
<td>1,402</td>
<td>906</td>
</tr>
<tr>
<td><strong>Fuels Subtreatments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The following treatments overlap other fuels treatments and are not additive</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extensive Mortality Area</strong></td>
<td>79</td>
<td>no change</td>
</tr>
<tr>
<td>(see description starting on pp. 55, A-32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fuels Connected Actions (miles)</strong></td>
<td>Miles of Mechanical Fireline Construction (see description starting on p. A-29)</td>
<td>9.3 miles</td>
</tr>
</tbody>
</table>

42 The extensive mortality area also covers smaller portions of several adjoining units. The planting acres in the adjoining units is included within the “interplanting” row of the table.

43 Within the constraints and guidelines detailed by the resource protection measures. There are unthinned patches that may not be burned or would have no direct ignition, and other sites that will have fire excluded within this total acreage.
Road Actions

Road action activities under Alternative 2 will be the same as Alternative 1 except for the differences noted below:

- Road Maintenance - The miles of roads to be maintained would remain the same as Alternative 1, but the frequency and intensity of maintenance work would be reduced slightly to account for a slightly less volume of material to be removed.

- Temporary Roads - Only temporary roads needed to access landings will be constructed. Temporary roads constructed to access landings are typically 100 feet to 200 feet and allow landing operations to take place within a safe distance from the road. Unauthorized routes will be used as temporary roads as feasible, as they are under Alternative 1. New temporary road construction totals approximately 1.6 miles; 1.3 mile less than Alternative 1.

- Landings – Alternative 2 would require an estimated 70 landings; 8 fewer than Alternative 1.

Table 15 summarizes Alternative 2 road and landing actions and indicates the relative differences between Alternative 2 and Alternative 1, the Modified Proposed Action.

Table 15. Summary of Alternative 2 Road and Landing Actions and Changes from Alternative 1

<table>
<thead>
<tr>
<th>Road and Landing Action</th>
<th>Alternative 2 No New Temporary Road Construction</th>
<th>Alt. 2 Change from the Modified Proposed Action (Alternative 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Road Actions by Forest Plan Land Allocation</strong></td>
<td>Miles (^{44})</td>
<td>Miles</td>
</tr>
<tr>
<td><strong>Forest Transportation System Actions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance Only</strong></td>
<td>14.9</td>
<td>no change</td>
</tr>
<tr>
<td>(Roads without other actions. All road actions listed elsewhere also include maintenance. See description pp. 57, A-39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSR</td>
<td>12.9</td>
<td>no change</td>
</tr>
<tr>
<td>Matrix</td>
<td>2.0</td>
<td>no change</td>
</tr>
<tr>
<td><strong>Open, Use and Maintain for Project, Close in LSR</strong></td>
<td>2.6</td>
<td>no change</td>
</tr>
<tr>
<td>(See description pp. 58, A-42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reconstruct and Close in LSR</strong></td>
<td>0.3</td>
<td>no change</td>
</tr>
<tr>
<td>(See description pp. 57, A-42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Add and Maintain in Matrix</strong></td>
<td>0.1</td>
<td>no change</td>
</tr>
<tr>
<td>(See description pp. 57, A-38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total FTS Road Action Miles</strong></td>
<td>17.9</td>
<td>no change</td>
</tr>
<tr>
<td><strong>Other Transportation Actions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temporary Roads and Decommissioning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decommission Unauthorized Route (LSR)</td>
<td>0.7</td>
<td>no change</td>
</tr>
<tr>
<td>(See description pp. 58, A-42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal Use Unauthorized Route as a Temporary Road then Decommission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See description pp. 58, A-39)</td>
<td>5.7</td>
<td>no change</td>
</tr>
<tr>
<td>LSR</td>
<td>3.8</td>
<td>no change</td>
</tr>
</tbody>
</table>

\(^{44}\) Rounding may cause slight discrepancies in totals
### Table 16. Alternative 2 Summary of Hydrologic Restoration Actions

<table>
<thead>
<tr>
<th>Treatment</th>
<th>RR Acres</th>
<th>Change from Alternative 1</th>
<th>RR Length (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream channel and floodplain restoration: Unauthorized Route Decommission with Recontour Stream and Floodplain</td>
<td>4.4</td>
<td>-3.7</td>
<td>1,700</td>
</tr>
<tr>
<td>Stream Channel and Floodplain Restoration: Recontour Stream and Floodplain, Add Low Profile/Embedded Woody Debris Structure</td>
<td>7.2</td>
<td>no change</td>
<td>1,569</td>
</tr>
<tr>
<td>Riparian Reserve Treatments (previously included in thinning, underburning-only, underburning, and meadow enhancement acres)</td>
<td>211</td>
<td>No change</td>
<td>N/A</td>
</tr>
<tr>
<td>Riparian Reserve Revegetation</td>
<td>94.9</td>
<td>no change</td>
<td>16,127</td>
</tr>
</tbody>
</table>

### Other Connected Actions

Hazard reduction as described in Alternative 1 remains the same.

### Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl

Alternative 3 is responsive to the issue regarding the assertion that treatments within designated critical habitat for the northern spotted owl violate the 2011 Revised Recovery Plan and the 2012 Final Critical Habitat Rule. Under Alternative 3, no NSO critical habitat would be treated, with the exception of the thinning and other mechanical treatments proposed in seven plantations (7, 12, 13, 14, 208, part of 15, and part of 6). No units within critical habitat would be underburned under Alternative 3. In comparison to Alternative 1, the plantations in critical habitat that are prescribed for machine piling and pile burning would...
require additional fireline construction to provide a barrier between the pile burning areas and the surrounding untreated natural stands. Alternative 3 treats 270 fewer acres with silvicultural harvest than Alternative 1. All other project design criteria, and thinning and fuels treatments and road actions outside of critical habitat are the same as under Alternative 1. Plantations in the CHU that are prescribed for machine piling and pile burning would require additional fireline construction over Alternative 1 to provide a barrier between the pile burning areas and the surrounding natural stands.

Forest and Meadow Restoration Treatments

Thinning
Alternative 3 thins approximately 1,886 acres of units in which approximately 1,590 acres are treated outside of UTPs as follows:

- Natural Stand Thinning – Alternative 3 applies natural stand thinning to 1,222 (304 fewer than Alternative 1) unit acres in which 1,006 acres outside of the UTPs (267 fewer than Alternative 1) will be treated. See the description of Natural Stand Thinning starting on pages 52 and A-25.

- Plantation Thinning – Alternative 3 applies the same plantation thinning as Alternative 1.

Table 17 further breaks down the natural and plantation thinning by prescription elements.

Meadow Enhancement
Meadow Enhancement - Alternative 3 is the same as Alternative 1 for meadow enhancement.

Adaptive Management Strategies
Alternative 3 includes the same adaptive management strategies as Alternative 1. However, individual adaptive management actions would be reduced if they were to occur in the units where thinning was eliminated in critical habitat. Table 17 displays information similarly to Alternative 1. Additionally, changes from Alternative 1 are noted in each row.

<table>
<thead>
<tr>
<th>PART I Treatment Prescription</th>
<th>Unit Acres*</th>
<th>Unthinned Patch Acres*</th>
<th>Timber Harvest Acres**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt. 3</td>
<td>Change from Alt. 1</td>
<td>Alt. 3</td>
</tr>
<tr>
<td>Thinning Units</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Stand Thinning</td>
<td>1,222</td>
<td>-304</td>
<td>144</td>
</tr>
<tr>
<td>Thinning Only</td>
<td>182</td>
<td>-151</td>
<td>20</td>
</tr>
<tr>
<td>With Group Selection, Plant Groups</td>
<td>39 no change 5 no change</td>
<td>34 no change</td>
<td></td>
</tr>
<tr>
<td>With Interplant</td>
<td>436</td>
<td>-32</td>
<td>52</td>
</tr>
<tr>
<td>With Radial Thin</td>
<td>104</td>
<td>-120</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 17. Alternative 3 Summary of Vegetation Restoration Treatments and Changes from Alternative 1

45 Part I of the table lists the unit acres, unthinned patch acres (within the units) and the remaining acres, which are thinned or receive meadow enhancement conifer removal. Those acres within units receiving thinning or meadow enhancement are listed as “harvest acres”. Thinning is divided into natural stands and plantations. Within each of these categories, the table further groups treatments by prescription elements. Part II of the table summarized subtreatment acres applied under natural stand thinning, plantation thinning, and meadow enhancement. These subtreatment acres are the actual estimated acres of each subtreatment, not the unit or larger harvest acres unless noted.
<table>
<thead>
<tr>
<th>PART I Treatment Prescription</th>
<th>Unit Acres*</th>
<th>Unthinned Patch Acres*</th>
<th>Timber Harvest Acres**^</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt. 3</td>
<td>Change from Alt. 1</td>
<td>Alt. 3</td>
</tr>
<tr>
<td>With Radial Thin, Group Selection, Plant Groups</td>
<td>108</td>
<td>no change</td>
<td>13</td>
</tr>
<tr>
<td>With Radial Thin, Interplant</td>
<td>354</td>
<td>no change</td>
<td>42</td>
</tr>
<tr>
<td>Plantation Thinning</td>
<td>664</td>
<td>no change</td>
<td>80</td>
</tr>
<tr>
<td>Young Plantations (10-39 Years)</td>
<td>320</td>
<td>no change</td>
<td>39</td>
</tr>
<tr>
<td>With Meadow Enhancement</td>
<td>63</td>
<td>no change</td>
<td>8</td>
</tr>
<tr>
<td>With Interplant</td>
<td>96</td>
<td>no change</td>
<td>12</td>
</tr>
<tr>
<td>Older Plantations (40-50 Years)</td>
<td>344</td>
<td>no change</td>
<td>41</td>
</tr>
<tr>
<td>With Group Selection, Plant Groups</td>
<td>59</td>
<td>no change</td>
<td>7</td>
</tr>
<tr>
<td>With Radial Thin</td>
<td>14</td>
<td>no change</td>
<td>2</td>
</tr>
<tr>
<td>With Radial Thin, Group Selection, Plant Groups</td>
<td>272</td>
<td>no change</td>
<td>33</td>
</tr>
<tr>
<td>Total Thinning</td>
<td>1,886 Unit Acres</td>
<td>-304</td>
<td>224 Acres of UTPs in Units</td>
</tr>
</tbody>
</table>

**Meadow Enhancement Unit**

<table>
<thead>
<tr>
<th>Meadow Enhancement</th>
<th>Unit Acres</th>
<th>Change from Alt. 1</th>
<th>Acres of UTPs in Units</th>
<th>Acrs of Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meadow Enhancement</td>
<td>518</td>
<td>no change</td>
<td>62</td>
<td>no change</td>
</tr>
<tr>
<td>Total Vegetation Treatment</td>
<td>1,704 Unit Acres</td>
<td>-1004</td>
<td>286 Acres of UTPs in Units</td>
<td>-37</td>
</tr>
</tbody>
</table>

**PART II - Vegetation Prescription Elements or Subtreatments – acres within units (not unit acres)**

<table>
<thead>
<tr>
<th>Subtreatment</th>
<th>Alt. 3 Natural Stand Thinning Rx</th>
<th>Change from Alt. 1</th>
<th>Alt. 3 Plantation Thinning Rx</th>
<th>Change from Alt. 1</th>
<th>Alt. 3 Meadow Enhancement Rx</th>
<th>Change from Alt. 1</th>
<th>Alt. 3 Total Acres</th>
<th>Change from Alt. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Selection</td>
<td>16</td>
<td>no change</td>
<td>58</td>
<td>no change</td>
<td>75</td>
<td>no change</td>
<td>172</td>
<td>-25</td>
</tr>
<tr>
<td>Radial Thinning</td>
<td>114</td>
<td>-25</td>
<td>58</td>
<td>no change</td>
<td>no change</td>
<td>172</td>
<td>-25</td>
<td></td>
</tr>
</tbody>
</table>

46 Unit 152-1 is the exception because the primary prescription puts it in the “Natural Stand Thinning with Radial thin, Group Selection, and Plant Groups” treatment but it also includes interplanting.

47 Acreage estimates for the subtreatments are the total accumulated when applied in smaller areas where the site-specific condition that prompts the treatment is encountered. The exception to this is harvest acres were used to estimate the biomass thinning and borax stump treatments.
Reforestation actions under Alternative 3 differ from Alternative 1 by nine fewer acres of interplanting. Table 18 provides a summary of reforestation actions for Alternative 3 and how each action differs in acres of treatment from Alternative 1.

### Table 18. Alternative 3 Summary of Reforestation Actions and Changes from Alternative 1

<table>
<thead>
<tr>
<th>Reforestation Action</th>
<th>Alternative 3 Estimated Acres</th>
<th>Change from Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Preparation for Planting (Mechanical Scalp)</td>
<td>269</td>
<td>no change</td>
</tr>
<tr>
<td>Hand Planting</td>
<td>304</td>
<td>-9</td>
</tr>
<tr>
<td>Interplanting without thinning</td>
<td>10</td>
<td>no change</td>
</tr>
<tr>
<td>Interplanting in thinning units in mortality areas and gaps over 1 acre (as needed)</td>
<td>159</td>
<td>-9</td>
</tr>
<tr>
<td>Planting group selections in thinning units</td>
<td>75</td>
<td>no change</td>
</tr>
<tr>
<td>Reforestation of extensive mortality areas</td>
<td>60&lt;sup&gt;50&lt;/sup&gt;</td>
<td>no change</td>
</tr>
</tbody>
</table>

<sup>48</sup> These acres include aspen within the meadow enhancement prescription and all thinning prescriptions.

<sup>49</sup> Since oaks are widely scattered across a number of natural stand thinning and plantation thinning units, oak release treatment was not broken down by natural stand or plantation. See Appendix A page A-26 for a list of units known to contain oak.

<sup>50</sup> The extensive mortality area also covers smaller portions of several adjoining units. The planting acres in the adjoining units is included within the “interplanting” row of the table.
Fire Restoration and Fuels Reduction Treatments

Alternative 3 reduces fuels treatment acres from Alternative 1 by eliminating underburning treatments in critical habitat. The other fuels treatments remain the same, including machine piling and pile burning in units 6, 12, 13, and 14. Alternative 3 requires additional mechanical fireline construction to isolate these units from the surrounding untreated natural stands for the purposes of pile burning. Roads would be used for control line to prevent fire from pile burning from entering critical habitat, with the exception of constructed mechanical fireline south of unit 230 and 6, at their boundary with unit 165. This results in an overall 0.8-mile increase in mechanical fireline from Alternative 1. Table 19 summarizes fuels restoration treatments under Alternative 3 and how that differs from Alternative 1.

Table 19. Alternative 3 Summary of Fuels Reduction Treatments and Change from Alternative 1

<table>
<thead>
<tr>
<th>Fuels Reduction Treatment</th>
<th>Alternative 3 No Treatment in Natural Stands in NSO CHU</th>
<th>Alt. 3 Change from the Modified Proposed Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underburning&lt;sup&gt;51&lt;/sup&gt; (see description starting on pp. 54, A-29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underburn After Thinning and Meadow Enhancement Treatments</td>
<td>2,209</td>
<td>-499</td>
</tr>
<tr>
<td>Underburn Prior to Interplanting in Plantations (No Timber Harvest Proposed)</td>
<td>28</td>
<td>no change</td>
</tr>
<tr>
<td>Underburn Only (No Timber Harvest or Planting Proposed)</td>
<td>529</td>
<td>-217</td>
</tr>
<tr>
<td>Total Underburning</td>
<td>2,766</td>
<td>-716</td>
</tr>
<tr>
<td>Machine Pile and Pile Burn (see description pp. 54, A-30 and Table Appendix A-3)</td>
<td>Maximum Estimated Maximum Estimated</td>
<td>1,365 884 -96 -60</td>
</tr>
<tr>
<td>Fuels Subtreatments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The following treatments overlap other fuels treatments and are not additive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extensive Mortality Area (see description starting on pp. 55, A-32)</td>
<td>79</td>
<td>no change</td>
</tr>
<tr>
<td>Fuels Connected Actions (miles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine Fireline Construction (see description starting on p. A-29)</td>
<td>10.1</td>
<td>+0.80</td>
</tr>
</tbody>
</table>

Road Actions

Road action activities under Alternative 3 will be the same as Alternative 1 except for the differences noted below:

<sup>51</sup> Within the constraints and guidelines detailed by the resource protection measures. There are unthinned patches that may not be burned or would have no direct ignition, and other sites that will have fire excluded within this total acreage.
• Maintenance - The miles of roads to be maintained would be reduced slightly from Alternative 1 by approximately 0.7 miles. The frequency and intensity of maintenance work would also decrease due to 304 fewer acres of thinning than Alternative 1.

• Temporary Roads - Approximately 1.7 miles of existing unauthorized routes within the dropped treatment units would not be used as temporary roads but would still be decommissioned. The new construction for temporary roads would drop from 2.9 miles to 1.5 miles. 4.7 miles of UA routes would be used as temporary roads then decommissioned.

• Landings – Alternative 3 would require 62 landings, 16 fewer than Alternative 1. Landings in critical habitat would be reduced.

Table 20. Alternative 3 Road and Landing Actions by Forest Plan Allocation and Changes from Alternative 1

<table>
<thead>
<tr>
<th>Road or Landing Action</th>
<th>Alternative 3 No Treatments in Natural Stands in NSO CHU</th>
<th>Alt. 3 Change from the Modified Proposed Action (Alternative 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Actions and Forest Plan Land Allocation</td>
<td>Miles(^{52})</td>
<td>Miles</td>
</tr>
<tr>
<td>Forest Transportation System Actions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance Only (Roads without other actions. All road actions listed elsewhere also include maintenance. See description pp. 57, A-39)</td>
<td>14.7</td>
<td>-0.2</td>
</tr>
<tr>
<td>LSR</td>
<td>12.2</td>
<td>-0.2</td>
</tr>
<tr>
<td>Matrix</td>
<td>2.0</td>
<td>no change</td>
</tr>
<tr>
<td>Open, Use and Maintain for Project, Close in LSR (See description pp. 58, A-42)</td>
<td>2.6</td>
<td>no change</td>
</tr>
<tr>
<td>Reconstruct and Close in LSR (See description pp. 57, A-42)</td>
<td>0.3</td>
<td>no change</td>
</tr>
<tr>
<td>Add and Maintain in Matrix (See description pp. 57, A-38)</td>
<td>0.1</td>
<td>no change</td>
</tr>
<tr>
<td><strong>Total FTS Road Action Miles</strong></td>
<td><strong>17.7</strong></td>
<td><strong>-0.2</strong></td>
</tr>
<tr>
<td>Other Transportation Actions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Roads and Decommissioning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decommission Unauthorized Route (LSR) (See description pp. 58, A-42)</td>
<td>1.7</td>
<td>+1</td>
</tr>
<tr>
<td>Use Unauthorized Route as a Temporary Road then Decommission (See description pp. 58, A-39)</td>
<td>4.7</td>
<td>-1</td>
</tr>
<tr>
<td>LSR</td>
<td>2.8</td>
<td>-1</td>
</tr>
<tr>
<td>Matrix</td>
<td>1.9</td>
<td>no change</td>
</tr>
<tr>
<td>New Temporary Road Constructed then Decommission</td>
<td>1.5</td>
<td>-1.4</td>
</tr>
<tr>
<td><strong>Total Decommissioning - Unauthorized Routes and Temporary Road Use, construction and decommissioning</strong></td>
<td><strong>7.9</strong></td>
<td><strong>-1.4</strong></td>
</tr>
</tbody>
</table>

\(^{52}\) Rounding may cause slight discrepancies in totals
### Hydrologic Function and Soils Actions

Alternative 3 hydrologic function actions are summarized in Table 21. Windrow resspreading is the same as in Alternative 1.

Table 21. Summary of Alternative 3 Hydrologic Restoration Actions

<table>
<thead>
<tr>
<th>Treatment</th>
<th>RR Acres</th>
<th>RR Length (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream channel and floodplain restoration: Unauthorized Route Decommission with Recontour Stream and Floodplain</td>
<td>3.8</td>
<td>1,700</td>
</tr>
<tr>
<td>(4.3 fewer than Alt. 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream Channel and Floodplain Restoration: Recontour Stream and Floodplain, Add Low Profile/Embedded Woody Debris Structure</td>
<td>7.2</td>
<td>1,569</td>
</tr>
<tr>
<td>Riparian Reserve Treatments (previously included in thinning, burning and meadow enhancement acres)</td>
<td>165</td>
<td>N/A</td>
</tr>
<tr>
<td>Riparian Reserve Revegetation</td>
<td>94.9</td>
<td>16,127</td>
</tr>
</tbody>
</table>

### Other Connected Actions

Hazard reduction as described in Alternative 1 remains the same.

### Alternative 4 - No Action

Alternative 4 is the no action alternative. The analysis of the no action alternative provides reviewers a baseline to compare the magnitude of environmental effects of the action alternatives. Alternative 4 is the continuation of the existing condition, current management and ongoing activities in the project area. Current management and ongoing activities in the project area, as permitted under past, current or potential future NEPA may include road maintenance, hazard tree felling, fuelwood collection, over-snow vehicle use associated with the Pilgrim Creek Snowmobile Park, dispersed recreation (e.g., sightseeing, hunting), forest products collection and other permitted special uses. Additional thinning in unit 401 under the Pilgrim Vegetation Management Project is pending. This analysis includes modeling of stand growth and fire behavior that is predicted if no new action is taken in the project area. Under no action, no treatments or road actions would be implemented to accomplish the purpose and need and project resource objectives.
Comparison of Actions - Alternatives Considered in Detail

The tables below provide treatment summaries by alternative. The summaries often represent overlapping treatments and are not necessarily additive in scale. Appendix A provides detailed descriptions of the actions and specific treatments by unit (Table Appendix A-2. Starting p. A-6) and road actions (Table Appendix A-5, p. A-36). Variations in treatments were developed within the broader categories responsive to site specific stand conditions as described in Appendix A. The alternative maps in Appendix D graphically display the vegetation, fuels and road actions.

- Vegetation Treatments – See Table 22 for thinning and meadow restoration and Table 23 for reforestation actions.
- Fuels Treatments – Table 24 (p. 82) lists fuels treatments by alternative.
- Road and Landing Actions – See Table 25 (p. 82)
- Hydrologic Restoration Actions – See Table 26 (p. 83)

Forest and Meadow Restoration Treatments

Table 22 displays vegetation treatments including thinning, meadow restoration and adaptive management for salvage. The table provides harvest acres, which are typically the unit acres minus UTPs, however some units have smaller harvest areas due to unforested areas within the unit boundary from insect and disease activity or from natural openings. Table 22 also notes planting within the vegetation subtreatments, and Table 23 provides more detailed information on planting and site preparation.

**Table 22. Summary of Forest and Meadow Restoration Treatments Involving Timber Harvest**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinning of Natural Stands (See descriptions starting p. A-25.)</td>
<td>1,273</td>
<td>1,230</td>
<td>1,006</td>
<td>0</td>
</tr>
<tr>
<td>Thinning Only</td>
<td>309</td>
<td>280</td>
<td>162</td>
<td>0</td>
</tr>
<tr>
<td>Thin, Group Selection, Plant Groups</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>0</td>
</tr>
<tr>
<td>Thinning with Interplant</td>
<td>341</td>
<td>335</td>
<td>312</td>
<td>0</td>
</tr>
<tr>
<td>Thin, Radial Thin</td>
<td>182</td>
<td>182</td>
<td>91</td>
<td>0</td>
</tr>
<tr>
<td>Thin, Radial Thin, Group Selection, Plant Groups</td>
<td>95</td>
<td>87</td>
<td>95</td>
<td>0</td>
</tr>
<tr>
<td>Thin, Radial Thin, Interplant</td>
<td>312</td>
<td>311</td>
<td>312</td>
<td>0</td>
</tr>
<tr>
<td>Thinning of Plantations (See descriptions starting p. A-21)</td>
<td>584</td>
<td>570</td>
<td>584</td>
<td>0</td>
</tr>
<tr>
<td>Young Plantation Thin</td>
<td>141</td>
<td>141</td>
<td>141</td>
<td>0</td>
</tr>
</tbody>
</table>

53 All acres are estimated and in the case of subtreatments actual conditions during implementation may create a range of acreage. Slight differences in treatment totals throughout the record may exist due to differing rounding methodologies and subtotals may reflect a slight difference than the sum of the components shown in the summary table due to rounding.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Young Plantation Thin with Meadow Enhance</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>0</td>
</tr>
<tr>
<td>Young Plantation Thin, Interplant</td>
<td>84</td>
<td>84</td>
<td>84</td>
<td>0</td>
</tr>
<tr>
<td>Older Plantation Thin, Group Selection, Plant Groups</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>0</td>
</tr>
<tr>
<td>Older Plantation Thin, Radial Thin</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Older Plantation Thin, Radial Thin, Group Selection, Plant Groups</td>
<td>239</td>
<td>225</td>
<td>239</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Thinning</strong></td>
<td><strong>1,857</strong></td>
<td><strong>1,800</strong></td>
<td><strong>1,590</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>Meadow Restoration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See description starting p. A-29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Harvest Acres</strong></td>
<td><strong>2,236</strong></td>
<td><strong>2,154</strong></td>
<td><strong>1,969</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td><strong>Additional Thinning Detail</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(these acres are already included in the thinning listed above)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Selection</td>
<td>75</td>
<td>71</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Radial Thinning</td>
<td>193</td>
<td>188</td>
<td>172</td>
<td>0</td>
</tr>
<tr>
<td>Interplanting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Interplanting within other primary treatments including reforestation of the extensive mortality area. &quot;Interplanting-only&quot; as the primary treatment is included with reforestation treatments in Table 8 below)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass Thinning</td>
<td>1,864</td>
<td>1,814</td>
<td>1,660</td>
<td>0</td>
</tr>
<tr>
<td>Aspen Release (and adaptive management restoration if needed)</td>
<td>24</td>
<td>21</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Oak Release**54</td>
<td>30</td>
<td>30</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Adaptive Management Salvage (if needed to remove dead and dying pine)</td>
<td>811</td>
<td>805</td>
<td>766</td>
<td>0</td>
</tr>
<tr>
<td>Borax Stump Treatment (stumps over 14&quot; diameter)</td>
<td>2,040</td>
<td>1,958</td>
<td>1,773</td>
<td>0</td>
</tr>
<tr>
<td><strong>Estimated Net Harvest Volume</strong>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Hundred Cubic Feet - CCF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Volume</td>
<td><strong>43,900</strong></td>
<td><strong>41,600</strong></td>
<td><strong>37,600</strong></td>
<td><strong>0</strong></td>
</tr>
<tr>
<td>Biomass Material (trees 9.9&quot;DBH and less, and tops)</td>
<td>6,000</td>
<td>5,700</td>
<td>5,300</td>
<td>0</td>
</tr>
</tbody>
</table>

54 Since oaks are widely scattered across a number of natural stand thinning and plantation thinning units, oak release treatment was not broken down by natural stand or plantation. See Appendix A page A-26 for a list of units known to contain oak.

55 Net estimations for Alternative 1 derived from cruise sampling (6/5/15 Cruise Report B1) rounded up to nearest 100 CCF. Other alternatives extrapolated from Alternative 1 data.
### Table 23. Summary of Reforestation Treatments

<table>
<thead>
<tr>
<th>Reforestation Treatment</th>
<th>Alternative 1 Proposed Action</th>
<th>Alternative 2 No New Temporary Road Construction</th>
<th>Alternative 3 No Treatment in Natural NSO Critical Hab.</th>
<th>Alternative 4 No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site Preparation for Planting (Mechanical Scalp)</strong></td>
<td>269</td>
<td>266</td>
<td>269</td>
<td>0</td>
</tr>
<tr>
<td>Hand Planting</td>
<td>313</td>
<td>309</td>
<td>304</td>
<td>0</td>
</tr>
<tr>
<td>Interplanting without thinning</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Interplanting in thinning units in smaller mortality areas and gaps over 1 acres (as needed)</td>
<td>168</td>
<td>168</td>
<td>159</td>
<td>0</td>
</tr>
<tr>
<td>Planting group selections in thinning units</td>
<td>75</td>
<td>71</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Reforestation of extensive mortality area</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td><strong>Post Planting Hand Release for Growth (1 entry between years 1-5)</strong></td>
<td>313</td>
<td>309</td>
<td>304</td>
<td>0</td>
</tr>
</tbody>
</table>

* Minor discrepancies in subtotals and totals may exist due to rounding of raw data.

### Fuels Treatments

Table 24 lists the fuels actions including underburning, piling and pile burning, and hazard reduction by alternative. Underburning overlaps all treatment unit boundaries in Alternatives 1 and 2. Total acres reflect unit acres rather than the smaller harvest acres shown in the summary of vegetation treatments in Table 22 above. Certain fuels treatments may be in concert with other fuels treatments and do not represent additive acres.

---

The text in the image is a page from a document titled **Final Environmental Impact Statement**. It discusses restoration treatments and reforestation activities, providing a detailed breakdown of various actions and their corresponding acres. The table highlights alternative proposals for road construction, treatment in natural NSO critical habitats, and no action, along with a summary of log material harvesting acres. Further breakdown includes site preparation, plantings, and reforestation activities, emphasizing the use of mechanical scalping, hand planting, and post-planting hand release for growth. The fuels treatments section also mentions underburning and hazard reduction, noting their overlap with other treatments and the necessity to consider various combinations of these actions for effective vegetation management. The document is part of the Shasta-McCloud Management Unit, as indicated in the footer. The page number is 81, suggesting it is part of a larger report or study. The text is written in a formal tone, consistent with environmental impact assessment standards.
### Table 24. Summary of Fuels Reduction Treatments

<table>
<thead>
<tr>
<th>Fuels Reduction Treatment</th>
<th>Alternative 1 Proposed Action</th>
<th>Alternative 2 No New Temporary Road Construction</th>
<th>Alternative 3 No Treatment in Natural NSO Critical Habitat</th>
<th>Alternative 4 No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underburning(^{56}) (see description starting on p. A-29)</td>
<td>3,482</td>
<td>3,482</td>
<td>2,961</td>
<td>0</td>
</tr>
<tr>
<td>Underburn After Thinning and Meadow Enhancement Treatments (Includes Extensive Mortality Area Treatment described on p. A-32)</td>
<td>2,708</td>
<td>2,597</td>
<td>2,404</td>
<td>0</td>
</tr>
<tr>
<td>Underburn Prior to Interplanting in Plantations (No Timber Harvest Proposed)</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>0</td>
</tr>
<tr>
<td>Underburn Only (No Timber Harvest or Planting Proposed)</td>
<td>746</td>
<td>857</td>
<td>529</td>
<td>0</td>
</tr>
<tr>
<td>Machine Pile and Pile Burn (see description starting on p. A-30 and Table Appendix A-3)</td>
<td>est. max.</td>
<td>est. max.</td>
<td>est. max.</td>
<td>est. max.</td>
</tr>
<tr>
<td></td>
<td>944</td>
<td>1,461</td>
<td>906 1,402</td>
<td>884 1,365</td>
</tr>
</tbody>
</table>

**Additional Detail**

| Extensive Mortality Area Subtreatment (see description starting on p. 55)                 | 79                           | 79                                              | 79                                                         | 0                        |
| Mechanical Fireline Construction (see description starting on pp. 55, A-29)              | 9.3                          | 9.3                                             | 10.1                                                       | 0                        |

* Minor discrepancies in subtotals and totals may exist due to rounding of raw data.

### Roads and Landings

Table 25 summarizes the road and landing actions by alternative.

### Table 25. Summary of Road and Landing Actions

<table>
<thead>
<tr>
<th>Road or Landing Action (see descriptions starting p. A-33)</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative 1 Modified Proposed Action</td>
</tr>
<tr>
<td></td>
<td>Alternative 3 No Treatment in Natural NSO Critical Habitat</td>
</tr>
<tr>
<td>Forest Transportation System (FTS) Actions</td>
<td></td>
</tr>
<tr>
<td>Maintenance Only (Roads without other actions. All road actions listed elsewhere also include maintenance. See description pp. 57, A-39)</td>
<td>14.9</td>
</tr>
</tbody>
</table>

\(^{56}\) Within the constraints and guidelines detailed by the resource protection measures. There are unthinned patches that may not be burned or would have no direct ignition, and other sites that will have fire excluded within this total acreage.
## Road or Landing Action
(see descriptions starting p. A-33)

<table>
<thead>
<tr>
<th>Road or Landing Action</th>
<th>Alternative 1 Modified Proposed Action</th>
<th>Alternative 2 No New Temporary Road Construction</th>
<th>Alternative 3 No Treatment in Natural NSO Critical Habitat</th>
<th>Alternative 4 No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open, Use and Maintain for Project, Close (See description pp. 58, A-42)</td>
<td>2.6</td>
<td>2.6</td>
<td>2.6</td>
<td>0</td>
</tr>
<tr>
<td>Reconstruct and Close (See description pp. 57, A-42)</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0</td>
</tr>
<tr>
<td>Add and Maintain (See description pp. 57, A-38)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total FTS Road Action Miles</strong></td>
<td><strong>17.9</strong></td>
<td><strong>17.9</strong></td>
<td><strong>17.7</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

### Other Transportation Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decommission Unauthorized Route (See description pp. 58, A-42)</td>
<td>0.7</td>
<td>0.7</td>
<td>1.7</td>
<td>0</td>
</tr>
<tr>
<td>Use Unauthorized Route as a Temporary Road then Decommission (See description pp. 58, A-39)</td>
<td>5.7</td>
<td>5.7</td>
<td>4.7</td>
<td>0</td>
</tr>
<tr>
<td>New Temporary Road Constructed then Decommission</td>
<td>2.9</td>
<td>1.6</td>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td><strong>Decommissioning - Routes and Roads</strong> (see description starting on p. A-42)</td>
<td><strong>9.3</strong></td>
<td><strong>8.0</strong></td>
<td><strong>7.9</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

### Landings

<table>
<thead>
<tr>
<th>Landings</th>
<th>Total Landings*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Landings</td>
<td>38</td>
</tr>
<tr>
<td>New Landings</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>78</strong></td>
</tr>
</tbody>
</table>

*Landings reflect total needed for the action alternatives. See the individual alternative tables for an estimation of existing landings that may be utilized. Under no action no landings would be needed. Existing landings is higher for No Action that the action alternatives because some are unsuitably located.

## Hydrologic Function and Soils Restoration Actions

Table 26 summarizes hydrologic restoration actions.

### Table 26. Summary of Hydrologic Restoration Actions (acres)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream channel and floodplain restoration: Unauthorized Route Decommission with Contour Stream and Floodplain</td>
<td>8.1</td>
<td>4.4 (3.7 fewer than Alt. 1)</td>
<td>3.8 (4.3 fewer than Alt. 1)</td>
</tr>
<tr>
<td>Stream Channel and Floodplain Restoration: Contour Stream and Floodplain, Add Low Profile/Embedded Woody Debris Structure</td>
<td>7.2</td>
<td>no change</td>
<td>no change</td>
</tr>
<tr>
<td>Riparian Reserve Treatments (previously included in thinning, underburning-only, underburning, and meadow enhancement acres)</td>
<td>211</td>
<td>no change</td>
<td>165 (46 fewer than Alt. 1)</td>
</tr>
<tr>
<td>Riparian Reserve Revegetation</td>
<td>94.9</td>
<td>94.9</td>
<td>94.9</td>
</tr>
<tr>
<td>Windrow Respreading</td>
<td>167</td>
<td>no change</td>
<td>no change</td>
</tr>
</tbody>
</table>
Other Connected Actions

Hazard reduction as described in Alternative 1 of 87 acres applies to all alternatives.

Resource Protection Measures Common to All Action Alternatives

Resource Protection Measures (RPMs) were developed for site specific conditions relative to the Proposed Action and are common to action alternatives. Resource Protection Measures are intended to minimize or eliminate potential environmental effects while achieving the desired condition. Development was guided by Forest Plan direction as well as other applicable law, regulation and policy; project-specific objectives; and resource concerns identified by the resource specialists. In addition to RPMs, practices and procedures that may apply to the Elk Project but are not developed as site specific RPMs including compliance with applicable law, regulation, policy and Forest Plan Standards and Guidelines (legal and policy framework), and the standard operating procedures (SOPs) and Best Management Practices (BMPs) developed to meet the legal and policy framework are included in Appendix C. The design criteria (generally limitations on the Proposed Action) and design elements (aspects of the Proposed Action) most important to meeting the Purpose and Need for Action and legal and regulatory framework are described in the Proposed Action including detailed descriptions in 0. Some listed items originate or respond to multiple requirements or needs identified for site specific protections.

Cultural Resources

Also see Appendix C on page C-1 for common standard operating procedures for cultural resources.

1. National Register-eligible or unevaluated cultural resource sites (“historic properties”) will be avoided except within the parameters listed below, which will preserve the National Register integrity that may occur within these historic properties. Prior to project implementation, historic properties will be delineated with coded flagging or other effective marking (USDA-FS & SHPO, 2013 pp. 1.1, E-2).
   a. Prescribed fire will be excluded from historic properties within the project area using the following methods:
      Non soil-disturbing methods, hand-constructed fire line, and dozer-constructed fire line may be used around the Ash Creek Mill site.
      Non soil-disturbing methods and hand-constructed fire line may be used in the vicinity of Coonrod Flat.
      Non soil-disturbing methods such as fire retardant foam, water, and other wetting agents may be utilized to protect all other historic properties (USDA-FS & SHPO, 2013 pp. 2.2, (b) A, D, E, F (pg. E-5) E-2).
   b. Fire retardant foam, water, other wetting agents may be utilized to protect at risk historic properties (USDA-FS & SHPO, 2013 pp. 2.2, (b) A, D, E, F (pg. E-5) E-2).
   c. If woody material is removed from historic properties, it will be hand-felled and cut to a size that can be hand-carried outside the site boundary (USDA-FS & SHPO, 2013 pp. 2.2 (a), E-2). Mechanical equipment may be used to reach into the site for larger trees within the treatment unit. No ground disturbance or an increase in fuel loading from project activities will occur within the site boundaries. No woody material will be chipped or piled within site boundaries.\(^{57}\)
   d. Roads within or adjacent to historic property boundaries may be maintained at their usual maintenance level within the existing road prism. Activities that are not permitted within the boundaries of historic properties include road reconstruction activities (unless there is no potential for subsurface cultural deposits) (USDA-FS & SHPO, 2013 pp. 1.2, E-2; 2.1 (d)(f), E-44).

\(^{57}\) Treatment units have also been designed where possible to exclude site boundaries.
e. Other activities not permitted include: road widening, realigning, side casting or depositing of any earthen or vegetative material, new drainage control work such as wing ditch construction, culvert installation, and equipment staging. Roads that are decommissioned or closed within site boundaries will be blocked with barriers that do not disturb subsurface deposits or lead to other effects to sites. Erosion control features such as seeding and mulching may occur within historic property boundaries where the integrity of the property is unlikely to be affected.

2. Areas of Native American importance will be protected.

a. No treatments will occur within 0.25 miles of Coonrod Flat during July and August when this area is being utilized by Native Americans (36 CFR 800). Activities such as vegetation treatment, burning, and maintenance or hauling on adjacent roads will not occur within Coonrod Flat, and will not occur within ¼ mile during this time, thereby eliminating noise, dust, smoke, and other disruptive effects. Skidding of felled trees in units 402 and 317 would be completed prior to July 1, and no operations will occur in unit 402 during the month of July.

b. Road closures proposed near areas of Native American importance will be completed using large boulders, directional felling of trees, and other such barriers to maintain a natural setting.

Hydrology and Soils

Also see Appendix C on page C-1 for common standard operating procedures for soil and water resources.

3. Some existing landing piles will not be burned in Riparian Reserves in unit 346. Existing landing piles selected for specific retention of either water quality or wildlife values will be identified and designated and will not be burned as determined by the hydrologist or wildlife biologist.

4. Unit machine pile size will not exceed 10 feet long by 10 feet wide by 6 feet tall to protect soils from destructive burning.

5. Mechanical fireline construction shall only remove litter and duff and avoid removing the upper layers of the topsoil.

Riparian Reserves (RR), Including Slash Material, Burning Activities and Landings

Also see Appendix C Best Management Practices Starting on page C-3.

6. A minimum 20-foot equipment exclusion zone (EEZ) will be flagged along intermittent and ephemeral stream channels as determined by the hydrologist and may be increased based on the hydrologist’s or soil scientist’s site-specific evaluation and is located on the sale area map (BMP 1.4). Hand piling is the only piling treatment allowed within the EEZ. This EEZ may be larger, depending on resource conditions and RR and wildlife objectives for the treatment unit. From the boundary of the delineated EEZ, equipment may reach in to accomplish treatment objectives. The EEZs may be entered, if needed, after post-harvest activities are complete, by heavy equipment, to restore meadow, channel and floodplain functions to areas disturbed from past activities and as determined by the hydrologist.

7. Minimize soil disturbance in RRs by requiring directional felling and minimizing turning of harvest equipment. In the event that trees are accidentally felled into Ash Creek or its inner gorge, they will be left in place.

8. No mechanical site preparation will take place within RRs.

9. There will be no crossing of Ash Creek with equipment during sale activities. Any required temporary stream crossing locations on other intermittent/ephemeral streams will be designed and constructed in accordance with the hydrologist’s expertise. If rocking is required to maintain
channel form and reduce compaction in stream crossing(s), the crossing will be rocked with andesite or basalt and source material would be weed-free. Any material used in crossings will be removed post-implementation and either scattered over the ground, if native, or utilized after the project in road closures.

10. Within the Elk Flat meadow restoration unit 402, harvest with heavy equipment will be completed when there is at least 3 inches of frozen ground or in areas where work can be completed over dry soils that will not result in soil displacement leading to potential significant adverse effects to meadow, floodplain and hydrologic function.

11. Within RRs, embedded downed logs, stumps and riparian plants and root systems will be retained during burning operations with minimal (up to 5%) damage (over the project area). Large decadent willow scattered within RRs will be allowed to lightly burn with up to 5% mortality (over the project area). Piles may be burned within the Ash Creek RR, but no machine piling will occur within the designated EEZ as described in RPM 6. Only hand piles may be constructed in the EEZ, and piled and burned 20 feet away from the inner gorge in the Ash Creek RR where Units 18, 106, 107, 113, 150, 154, 157, 163, 180, 346, 347, 402, 152-1, 152-2 and 346-U have been identified as needing treatment to reduce excess fuels by either machine piling or hand piling (Table Appendix A-2).

12. Excess slash material from operations or heavy mortality pockets within the Ash Creek RR beyond that to be retained as prescribed in RPM 40 starting on page 91 may be piled and burned outside of the EEZ or left in place and treated with underburning.

13. Existing landings will be utilized outside of the Ash Creek RR; and no new landings will be constructed within the Ash Creek RR and existing landing areas from past activities within RR will be recontoured and restored to properly functioning conditions. An earth scientist or hydrologist would assist the sale administrator in designating any new landing locations in other units containing intermittent or ephemeral channel RRs.

### Landings and Skid Trails

Also Appendix C for common standard operating procedures related to landings and skid trails starting on page C-2.

14. Till/sub-soil landings and main skid trails within 200 feet of landings with equipment such as a winged sub-soiler or other tilling device to a maximum depth of 18 inches so that the soil is lifted vertically and fractured laterally to alleviate any detrimental compaction (Forest Plan pp. 4.25, O-2) following completion of management activities in units 162, 164, 166, and 206. Tillage/sub-soiling would be completed outside of the tree drip line to minimize impacts to root systems.

### Invasive Plant Species

Appendix C for common standard operating procedures related to invasive species starting on page C-2.

15. When seeding decommissioned temporary roads, unauthorized routes, landings and main skid trails, use a native mix of pollinator-friendly forbs and grasses at a rate of 10 to 15 pounds per

---

58 Compaction is considered detrimental if soil porosity is not at least 90 percent of the total porosity found under undisturbed or natural conditions. Porosity is evaluated between four and eight inches below the surface for soils with tree and shrub potential, and between zero and four inches for soils with herbaceous potential (Forest Plan pp. O-1).

59 At the present time, there are no high priority weed populations within the project boundary. However, there is one known population of a high priority weed along Pilgrim Creek Road near the snowmobile park.
acre and mulch with certified weed-free straw, or other approved fine slash to reduce seed predation, retain moisture, reduce the potential for wind erosion and, if necessary, to reduce overland flow erosion during rainfall events and snow melt.

**Road Management**

Also see Appendix C for common standard operating procedures related to road management starting on page C-3.

16. Road construction and maintenance will be managed for consistency with LSR standards and guidelines (Forest Plan p. 4.39). If temporary roads are necessary to implement project activities, they will be kept to a minimum, be routed through non-late-successional or low quality late-successional habitat where possible.

17. If winter snow plowing occurs on FA19 or FA13 beyond the Pilgrim Snowmobile Park between December 1 and April 15 single lane plowing would be utilized to minimize impacts to winter recreation opportunities. The timing of this requirement may be adjusted through discussion with the Recreation Officer on impacts (e.g., periods of low snowfall).

**Plant Species of Special Concern**

See Appendix C for common standard operating procedures related to sensitive and non-vascular plants on page C-3. Implement the following pertaining to hardwoods.

18. Minimize impacts to California black oak and other hardwoods during thinning and burning operations as much as practicable. Units known to have oaks include 6, 14, 153, 155, 154, 165, 168-1, 168-2, 170, 173, 178, 317 and 318.

19. When burning around aspen (units known to have aspen include 157, 175, 318 and 402):
   
   a. Exclude prescribed fire in aspen stands that had conifer removal treatment that are actively suckering until they are determined to be well established. (see aspen Monitoring starting on page 93 and adaptive management strategy in the proposed action for aspen where the characteristics of an established aspen stand are described starting on page 53.)
   
   b. When burning surrounding areas exclude fire within 75 feet from the outer edge of the clump/stand (last sprout) to protect young aspen roots.
   
   c. Point protection will be used to protect small (<0.5 acres) clones. Point protection may include but is not limited to sprinklers, mechanical fire line, hand line, existing skid trails and roads, or any other tool determined to be applicable. These tools can also be used on larger stands.

20. When burning within aspen:
   
   a. If needed to control fire intensity, reduce combustible fuels in and around aspen to 5 to 15 tons per acre by using mechanical or manual methods.
   
   b. Remove young conifer and shrubs if needed, by manual or mechanical means prior to burning;
   
   c. Minimize residency time; implement fast moving prescribed fire.
   
   d. Burn only when soil is moist and surface fuels are dry.
   
   e. Limit mortality of the largest aspen to no more than 5% .
   
   f. Protect the base of live aspen overstory trees from scorch as much as practicable.

**Survey and Manage Vascular and Non-Vascular Plants**

21. Bryophytes - All known *Ptilidium californicum* (Pacific fuzzwort) sites will be protected by designated unthinned patches where no thinning or mechanical equipment operation will occur

---

60 Unless an established research project pertaining to burning in aspen requires an alteration of methodology.
as described in the proposed action. Trees would be felled away from occupied sites to avoid physical damage.

22. Broadcast burning should not occur within occupied *Ptilidium californicum* (Pacific Fuzzwort). The occupied site(s) would be buffered to a sufficient distance (approximately 100 feet) such that radiant heat and smoke will not cause mortality to individuals (Harpel, et al., 2006 pp. 14-15).

**Silviculture and Fuels**

Also see Appendix C for common standard operating procedures related to silviculture and fuels starting on page C-3.

23. Within four hours of cutting, conifer stumps greater than 14 inches stump diameter will be treated with a registered borate compound (such as Cellu-Treat® or Sporax®) to prevent spread of *Heterobasidion* root disease. Application of the compound will follow all state and federal rules and will not be applied during precipitation events.

24. Underburning treatments in natural stands would be planned and implemented to meet the prescribed targets of duff and litter consumption while minimizing mortality of shrubs and trees (displayed in Table 27 and Table 28) and retaining coarse woody material at levels that meet RPMs 11 40e, 41 and 42, (also see number 17 on page C-3). The target consumptions and maximum mortality levels are determined as an average across the project area.

<table>
<thead>
<tr>
<th>Table 27. Levels of Acceptable Mortality When Underburning Natural Stand Units - Underburn Only</th>
<th>Size Class (DBH)</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribed Fire Objectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duff Consumption</td>
<td>NA</td>
<td>30 to 50%</td>
</tr>
<tr>
<td>Litter Consumption</td>
<td>0-3&quot;</td>
<td>40 to 100%</td>
</tr>
<tr>
<td></td>
<td>1-3&quot;</td>
<td>40 to 85%</td>
</tr>
<tr>
<td></td>
<td>3-10&quot;</td>
<td>30 to 70%</td>
</tr>
<tr>
<td>Average CWD Removal</td>
<td>Burn to Retain Coarse Woody Debris Objectives in Accordance with RPMs 11 40e, 41 and 42, (also see number 17 on page C-3).</td>
<td></td>
</tr>
<tr>
<td>Conifer Mortality</td>
<td>&lt;4&quot;</td>
<td>50 to 100%</td>
</tr>
<tr>
<td></td>
<td>4 to 8&quot;</td>
<td>10 to 30%</td>
</tr>
<tr>
<td></td>
<td>9 to 14&quot;</td>
<td>&lt;10%</td>
</tr>
<tr>
<td></td>
<td>&gt;14&quot;</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>Brush and Shrub Mortality</td>
<td>N/A</td>
<td>30 to 50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 28. Levels of Acceptable Mortality When Underburning Natural Stand Thinning Units</th>
<th>Size Class (DBH)</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribed Fire Objectives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duff Consumption</td>
<td>NA</td>
<td>30 to 50%</td>
</tr>
<tr>
<td>Litter Consumption</td>
<td>0-3&quot;</td>
<td>40 to 100%</td>
</tr>
<tr>
<td></td>
<td>1-3&quot;</td>
<td>40 to 85%</td>
</tr>
<tr>
<td></td>
<td>3-10&quot;</td>
<td>30 to 70%</td>
</tr>
<tr>
<td>Average CWD Removal</td>
<td>Burn to Retain Coarse Woody Debris Objectives in Accordance with RPM 11 40e, 41 and 42, (also see number 17 on page C-3).</td>
<td></td>
</tr>
<tr>
<td>Conifer Mortality</td>
<td>&lt;4&quot;</td>
<td>50 to 100%</td>
</tr>
<tr>
<td></td>
<td>4 to 8&quot;</td>
<td>10 to 30%</td>
</tr>
<tr>
<td></td>
<td>9 to 14&quot;</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>Brush and Shrub Mortality</td>
<td>&gt;14&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------</td>
<td>-----</td>
</tr>
</tbody>
</table>
| *If material that is 4 to 6.9 inches DBH is not commercially thinned due to market conditions at the time of implementation and is instead treated with prescribed fire during the underburning operations with or without other mechanical or hand treatments, the range of acceptable mortality is 30-50% to meet objectives since the burning treatment would be utilized to complete the thinning of that size class.*

25. Measures will be taken to reduce injury or mortality to large predominant trees during prescribed fire operations. Potential methods may include but are not limited to:
   a. multiple low severity burns to reduce fuels accumulations over time (also see 11 40e, 41 and 42, and SOP number 17 on page C-3).
   b. burning in conditions of a moist duff layer (subject to limited operating periods in RPMs 31, 34, 39 and 43), ensuring consumption of the upper layer of litter, while protecting the roots in the lower duff areas,
   c. ignition techniques, such as short head runs, designed to limit residence time at the base of large trees,
   d. pulling duff away from bole damage such as lighting scars and pitch seams that may cause fire to burn longer or move up into the crown,
   e. tree well burning to pre-burn the area immediately surrounding the tree during moist conditions prior to stand under burning,
   f. reducing large down fuels near the base of the tree to limit the heat and residence time for the tree bole and fine roots, and
   g. mixing duff and litter to encourage fine roots to grow down into the soil prior to underburning or to bring moisture to the surface to discourage fire from reaching the boles.

26. Prescribed fire in plantations that are not thinned as part of project implementation will be managed at each entry to minimize mortality to trees to no more than 15% and consumption of shrub, forb, grass cover and CWD to no more than 10%. No snags will be directly ignited. Utilize firing techniques or control lines as needed to retain this existing migratory bird habitat and deer forage and cover, while returning low intensity fire to the landscape. Avoid prolonged duration of fire within plantations to prevent damage to roots and root collars of trees less than 10 inches diameter at soil level. Evaluate these protection measures prior to repeated burn entries for current conditions.

27. Prescribed fire in plantations that are being thinned as part of project implementation would be managed at each entry to minimize mortality to trees to no more than 15% and consumption of shrub, forb and grass cover to no more than 25 to 50%. Maintain CWD in accordance with RPMs 11, 40e, 41 and 42, (also see number 17 on page C-3). No snags would be directly ignited. The end result should be a mosaic of burned and unburned shrub and understory vegetation pockets throughout a treatment unit.

28. Apply prescribed fire only after remaining trees show signs of increased health and vigor. Fuels and silviculture specialists will assess signs of readiness by evaluating thinning response (release) indicated by increased increment of spring wood in the radial core or increased foliage or shoot growth. Adequate response may occur as early as one full growing season following a thinning treatment in a healthy stand under average precipitation years.

29. During underburning, maintain at least 30% of grass, forbs and shrubs. Evaluate these protection measures prior to repeated burn entries for current conditions.

30. There will be no direct ignition in unthinned patches in units 123, 152-1, 154, 165, 169, 171, 172, 174, and 235 to reduce fire effects to sensitive and ethnobotanical species and wildlife habitat.
Wildlife

31. A limited operating period (LOP) that restricts ground disturbing activities, loud and continuous noise and smoke-generating activities within a ¼-mile of known northern goshawk territories is required between February 1 and August 15. The LOP will also be required if a new territory is established within, or within ¼-mile of, any treatment unit during project implementation. In any year of implementation, activities may occur during the LOP if surveys conducted after June 1 determine there are no breeding goshawks within the nest core. Currently, this LOP is required for units 114, 155, 156, 182, 221, 224, 346 and 346-U. When burning in spring outside of the LOP area, smoke should be managed so that light to moderate, dispersed smoke may be present within an area, but dissipates or lifts within 24 hours. Ignition should be discontinued if heavy, concentrated smoke begins to inundate the area.

32. No mechanical harvest operations, skidding or other ground disturbance (other than prescribed fire and road actions) will occur within the 200-acre core of northern goshawk territory(ies).\textsuperscript{61}

33. Northern spotted owl (NSO) surveys, stand searches or spot checks will be conducted prior to and throughout implementation, consistent with current survey protocol and as discussed and agreed to with the FWS-FS Level 1 (line officers from both agencies) team on an annual basis.

34. A limited operating period (LOP) for habitat altering, smoke-generating and noise-generating activities above ambient levels will be required within 0.25-mile of an active NSO nest, and within a 0.25 mile of Nesting/Roosting habitat (units 150 and 168-2, and portions of units 152-1 and 154). The LOP will remain in effect until surveys, stand searches and/or spot checks are completed during a year of operations. The NSO LOP begins February 1st and will extend through April 15th, and/or the completion of surveys, stand searches and/or spot checks if efforts are not completed by April 15th:
   a. If no NSOs are detected, operations may commence upon notification from the biologist that the surveys are negative.
   b. If a single NSO is detected, operations may commence after July 9th.
   c. If nesting NSOs are detected, the LOP will remain in effect within 0.25 mile of the nest through:
      1. July 31st for activities that result in noise above ambient levels (e.g., road actions)
      2. September 15th for habitat altering/smoke-generating activities (e.g., thinning, machine piling/burning piles, prescribed fire)

Spot checks are intended to supplement the general project-level surveys and avoid the potential direct take of spotted owls from project implementation. Based on the survey history for NSOs and barred owls in the project area, if implementation is underway before February 1st, the spot checks will occur concurrent with operations. If an NSO is detected during any survey efforts, all ongoing operations that have a likelihood of direct harm to an NSO or creating above-ambient noise shall be postponed. When burning in spring outside of the LOP area, smoke should be managed so that light to moderate, dispersed smoke may be present within an area, but dissipates or lifts within 24 hours. Ignition should be discontinued if heavy, concentrated smoke begins to inundate the area.

35. For all listed LOPs, the wildlife biologist will work with the fuels shop on an annual basis when developing, or modifying the project’s burn plan.

36. If a new NSO (non-nesting) or barred owl detection occurs prior to or during project implementation, technical advice or re-initiation with the FWS may be required.

\textsuperscript{61} No cores currently exist within the project boundary that are subject to mechanical harvest, skidding or other ground disturbance. This procedure will be followed if a core is established at any time prior to or during implementation.
37. Where piling and burning is conducted within NSO and NGO (northern goshawk) foraging habitat, leave two unburned slash piles per acre to provide small mammal habitat. Pile size can vary as safety allows, but in general should not exceed 10 feet long by 10 feet wide by 6 feet tall. The project wildlife biologist and fuels specialist will conduct a review of units after piling is completed to determine which piles to retain, and if additional piles are needed. If needed, hand piles of smaller material will be constructed (~1 to 2 additional piles per acre). Applicable units are: 151, 152-1, 154, 157, 158, 159, 160, 163, 164, 165, 166, 167, 174, 181, 201 and 235. While units 175, 204 and 206 do provide for a substantial prey base, notably for goshawk and fisher, it is not operationally feasible to retain unburned piles in these units that are within the Extensive Mortality Area.

38. No more than 50 percent of the suitable habitat within an NSO core or home range, or a currently known NGO territory will be burned during any given burn season, or if nesting or resident NSO/NGO are present, during any 12-month period. In the event that a new NSO activity center or NGO territory is established, this same design feature will apply to the Burn Plan (see RPM 35). Applicable units are: 156, 182, 221, 224, 346 and 346-U; 150, 151, 152-1, 152-2, 153, 154, 161, 163, 165, 166, 167, 168-1, 168-2, 170, 171, 172, 173, 174 and 178.

39. To minimize direct disturbance to female fishers during their most vulnerable period of denning and kit rearing, an LOP for vegetation and fuels management activities will extend from March 1 through July 31 around known denning areas and within areas that support denning habitat. Applicable areas include: units 150, 152-2, 153, 154, 156, 168-2, 182, 221 and delineated areas along Ash Creek in units 152-1, 157 and 163.

40. Snag and down log retention outside of the meadow restoration units is based on the recommendations for mixed conifer and white fir vegetation communities in Tables 3-1 to 3-3 of the LSRA. These recommendations represent an average for a landscape or treatment area (i.e., 100 acres). Per the LSRA, numbers of snags and down logs can vary on any particular acre (LSRA p. 164).

a. Within thinning and fuels treatment units in LSR, retain, on average, 7 snags per acre ranging from 15 to 20+ inches diameter with a preference for snags larger than 20 inches or the largest size class available (LSRA p. 164). Plantation units may or may not contain this level of snags, and thinning prescriptions were developed with snag objectives as part of the desired condition. Live trees with decadent late-successional characteristics count towards snag retention recruitment where snags are not available. While snag removal is not proposed as a treatment in the majority of the project area, snags may be felled to reduce hazards to the public or during operations, or to complete specific elements of the proposed action (e.g., group selections within plantations, hazard reduction zones within 300 feet of specified private property boundaries and 150 feet of designated roads, site preparation for reforestation efforts).

b. Retain Douglas-fir, sugar pine and incense cedar snags larger than 20 inches diameter, safety permitting.

c. Where safely feasible retain groups of snags in existing mortality pockets. Retained snag pockets should be at least 150 feet from System roads and 300 feet from private property boundaries.

d. Within thinning and fuels treatment units in LSR and matrix outside of the meadow enhancement unit 402, maintain and protect existing coarse woody debris from disturbance to the greatest extent possible (Forest Plan pp. 4.38, 4.61).

e. In accordance with the LSRA, the desired condition is an average of 6 to 10 large down logs per acre. Retained logs are to be in a variety of decay classes with a preference for 20-inch diameter logs, or the largest size class available. Within pine dominated stands retain at least 6 logs per acre, within fir dominated at least 8 logs per acre and within mixed conifer at least 10 logs per acre. Within the hazard reduction zones, large down log retention would average 4 to 6 per acre. On average, remaining tonnage will range from 5 tons per acre in size classes less than 3 inches to 20 to 35 tons per acre for larger diameter logs, depending on location, and is in accordance
with the LSRA (LSRA p. 3.3), the Forest Plan, the Forest Plan habitat capability models and best available science for maintaining and promoting habitat suitability for the NSO, NGO and fisher.

f. Where safely feasible, retain scattered or concentrations of natural fall and downed wood piles and 10-20% of the existing shrubs and minor species important for NSO prey base (whitethorn, bush chinquapin, Scouler’s willow) when conducting site preparation and planting to meet the condition described above in e. Preference is to retain piles within the interior of the treatment unit, and not in close proximity (within 50 feet) to main use roads and private property.

41. Within the forested portions of the meadow enhancement unit 402 maintain 15 inch or larger diameter snags. Maintain an average of 5 tons of unburned coarse woody debris per acre with a preference for at least 5 logs > 10 feet in length at the largest available diameter (Forest Plan pp. 4.38, 4.61). Maintain scattered conifers or small groups of conifers at a rate of 5 to 20 trees per acre (LSRA p. 170).

42. To minimize the loss of nesting, roosting, foraging, resting, denning and prey base habitat components (including mycorrhizal fungi), underburning would occur during conditions that do not result in more than 10% full consumption of down logs in the 20 inch diameter and larger size class. Conditions that limit consumption of 24 inch diameter and larger logs to 5% or less are preferable. This applies to all units, though may not be operationally or safely feasible in units 163, 175, 204 and 206. This RPM is also intended to minimize the potential for loss of understory layering, large snags and trees, and large down wood in nesting/roosting, resting/denning, and higher quality foraging habitats for NSO, NGO and fisher for units 150, 152-1, 152-2, 154, 155, 156, 162, 165, 167, 168-2, 173, 182 and 221. Refer to RPM 11 for CWD burning objectives within Riparian Reserves that are more restrictive. Also see RPMs 24-30 for additional protections during prescribed burning.

43. To limit the potential for direct adverse effects to ground-nesting and riparian-obligate migratory bird species within Elk Flat meadow and along the Ash Creek RR when underburning:
   a. Burning from August 1 to February 1 is permitted, provided the NSO and NGO LOPs described in RPMs 31 and 34 are not in place.
   b. Avoid burning operations during the primary nesting season of April 15 to July 31 if the LOPs for NGO or NSO are not in place.
   c. When burning in spring, smoke should be managed so that light to moderate, dispersed smoke may be present within an area or drainage, but dissipates or lifts within 24 hours.
   d. Ignition should be discontinued if heavy, concentrated smoke begins to inundate the area.
   e. Units this RPM applies to include: 150, 152-1, 152-2, 154, 157, 163, 171, 180, 218, 346, 347, 401 and 402.

44. RPMs specific to the gray wolf are as follows:
   a. If a den site is detected within or near the project area during the project’s implementation timeframes, a Limited Operating Period (LOP) that restricts noise- and smoke-generating activities within one mile of the den will be implemented from April 1 through June 30.
   b. While the provision for the den site LOP is expected to provide protections from any prolonged or substantial project-related disturbance during the critical pup-rearing period at early rendezvous site(s), a similar LOP for activities within one mile of active rendezvous sites from April 1 through August 31 will be implemented. Further discussions and coordination with the FWS may result in modified distances, or more flexible dates, for this specific resource protection measure.
   c. These LOPs will be implemented unless there are topographic features or terrain that clearly separates the noise- or smoke-generating activities from the den or rendezvous site(s).
   d. While there are no known den or rendezvous sites associated with the Shasta Pack within one mile of the project area at this time, the LOPs specific to the gray wolf will be included in the
timber sale contract and would be put in place if denning wolves are detected. These measures will also be included in the burn plan and any other implementation contracts or plans.

**Visual Resources**

45. The following resource protection measures are prescribed within a 150-foot visual corridor adjacent to the Pilgrim Creek Road (Forest Road 42N13). This visual corridor would apply to units 16-115, 106, 107, 123, 125, 157, 159, 162, 176, 179, 180, 176, and 347.

a. Use existing landings and locate new landings out of view as seen from the roads where feasible.

b. Stump height will be 6 inches or less (if a landscape feature obstructs the view between the road and the cut trees, stump height may be higher).

c. Cut or leave trees will be marked on the sides facing away from the roads. Prior to treatment, further measures such as flagging of individual leave trees may be implemented to assure operators can clearly identify leave trees.

46. The goal within the visual corridor is to have a clean look by removing the majority of the slash and woody debris with the least amount of ground disturbance. This may be accomplished by: lopping and scattering if there are not large amounts of residual slash, as generally occurs with whole tree-yarding; hand piling and burning excess slash and scattering the burn pile residue that is not fully consumed or machine piling the slash outside of the visual corridor.

**Monitoring Common to All Action Alternatives**

The following monitoring is proposed as applicable for pre-, during-, and post-treatment.

**Aspen**

Long-term monitoring plots\(^{62}\) will be set up prior to implementation to collect baseline data. Monitoring or research may be accomplished by enlisting the help of research facilities who are interested in finding ways to improve the outcomes for aspen restoration. This will be helpful in providing the forest with more information which will lead to better results in restoration.

46. The sprouting stimulus results of conifer removal will be assessed. Conifer removal units will be monitored after years one and three post-harvest to determine if conifer removal treatment sufficiently improved or stimulated suckering. Thinning and meadow enhancement units with known aspen include 157, 175 and 402.

a. If suckering is not occurring after three years, other stimulus methods including underburning or mechanical soil disturbance as described in the adaptive management for aspen restoration of the proposed action will be introduced as appropriate. Assess the health of aspen prior to implementation to determine which treatments are most appropriate for the site specific situation.

b. If conifer removal treatment successfully stimulates suckering, monitoring will continue in year five and then as needed until the aspen has met the initial establishment objectives.

c. Once the initial objectives are met, assess the clump or stand to determine if further actions as described in the Proposed Action to meet the Purpose and Need are necessary.

47. Aspen in fuels-only (no timber harvest) units will be monitored after each burn to determine if underburning is achieving the desired results. Under aspen restoration adaptive management, if desired results are not being met, modifications may be required for future burns, or the use of mechanical soil disturbance will be evaluated. Unit 318 is a known underburn unit with aspen.

---

\(^{62}\) Accepted monitoring methods will be used to set up these plots. They may consist of photo points as well as some other plot method (as yet to be determined) for gathering data.
48. If post-treatment monitoring shows detrimental browsing, determine if browsing is from livestock, wildlife or both and fence appropriately as described in the Proposed Action. Continue to monitor and remove fencing when appropriate.

Botany

49. Prior to treatment, monitoring plots will be established in units where fungi and plants of interest are known to occur and examined post-treatment to assess project effects.

Cultural Resources

50. An archaeologist will be present when protection measures are initiated around prehistoric sites (if initiated prior to burning) to ensure adequate distance from and protection of the sites. An archaeologist and fuels project leader will visit the site prior to burning to review the site boundaries and discuss protection measures, or an archaeologist will be present to monitor when nearby fuels are ignited.

51. On-site actions determined necessary for fuels reduction around historic property site boundaries will be monitored to ensure no damage occurs to historic properties.

52. An archaeologist will monitor the mechanical fire line constructed to determine whether new cultural materials have been uncovered (after the mechanical fire line is constructed). Other monitoring of historic properties will be conducted as needed.

Fuels

53. Units will be monitored post-harvest by the fuels specialist, silviculturist and wildlife biologist as necessary, to evaluate and determine the most appropriate fuels management practice in order to avoid unnecessary disturbance to understory vegetation. Specifically, the need for machine piling and burning prior to underburning will be evaluated in those units designated for possible machine piling. Fuels post-harvest and post-piling monitoring would compare effectiveness, soils impacts, and costs, with other nearby projects. Public participation in monitoring would be encouraged.

54. Validate project treatment and habitat objectives, incorporate project monitoring results and check for changed circumstances prior to reentry for follow-up fuels work after the initial treatments.

Invasive Species

55. Surveys and treatments for noxious weeds will continue throughout all phases of project implementation and beyond by at least 5 years to respond to delayed germination.

Road Management

56. Monitor and any identify draft site damage. Repairs as needed will be conducting during and post implementation.

Reforestation

57. The Management Unit or project silviculturist would monitor replanted areas to verify that stocking objectives are achieved within five years of planting. For areas where natural regeneration is proposed, exams would also occur to assure that stands are restocked.
Silviculture and Wildlife

58. The project silviculturist and wildlife biologist will coordinate with the marking crew and inspect the marking to ensure that the unit-specific prescriptions, marking guides and Project Design Features are applied as described in order to maintain, improve or promote habitat structure and function.

59. Monitoring will be completed to assess effects of underburning-only treatments within suitable NSO habitat, as described for Recovery Action 11 in the Revised Recovery Plan. The effects will be evaluated periodically to see if the treatment is meeting the levels of acceptable mortality determined by the IDT and FWS, or whether there is new information to be assessed prior to continued implementation.

60. Stands will be surveyed/monitored for northern goshawk and NSO prior to and for the full extent of project implementation utilizing a variety of survey methods. Similar monitoring may also be performed for NGOs and NSOs after implementation to evaluate effects of the project on any territories or home ranges that overlap the project area.

61. Carnivore monitoring, utilizing a variety of methods, will occur prior to, and to the extent practicable, during and after project implementation. This monitoring work informs the SMMU regarding fisher presence and use of the stands prior to, during and after treatment and contributes information to Forest Plan Implementation Monitoring.

62. Point counts to assess migratory and resident bird species presence will be completed prior to, and to the extent practicable, during and after project implementation.

63. Oak release treatments in NSO and fisher habitat will be monitored to assess if objectives for oaks and foraging, resting and denning habitat are met. The effects will be evaluated periodically to see if the treatment is meeting the objectives set determined by the IDT and FWS, or whether there is new information to be assessed prior to continued implementation.

64. Camera stations will continue to be utilized to monitor for potential wolf use, including near or at potential den or rendezvous habitats within the project area, within one mile of the project’s activities and other portions of the wolf action area.

65. Wolves around den and rendezvous sites are fairly obvious, given the tracks, prey carcasses and bones, scat, visual observation of a wolf or wolves. While these signs have not been observed in or near the project area to date during activities or pre-decision planning and field work, surveys for other wildlife and implementation monitoring are ongoing and will continue throughout and after project implementation. Information from these surveys will be used to determine if LOPs are needed, if the determinations made in the BA are still applicable or whether there is new information to be considered prior to continued implementation.

66. Interagency coordination and close collaboration with FWS and CDFW is an essential conservation measure. The Forest Service will continue to coordinate and communicate with FWS and CDFW on their monitoring efforts. While there are no immediate plans to collar individuals in the Shasta Pack, as coordination with Oregon and other agencies is needed (Kovacs, 2015) if individuals are collared it may be feasible to better track their location and implement necessary conservation measures. If the Forest Service observes wolves, dens or rendezvous sites, it will be reported to the CDFW and the FWS\textsuperscript{63} so that follow-up investigation(s) can occur.

\textsuperscript{63} The CDFW holds the responsibility for contacting private landowners (CDFW \textit{et al.} 2012)
Revegetation

67. Decommissioned unauthorized routes and temporary roads would be monitored for adequate revegetation response for compliance with the National Forest Management Act.

Water Quality, BMPs and Soil Productivity

Timber sales that have the potential to affect water quality would be enrolled in the Timber Harvest Waiver Program administered by the Central Valley Regional Water Quality Control Board (CVRWQCB) under Resolution No. R5-2014-0144 (CVRWQCB, 2014). In order to comply with the timber harvest waiver the Forest Service would conduct implementation and effectiveness monitoring as described in monitoring guidelines provided by the Central Valley Board. The monitoring program would accomplish the following objectives.

a. Determine if Best Management Practices, mitigations, resource protection measures and management measures have been properly put into place before the start of the winter period (November 15th through April 1st).

b. Determine if significant pollution occurs as a result of timber harvest activities during the winter period.

c. Determine if the management measures were effective in preventing significant pollution during the winter period.

Monitoring of implementation activities would be accomplished by resource personnel including the hydrologist and sale administrators. If problems are identified, the Forest Service would consult with the CVRWQCB and take corrective actions (e.g., suspension of work, temporary closure, spot-rocking).
Comparison of Effects – Alternatives Considered in Detail

This section provides a brief summary of effects for each alternative considered in detail.

Table 29 presents the comparison of effects by section I-Achievement of the Purpose and Need for Action, II-Effects Relative to Key Issues (starting p. 104), III, Additional Resource Effects (starting p. 109), and IV Additional Required Disclosures, Compliance and Consistency (starting p. 115). Each item in the table references the locations elsewhere in the EIS where the topics are discussed in more detail.

Table 29. Comparison of Effects of Alternatives Considered in Detail

### Table 29 Part I. Comparison of Achievement of Purpose and Need for Action

**P&N #1. Risk Reduction in Early, Mid and Late-Successional Habitat and Increased Stand Resilience to Disturbance (LSRA Objectives I and III) (see pp. 10, 154, 157, 161, 129, 132, 140, 145, 148)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stands totaling 2,169 acres treated to address elevated insect and disease outbreaks, or reduce the risk of additional outbreaks</td>
<td>Stands totaling 2,103 acres treated, This is 66 fewer acres of risk reduction treatment, but all stands with elevated insect and disease are still treated</td>
<td>Stands totaling 1,866 acres treated, This is a total of 303 less acres; of which 169 acres are stands with elevated insect and disease outbreak, and 135 acres are stands at risk of outbreak. See No Action discussion of contiguous untreated stands</td>
<td>No Stands Treated. Contiguous dense stands are left intact, including those with elevated insects and disease. These areas will continue to be active infection centers and keep adjacent stands at risk by providing conditions that support epidemic outbreaks</td>
</tr>
<tr>
<td>1a. Insect and Disease Activity</td>
<td>Stands totaling 2,002 acres treated</td>
<td>Stands totaling 1,936 acres treated</td>
<td>Stands totaling 1,699 acres treated</td>
<td>No stands treated</td>
</tr>
</tbody>
</table>

Shasta-McCloud Management Unit
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1b. Stand Composition, Structure and Density - Acres of reduced stand densities supporting stand growth and resilience</td>
<td>Density (SDI) reduced below pine mortality threshold post-thin</td>
<td>Same average reductions in SDI but on 66 fewer acres</td>
<td>Same average reductions in SDI but on 303 fewer acres</td>
<td>Density (SDI) well above pine mortality threshold at year 1 and year 20 - However projections do not account for insect and disease outbreak. Field observations and research indicate the high densities will not persist for 20 years</td>
</tr>
<tr>
<td>1c. Fire and Fuels – Fire Regime, Fuel Loading, and Fire Behavior:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Loading – acres of reduced fuels</td>
<td>Thinned</td>
<td>2,237</td>
<td>2,154</td>
<td>1,969</td>
</tr>
<tr>
<td>Underburned</td>
<td>3,482</td>
<td>Same as Alternative 1</td>
<td>2,766</td>
<td>0</td>
</tr>
<tr>
<td>Piled</td>
<td>1,461</td>
<td>1,402</td>
<td>1,365</td>
<td>0</td>
</tr>
<tr>
<td>Fuel Models - FMs in Project Area (1 and 9 desired)</td>
<td>2, 9, 10</td>
<td>2, 9, 10 trending to 13</td>
<td>2, 9, 10 trending to 13</td>
<td>2, 9, 10 trending to 13</td>
</tr>
<tr>
<td>Potential Fire Behavior – flame length (feet) on 90th percentile weather day</td>
<td>&lt;4’</td>
<td>&lt;4’-6’</td>
<td>&lt;4’-6’</td>
<td>4’-6’</td>
</tr>
<tr>
<td>Fire Type - anticipated under extreme fire conditions</td>
<td>surface fire</td>
<td>surface and passive crown fire</td>
<td>surface and passive crown fire</td>
<td>passive crown fire</td>
</tr>
<tr>
<td>Conclusions</td>
<td>Highest response to P&amp;N #1 with risk reduced in natural stands across the project area. Greatest extent of fire regime restoration, with the highest potential for manageable conditions in the event of wildfire. Meets law and policy.</td>
<td>Project area moves towards desired conditions. Objectives are met on fewer acres than Alternative 1.</td>
<td>Project area moves towards desired conditions. Objectives are met on fewer acres than Alternatives 1 and 2.</td>
<td>No achievement of P&amp;N #1. Current trends continue with the habitat in the project area at risk of uncharacteristic levels of disturbance. No restoration of fire regime. No action does not meet safety or fire behavior objectives and does not meet Forest Plan or Policy direction.</td>
</tr>
</tbody>
</table>
### P&N #2. Accelerate Development of Late-Successional and Old-Growth Forest Characteristics (LSRA Objective II) and Promote Late-Successional Habitat Connectivity (LSRA Objective IV) (see pp. 135, 137, 142, 146, 148, H-28, 234)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2a. Acres early and mid-successional treated to accelerate development of late successional characteristics</td>
<td>692 Acres of Plantations 1,385 acres of natural stands (of which nearly half are in a mid-successional condition)</td>
<td>676 Acres of Plantations; this is 16 fewer acres 1,335 acres of natural stands; this is 50 fewer acres</td>
<td>692 Acres of Plantations – no change 1,083 acres of natural stands; this is 304 fewer acres</td>
<td>No stands treated</td>
</tr>
<tr>
<td>2b. Number of trees &gt; 24&quot; DBH immediately post-treatment and projected in 20 years based on comparative modeling of the alternatives.</td>
<td>Post thin ranges 16-19 TPA &gt;24&quot; DBH (varies by density class) Year 20 ranges 17-22 TPA &gt; 24&quot; DBH (varies by density class)</td>
<td>Same as Alt. 1</td>
<td>Same as Alt. 1</td>
<td>Year one ranges 16 – 24 TPA &gt; 24&quot; DBH (varies by density class) Year 20 ranges 16-31 TPA &gt; 24&quot; DBH however mortality observations and research on pine density threshold do not support these upper projected numbers at year 20</td>
</tr>
<tr>
<td>2c. Number of snags greater than 20 inches dbh projected in 20 years from comparative modeling. (see modeling limitations in Chapter 3 Silviculture Section)</td>
<td>Post- thin ranges 2.0 to 3.5 snags/acre depending on stand density class Year 20 ranges 0.3 to 3.6 snags/acre depending on density class</td>
<td>Same as Alt. 1</td>
<td>Same as Alt. 1</td>
<td>Year 1 ranges 2.5 – 4.4 snags/acre depending on stand density class Year 20 ranges 0.4 – 4.6 snags/acre depending on density class</td>
</tr>
<tr>
<td>2d. Retention of late successional forest at watershed scale</td>
<td>Percent of capable land occupied by forest types that meet the criteria of late-successional forest will remain at approximately 53 percent in the Ash Creek watershed.</td>
<td>Same as Alt. 1</td>
<td>Same as Alt. 1</td>
<td>No Change</td>
</tr>
<tr>
<td>2e. Soil Productivity – restored top soil displacement in windrowed plantations to accelerate growth</td>
<td>Windrows respread in 2 plantations</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>No windrow respreading</td>
</tr>
</tbody>
</table>
### Elk LSR Enhancement Project

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusions</td>
<td>Highest response to P&amp;N#2 (equal to alternative 3)</td>
<td>14 fewer acres of meeting P&amp;N #2</td>
<td>Highest response to P&amp;N#2 (equal to alternative 1)</td>
<td>No achievement of P&amp;N #2. Current trends continue risking the achievement of successional development within plantations.</td>
</tr>
</tbody>
</table>

**P&N #3. Restore Meadow Habitat in Elk Flat (see pp. 30, 157, 198, 200, and also see P&N #5 below)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3a. Restoration of early seral vegetative conditions in Elk Flat – acres of meadow enhancement treatment in Unit 402</td>
<td>379 acres meadow enhancement treatment (518 acres of the meadow including the UTPs)</td>
<td>354 acres meadow enhancement treatment (494 acres of the meadow including the UTPs)</td>
<td>Same as Alternative 1</td>
<td>0 acres of meadow enhancement treatment</td>
</tr>
<tr>
<td>3b. Restoration of natural fire regime in Elk Flat- acres of underburning in Elk Flat unit 402</td>
<td>518 acres underburned</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>0 acres underburned</td>
</tr>
<tr>
<td>Conclusions</td>
<td>Meadow restoration provided, meeting P&amp;N #3</td>
<td>Meadow restoration provided, meeting P&amp;N #3. 25 fewer acres of conifer removal than Alternatives 1,2 decrease effectiveness on those acres.</td>
<td>Meadow restoration provided, meeting P&amp;N #3</td>
<td>No achievement of P&amp;N #3. Current trends continue with continued loss of dry meadow habitat to conifer encroachment and fire exclusion.</td>
</tr>
</tbody>
</table>
P&N #4. Retain Hardwoods as a stand component at density levels commensurate with development of late-successional stands (see pp. 33, 130, 138, 143 147, 148, 199, 200)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4a. Acres promoting growth and resilience of hardwoods including aspen,</td>
<td>Oak released in stands totaling 567 acres (i.e. oak has been detected and will be promoted throughout these stands). Approximately 30 total acres of oak release</td>
<td>Oak released in stands totaling 534 acres; this is 33 fewer acres than Alt. 1. Approximately 30 total acres of oak release</td>
<td>Oak released in stands totaling 419 acres; this is 148 fewer acres than Alt. 1. Approximately 9 total acres of oak release</td>
<td>Aspen and oak continue declining in stands due to competition and shading out by overtopping conifers</td>
</tr>
<tr>
<td>commensurate with late successional stand development.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4b. Acres of aspen release and restoration</td>
<td>24</td>
<td>20.9</td>
<td>Same as Alternative 1</td>
<td>Does not meet the Purpose and Need for Action #4. Current trends will continue of a declining hardwood component</td>
</tr>
<tr>
<td>Conclusions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P&N #5. Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries. (see pp. 34, 211)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5a. Riparian Processes and Functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Water Quality – ACS Objective #4</td>
<td>Increase in near-channel riparian vegetation will contribute to lowering water temperature and reducing turbidity.</td>
<td>Same as Alternative 1 except that less access will result in 4,549 feet less treatment along Ash Creek to improve near channel riparian vegetation and reduction in turbidity.</td>
<td>Same as Alternative 1.</td>
<td>Current trends continue towards high variability in water temperature with the lack of near-surface stream shade and road interactions with channels and road, landings and main skid trails.</td>
</tr>
<tr>
<td>- Riparian Vegetation – ACS objective #8</td>
<td>Treating in RRs 211 acres (outside the UTPs) promotes riparian growth with the increase in available sunlight: 64 acres thinned, 65 acres meadow enhancement, 80 acres underburn-only.</td>
<td>Same as Alternative 1 except that less access would limit promoting riparian growth on 3.3 acres of RR from less thinning.</td>
<td>Treating in RRs 165 acres (outside the UTPs) promotes riparian growth with the increase in available sunlight: 55 acres thinned, 65 acres meadow enhancement, and 45 acres underburn only.</td>
<td>Current trends continue towards high stand mortality and densities, even-aged stands, excessive fuels and associated risk of uncharacteristic fire, compromising riparian processes.</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------------------------------</td>
<td>---------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>5b. Floodplain and Meadow Processes and Functions -</td>
<td>Incremental increase in raising local water table elevation as greater infiltration increases water storage with the removal of manmade features and the restoration of natural contours.</td>
<td>Same as Alternative 1 except that less access would limit restoring infiltration to 4.3 acres of RR reducing benefit to raising water table elevation.</td>
<td>Same as Alternative 1</td>
<td>Current trends continue towards infiltration limited to areas outside of manmade features as natural ground surface contours would not be restored.</td>
</tr>
<tr>
<td>- Water Table Elevation – changes within range of natural variability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Channel Bank Stability – ACS #7</td>
<td>Improved stability from riparian vegetation growth.</td>
<td>Same as Alternative 1 except that less access will result in 4,549 feet less treatment along Ash Creek to improve bank stability.</td>
<td>Same as Alternative 1</td>
<td>Current trends continue towards low riparian vegetation abundance and channel bank stability.</td>
</tr>
<tr>
<td>- Road Interactions – ACS #7</td>
<td>Current road interactions eliminated</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Current trends continue to contribute road runoff sediment to channels.</td>
</tr>
<tr>
<td>Floodplain Restoration – ACS #7</td>
<td>Natural contours restored to floodplains at old landings, meadows; near-stream flooding resumed and flood energy dissipated. Reconnection of floodplain to channels improves timing, variability and duration of streamflow.</td>
<td>Same as Alternative 1 except that less access would limit restoring 4.3 acres of RR floodplain and reconnection to channels.</td>
<td>Same as Alternative 1</td>
<td>Current trends continue towards floodplain and channel disconnect at old landings and meadow areas.</td>
</tr>
<tr>
<td>Woody Debris – ACS #7</td>
<td>Change from the current whole tree failure, causing bank erosion and debris dams, to incremental input of woody debris as riparian vegetation stabilizes banks</td>
<td>Same as Alternative 1 except that less access would limit promoting riparian growth on 3.3 acres of RR from less thinning reducing benefit of incremental woody debris input and reduced sediment detention in channel.</td>
<td>Same as Alternative 1</td>
<td>Current trends continue towards whole tree failure, bank erosion and debris dams.</td>
</tr>
<tr>
<td>5c Riparian Habitat Connectivity</td>
<td>Plant communities expand laterally and across the floodplain.</td>
<td>Same as Alternative 1 except that less access would limit 7.6 acres of riparian plant community expansion.</td>
<td>Same as Alternative 1</td>
<td>Current trends continue towards low riparian vegetation species diversity and population.</td>
</tr>
<tr>
<td>– Riparian corridor habitat conditions – ACS #9</td>
<td>Plant communities expand laterally and across the floodplain.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Resource Elements, Indicators and Measures

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets P&amp;N by restoring riparian vegetation and floodplains in the Riparian Reserves, and treating stands to improve resilience to disturbance. All ACS objectives attained. Thinning within the RR will favor diversity, health and vigor of riparian vegetation and regulating the incremental input of woody debris to enhance instream aquatic bedform structure. Activities add approximately 0.2% ERA to the project area. ERA is reduced by 4% for each mile of road decommissioned.</td>
<td>Meets P&amp;N is met. Reduction of 7.6 acres and 4,549 feet along Ash Cr. meeting the P&amp;N from Alternative 1 reduces benefits to indicators due to less access to areas needing restoration. ERA for project area and road decommissioning is the same as Alternative 1.</td>
<td>P&amp;N is met. Slightly reduced underburning within the Ash Creek RR creates a slightly reduced response to the P&amp;N from Alternative 1. ERA for project area and road decommissioning is the same as Alternative 1.</td>
<td>P&amp;N not met. ACS objectives not met. Nonfunctioning hydrologic conditions would continue degrading the watershed and riparian areas. No change in ERA from past activity. No reduction in ERA for road decommissioning.</td>
</tr>
</tbody>
</table>

### Conclusions

**P&N #6. Manage the National Forest Transportation System and Decommission Unauthorized Routes (see pp. 38, 239, 241, 244)**

(Also see resource effects to transportation on p. 113)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Provide Access to Established Dispersed Recreation Site at Elk Flat</td>
<td>Provided through addition of 0.1 mile UA route as ML-2 FTS road.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Current condition of no legal access continued</td>
</tr>
<tr>
<td>1b. Decommission Unauthorized Routes</td>
<td>6.4 miles of existing UA routes decommissioned</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>6.4 miles of inventoried UA routes remain on the landscape</td>
</tr>
<tr>
<td>Conclusions</td>
<td>Achieves P&amp;N #6</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>P&amp;N #6 not achieved. No legal access provided to established site. UA routes continue to be present on the landscape.</td>
</tr>
</tbody>
</table>
### Issue 1 - Large Trees and Snags
See the information provided for Purpose and Need #2 for large trees and snags (p. 99).

### Issue 2 – Road Construction (see pp. 45, 238, 242, 244)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. miles of new temporary road construction</td>
<td>2.9 (will be decommissioned at end of project)</td>
<td>1.6 (will be decommissioned at end of project)</td>
<td>1.5 (will be decommissioned at end of project)</td>
<td>0</td>
</tr>
<tr>
<td>b. total open [NTS] road density (mi/sq. mi.)</td>
<td>2.74 (addition in matrix of existing UA Route that accesses established dispersed recreation site)</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>2.72</td>
</tr>
<tr>
<td>c. miles of existing UA route decommissioning</td>
<td>6.4</td>
<td>6.4</td>
<td>6.4</td>
<td>0</td>
</tr>
<tr>
<td>d. acres meeting soil quality standards</td>
<td>See Key Issue #5 below</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusions**
- No new FTS roads constructed. Decrease of 6.4 miles of existing UA route. Highest new temporary road construction.
- Same as Alt. 1 except 1.3 fewer miles of new temporary road constructed
- Same as Alt. 1 except 1.4 fewer miles of new temporary road constructed
- No new temporary roads constructed, but 6.4 miles of existing UA routes not decommissioned

### Issue 3 – [NSO] Critical Habitat (see pp. 46)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Acres of critical habitat, per primary constituent element, Maintained or Benefitted In:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCE1</td>
<td>91</td>
<td>PCE1</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>PCE2</td>
<td>120</td>
<td>PCE2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PCE3</td>
<td>53</td>
<td>PCE3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PCE4</td>
<td>0</td>
<td>PCE4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>HR / Project Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCE1</td>
<td>164</td>
<td>PCE1</td>
<td>152</td>
<td></td>
</tr>
<tr>
<td>PCE2</td>
<td>120</td>
<td>PCE2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PCE3</td>
<td>60</td>
<td>PCE3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>b. Acres of critical habitat, by primary constituent element, Degraded (PCE2/3) or Modified (PCE4) through treatments In:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core</td>
<td>PCE2 0</td>
<td>Same as Alternative 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCE3 114</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCE4 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HR / Project Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCE2 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCE3 224</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCE4 14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Acres of suitable and dispersal habitat projected in 20 years within critical habitat</td>
<td>Suitable PCE (2/3) 456</td>
<td>Same as Alternative 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dispersal PCE (4) 173</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Acres of capable habitat projected within 20 to 30 years within critical habitat</td>
<td>Capable (PCE1) 89</td>
<td>Same as Alternative 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------</td>
<td>------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Conclusions</td>
<td>629 acres of PCEs treated</td>
<td>No change in treatments, PCE acres affected or Conclusions</td>
<td>157 acres of PCEs treated</td>
<td>No treatments in any PCEs of CH and therefore, no effects</td>
</tr>
<tr>
<td></td>
<td>Short-term and minor adverse effects to PCE3 but meets Final Critical Habitat Rule recommendations on most acres</td>
<td>Treatments and acres affected under Alternative 2 are the same as Alternative 1</td>
<td></td>
<td>Current trends would persist, leaving critical habitat elements vulnerable to loss from overstocking, insect and disease outbreaks and a potential reduction or removal of habitat or connectivity within 40-60% of the project area CH from potential passive crown fire</td>
</tr>
<tr>
<td></td>
<td>PCE1 – At project scale, stand conditions moved toward PCE4 and PCE3 and a benefit to 96% of PCE1</td>
<td>PCE2 – 120 acres (100%) maintained. No increase in habitat diversity or risk reduction benefits from reintroduction of low-intensity prescribed fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Affects 22% of total CH</td>
<td>Affects 21% of total CH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCE2 – 120 acres (100%) benefitted and maintained through low-intensity prescribed fire that reduces surface and ladder fuel loading, and contributes toward understory diversity</td>
<td>PCE2 – 120 acres (100%) maintained. No increase in habitat diversity or risk reduction benefits from reintroduction of low-intensity prescribed fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCE3 – Short-term and minor adverse effects to PCE3 elements on 270 acres from reductions in trees, canopy closure, layering, snags, and down wood from thinning (224 ac) with similar effects to prey habitat; thinning with hardwood release (27 ac); and thinning with radial thinning around legacy pine (19 ac)</td>
<td>PCE3 – Short-term and minor adverse effects absent in PCE3 316 acres PCE3 maintained in current condition (44% of CH).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Indicator

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>46 acres in home range (outside core) downgraded to PCE4 for 10-30 years from the hardwood release and radial thinning around legacy pine represents a reduction in PCE3 habitat quality and loss of stand elements on 14% of PCE3 in home range/project area. Long term beneficial effects from increased stand resilience, hardwood diversity, legacy structure retention, improved tree growing conditions and prey base. Longer term effects to PCE3 from oak release (27 ac) and reducing the risk to legacy pine (19 ac); short term and long term effects</td>
<td>97% of total PCE3/PCE2 in the core (and 100% in the project area / home range) remain at risk to loss from ongoing density related-mortality, and the potential for high-severity uncharacteristic fire</td>
<td>6 fewer acres of suitable CH benefitted/maintained, degraded, or moved toward suitable conditions over 20 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>456 acres or 63% of CH benefitted/maintained, degraded (maintains function with reduction in quality) or moved toward suitable conditions over 20 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Issue 4 - Boletus Mushroom Collection in Elk Flat: Boletus Habitat in Elk Flat (see pp. 46, 195, 198, 199)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Boletus Habitat Reduction in Elk Flat Meadow - acres of conifer removal in Elk Flat Meadow</td>
<td>379</td>
<td>354</td>
<td>379</td>
</tr>
<tr>
<td>Conclusions Boletus habitat retained on 33 acres of UTPs in Elk Flat Meadow.</td>
<td>Same as Alternatives 1 and 3 except potentially 25 fewer acres reduction.</td>
<td>Same as Alternative 1</td>
<td>No reduction unless natural disturbance returns portions of Elk Flat to natural condition of dry meadow</td>
</tr>
</tbody>
</table>

### Issue 5 – Machine Piling (see pp. 47, 212, 229)

Shasta-McCloud Management Unit
## Elk LSR Enhancement Project

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Health</td>
<td>Also see resource effects to soil health below (p. 112)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. acres of machine piling</td>
<td>Up to 1,461</td>
<td>Up to 1,402</td>
<td>Up to 1,365</td>
<td>0</td>
</tr>
<tr>
<td>b. acres of attainment of soil quality standards post-implementation-porosity standard most relevant of SQSs</td>
<td>All Units Meet 90% Porosity Standard-legacy compacted areas treated with subsoiling</td>
<td>All Units Meet 90% Porosity Standard-legacy compacted areas treated with subsoiling</td>
<td>All Units Meet 90% Porosity Standard-legacy compacted areas treated with subsoiling</td>
<td>4 units do not meet porosity standard</td>
</tr>
<tr>
<td>Watershed Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment Transport and Erosion Rates</td>
<td>Reduced sediment transport and erosion rates. Erosive energy dissipated and sediment detention processes optimized. Increased stream bank stability leading to decreased sediment and erosion rates over time adding to watershed health.</td>
<td>Without temporary road access, some units will have reduced stand treatment, landings, machine piling and lower ground disturbance. However, because of the small area relative to the Watershed scale, the net outcome would be no measurable effect to any resource indicators.</td>
<td>Same as Alternative 1</td>
<td>Continuing trend of Road damage from runoff events and poor drainage on some unauthorized roads and further sediment transport and erosion.</td>
</tr>
<tr>
<td>Qualitative Evaluation of Disturbance at the Sub-Drainage Scale</td>
<td>Sub-Drainages continue to be resilient to disturbance from similar activities and respond with similar recovery as demonstrated by other areas with similar activities have shown.</td>
<td>Same as Alternative 1</td>
<td>No Change in Current Condition</td>
<td></td>
</tr>
<tr>
<td>Equivalent Roaded Area at the 5th field scale</td>
<td>Existing Condition ERA for the watershed is 8.3% additional future activities modeled for the watershed raises ERA to 1.3%, Alternative 1 increases ERA by 0.7%, when added to existing and future activities on public and non-public lands within the watershed ERA totals 10.3 for future ERA.</td>
<td>Same as Alternative 1</td>
<td>Existing Condition ERA for the watershed is 8.3% additional future activities modeled for the watershed raises ERA to 10.3%</td>
<td></td>
</tr>
</tbody>
</table>

Soil Health also see resource effects to soil health below (p. 112)
Conclusions
Effects to Watershed Health are mostly short-term disturbance to water-holding properties with little if any effects outside of the treated units or project area as measured by the amount of equivalent road acre at the project, sub-drainage and watershed scales.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusions</td>
<td>Effects to Watershed Health</td>
<td>Nearly the same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Continues current trend of sediment transport and erosion contributing to a decline in Watershed Health.</td>
</tr>
</tbody>
</table>

Table 29 Part III. Comparison of Additional Resource Effects

Additional information important to the Decision to be Made, not already covered under the comparison of effects related to Purpose and Need and Key Issues is provided below.

Wildlife (see p. 162)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened or Endangered Species</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSO Habitat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effects to Northern Spotted Owl Habitat (inclusive of designated Critical Habitat -see Issue #3 above)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suitable Nesting, Roosting, Foraging Habitat (N/R, F)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefitted through low-intensity fire only (acres)</td>
<td>120 N/R</td>
<td>Same as Alternative 1</td>
<td>0 N/R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>338 F</td>
<td>360 F</td>
<td>297 F</td>
<td></td>
</tr>
<tr>
<td>Maintained in existing condition (acres)</td>
<td>0 N/R</td>
<td>Same as Alternative 1</td>
<td>0 N/R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 F</td>
<td>0 F</td>
<td>0 F 270 F</td>
<td></td>
</tr>
<tr>
<td>Foraging Degraded through thinning treatments (acres)</td>
<td>697</td>
<td>675</td>
<td>473</td>
<td></td>
</tr>
<tr>
<td>Foraging Downgraded to Dispersal through thinning, and radial release of oak and legacy pine (acres)</td>
<td>98</td>
<td>Same as Alternative 1</td>
<td>52</td>
<td></td>
</tr>
</tbody>
</table>

Current trends remove due to large scale disturbance.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Removed (acres)</td>
<td>0</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Current trends remove due to large scale disturbance</td>
</tr>
<tr>
<td>Dispersal and Capable Habitat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispersal Benefited through low-intensity fire or thinning (acres)</td>
<td>80</td>
<td>82</td>
<td>Same as Alternative 1</td>
<td></td>
</tr>
<tr>
<td>Dispersal Modified (acres)</td>
<td>180</td>
<td>174</td>
<td>Same as Alternative 1</td>
<td></td>
</tr>
<tr>
<td>Dispersal Removed (acres)</td>
<td>41</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td></td>
</tr>
<tr>
<td>Capable Improved through thinning treatments in plantations and natural stands and maintained with low-intensity fire (acres)</td>
<td>329</td>
<td>320</td>
<td>317</td>
<td></td>
</tr>
<tr>
<td>Determination for NSO</td>
<td>May Affect Not Likely to Adversely Affect</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Determination for NSO Critical Habitat</td>
<td>Likely to Adversely Affect Designated Critical Habitat due to short-term and minor adverse effects from variable density thinning, black oak release, and radial thinning to promote legacy pine; general expanse of treatments over time and space with reductions in trees, shrubs, layering, snags, logs and prey base habitat elements</td>
<td>Same as Alternative 1</td>
<td>May Affect, Not Likely to Adversely Affect Designated Critical Habitat</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Sensitive Species**

<table>
<thead>
<tr>
<th>Northern Goshawk</th>
<th>Associated with Late-Successional Habitat and an indicators of meeting Purpose and Need #1, #2, #4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active territories treated mechanically</td>
<td>0</td>
</tr>
<tr>
<td>Known territories treated with low-intensity fire only</td>
<td>1</td>
</tr>
</tbody>
</table>

64 Associated with Late-Successional Habitat and an indicator of meeting Purpose and Need #1, #2, #4
## Final Environmental Impact Statement

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable habitat Benefitted through low-intensity fire only (acres)</td>
<td>496</td>
<td>524</td>
<td>328</td>
<td>Current trends remove due to large scale disturbance</td>
</tr>
<tr>
<td>Suitable habitat Degraded through thinning treatments and low-intensity fire (acres)</td>
<td>893</td>
<td>871</td>
<td>623</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td>Suitable habitat Downgraded through thinning, radial thin treatments and low-intensity fire (acres)</td>
<td>98</td>
<td>92</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td>Suitable habitat Removed (acres)</td>
<td>0</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td>Capable foraging habitat Benefitted through thinning and low-intensity fire (acres)</td>
<td>608</td>
<td>599</td>
<td>596</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td>Determination for Northern Goshawk</td>
<td>May affect individuals but is not expected to result in a trend toward federal listing or loss of viability</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Fisher</td>
<td>Associated with Late-Successional Habitat and an indicators of meeting Purpose and Need #1, #2, #4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Known denning areas mechanically treated / underburned</td>
<td>0</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Resting/Denning habitat Benefitted through low-intensity fire only (acres)</td>
<td>209</td>
<td>Same as Alternative 1</td>
<td>82</td>
<td>Current trends remove due to large scale disturbance</td>
</tr>
<tr>
<td>Foraging habitat Benefitted through low-intensity fire only (acres)</td>
<td>211</td>
<td>239</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>Foraging habitat Degraded through thinning treatments and low-intensity fire (acres)</td>
<td>990</td>
<td>963</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>Suitable habitat Downgraded (acres)</td>
<td>0</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td>Suitable habitat Removed (acres)</td>
<td>0</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
</tr>
</tbody>
</table>
### Indicator Alternative 1 (Modified Proposed Action) Alternative 2 (No New Temporary Road Construction) Alternative 3 (No Treatments in Natural Stands in NSO Critical Habitat) Alternative 4 (No Action)

| Capable foraging habitat Benefitted through thinning and low-intensity fire (acres) | 608 | 599 | 596 | N/A |
| Determination for Fisher | May affect individuals but is not expected to result in a trend toward federal listing or loss of viability | Same as Alternative 1 | Same as Alternative 1 | N/A |

### Conclusions - NSO and Sensitive Species associated with Late-Successional Habitats

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NSO</td>
<td>Moves most acreage toward increased resilience and larger tree sizes, with corresponding reduced risk of loss of habitat and connectivity for late-successional associated species 1,743 acres improved over 20 years through thinning and low-intensity fire 57% of LSR Improved</td>
<td>Reduced acreage of increased tree resilience and size classes from reduced thinning, though same benefits of low-intensity prescribed fire 1,730 acres improved over 20 years through thinning and low-intensity fire 56% of LSR Improved</td>
<td>Moves least acreage toward increased resilience and larger tree sizes, with corresponding increase in potential for habitat loss and reduced connectivity 1,346 acres improved over 20 years through thinning and low-intensity fire 44% of LSR Improved</td>
<td>Current trends would persist, leaving existing and developing late-successional elements vulnerable to loss from overstocking, insect and disease outbreaks and a potential reduction or removal of habitat or connectivity within 40% of the natural stands from potential passive crown fire</td>
</tr>
<tr>
<td>Fisher</td>
<td>2,018 acres improved over 20 years, including increase in denning habitat from oak release 66% of the LSR</td>
<td>2,010 acres improved over 20 years 65% of LSR</td>
<td>1,568 acres improved over 20 years No increase in denning habitat 51% of LSR</td>
<td></td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>1,997 acres improved over 20 years 65% of the LSR</td>
<td>1,883 acres improved over 20 years 61% of LSR</td>
<td>1,547 acres improved over 20 years 48% of LSR</td>
<td></td>
</tr>
</tbody>
</table>

### Botany (see p. 194)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TES botanical species</td>
<td>no effect (not present)</td>
<td>no effect (not present)</td>
<td>no effect (not present)</td>
<td>not present</td>
</tr>
</tbody>
</table>

### Soils (see p. 217)
## Final Environmental Impact Statement

### Indicator | Alternative 1 (Modified Proposed Action) | Alternative 2 (No New Temporary Road Construction) | Alternative 3 (No Treatments in Natural Stands in NSO Critical Habitat) | Alternative 4 (No Action)
---|---|---|---|---
Erosion Hazard Rating | Low | Low | Low | Low
WEPP (tons/acre) Soil Loss | 0.23 | 0.20 | 0.18 | 0.12
Soil cover -litter & duff (%) | 60 | 65 | 75 | 100
Resiliency | Litter Fall Mitigates Losses on Thinning Acres | Litter Fall Mitigates Losses, Thinning on 103 Fewer Acres | Litter Fall Mitigates Losses, Thinning on 270 Fewer Acres | N/A
LWD (logs/acre) (minimum, however RPMs may require more in specific locations) | 5-10 | 5-10 | 5-15 | >15
Compaction-Porosity (% of undisturbed) | Meets 90% Standard | Meets 90% Standard | Meets 90% Standard | 4 Units do Not meet
Resiliency | Highest impacts to soils, but meets soil quality standards | Less impact to soils than Alternative 1 | Least impact to soils | No impact to soils but decompaction of legacy compacted areas does not occur

### Transportation (see p. 234)

---|---|---|---|---
Public Safety, Road Conditions | 17.9 miles maintained, .27 reconstructed | Same as Alternative 1 | 17.4 miles maintained, .27 reconstructed | No scheduled road maintenance
Changes to Road MLs (miles) | Increase of ML 2 from 10.63 to 10.73 | Increase of ML 2 from 10.63 to 10.73 | Increase of ML 2 from 10.63 to 10.73 | No Change
Changes to Maintenance Costs | 0.10 miles added = slight increase | 0.10 miles added = slight increase | 0.10 miles added = slight increase | No Change
Landings | Estimated 78 (38 existing and 40 new) All Decommissioned | Estimated 70 (30 existing and 40 new) All Decommissioned | Estimated 62 (29 existing and 33 new) All Decommissioned | 44 existing

---

Shasta-McCloud Management Unit 113
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Conclusions</td>
<td>Contributes to improved road conditions on 17.9 miles of maintained road. Changes to road MLS and costs negligible.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1 except .5 fewer miles maintained</td>
<td>Continued existing condition</td>
</tr>
<tr>
<td>Cultural Resources (see p. 245)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adverse Effects to Historic Properties</td>
<td>No Adverse Effect</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Socio-Economics (see p. 249)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present Net Value</td>
<td>-$1,999,896</td>
<td>-$1,956,841</td>
<td>-$2,057,097</td>
<td>N/A</td>
</tr>
<tr>
<td>Benefit Cost Ratio</td>
<td>0.75</td>
<td>0.74</td>
<td>0.71</td>
<td>N/A</td>
</tr>
<tr>
<td>Employment</td>
<td>Jobs and income generated directly from the industries performing the tasks, as well as indirectly from the inter-industry purchasing and expenditures</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>No employment created</td>
</tr>
<tr>
<td>Forest Use</td>
<td>Legal access to dispersed site. Temporary travel restrictions and recreation disruption during implementation. Improved safety along roads in hazard reduction treatment areas. No disruption of range allotment management.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>No provisions of legal access to recreation site and no improvements to road safety. No temporary disruptions</td>
</tr>
<tr>
<td>Conclusions</td>
<td>Jobs, income and revenue generated. Costs are higher than monetary benefits, and so PNV is negative and benefit/cost ratio is less than 1. Forest use temporarily disrupted but with improvements in legal access and safety post project.</td>
<td>Similar to Alternative 1 with lowest PNV and lowest benefit/cost ratio. As with Alternatives 1 and 2, ratio is less than 1.</td>
<td>Similar to Alternative 1 with lowest PNV and lowest benefit/cost ratio. As with Alternatives 1 and 2, ratio is less than 1.</td>
<td>No monetary costs, no income, and revenue. No improved access or safety. No temporary disruptions in Forest use.</td>
</tr>
</tbody>
</table>
## Table 29 Part IV. Additional Required Disclosures, Compliance and Consistency

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short-term Uses and Long-term Productivity (see p. 258)</strong></td>
<td>There would be a short-term loss of soil productivity on areas dedicated to landings (up to approximately 58 acres). Some of these needs are provided by existing landings in the project area. Soil in treatment units in action alternatives would meet Forest Plan soil quality standards with implementation, and less than 15 percent of any unit would be in a non-productive state. Soil productivity would be restored in the previously windrowed units, and improved by decommissioning roads with residual soil compaction. Decommissioned roads would return to forest or grassland.</td>
<td>Same as Alternative 1 except an estimated 53 acres of landings</td>
<td>Same as Alternative 1 except an estimated 47 acres of landings</td>
<td>Legacy compaction would continue in 4 units. Up to an estimated 33 acres in existing landings.</td>
</tr>
<tr>
<td><strong>Irreversible and Irretrievable Commitments of Resources (see p. 259)</strong></td>
<td>There are no irreversible commitments of resources. The following irreversible commitments of resources occur:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The temporary loss of productive forest lands from creation of landings on approximately 58 acres. Skid trails, and temporary road uses (of existing unauthorized routes) or construction under Alternative 1 on approximately 8.6 miles</td>
<td>53 acres 8.3 miles</td>
<td>47 acres 6.2 miles</td>
<td>6.5 mile of existing unauthorized routes and approximately 28 acres of existing landings</td>
</tr>
<tr>
<td></td>
<td>Boletus habitat in Elk Flat meadow will be reduced in favor of returning natural processes that produce and maintain the unique dry meadow habitat.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>No reduction until natural processes reset early seral habitat</td>
</tr>
<tr>
<td></td>
<td>PCE 3 will be degraded (habitat quality reduced) on approximately 224 acres, and downgraded to dispersal habitat (PCE 4) on approximately 46 acres.</td>
<td>Same as Alternative 1</td>
<td>0 acres PCE3 Degraded 0 acres PCE3 Downgraded</td>
<td>No Effect to PCEs</td>
</tr>
<tr>
<td></td>
<td>Loss of habitat elements from new landing construction, existing landing enlargement or temporary road construction for landings on approximately: 4.5 acres of PCE 1 8.5 acres of PCE 3</td>
<td>Same as Alternative 1</td>
<td>4.5 acres of PCE 1 0 acres of PCE 3</td>
<td>No Effect to PCEs</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Unavoidable Adverse Effects (see p. 258)</td>
<td>Unavoidable adverse impacts result from managing the land for one resource at the expense or condition of other resources. Some adverse effects are short-term and necessary to achieve long-term beneficial effects. Unavoidable adverse effects, discussed by resource in Chapter 3, fall within Forest Plan standards and comply with the regulatory framework (see Appendix H).</td>
<td>Same as Alternative 1 although 82 fewer acres involve thinning or meadow enhancement, and up to 59 fewer acres may be machine piled. The reductions may reduce impacts on those acres.</td>
<td>Same as Alternative 1 although 267 fewer acres involve thinning or meadow enhancement, and up to 96 fewer acres may be machine piled. The reductions may reduce impacts on those acres. Reduced treatments apply to natural stands within NSO critical habitat.</td>
<td>Current trends continue resulting in adverse impacts to habitat through risk exposure.</td>
</tr>
<tr>
<td>Energy and Natural or Depletable Resource Requirements and Conservation Potential (see p. 259)</td>
<td>No unusual energy requirements under Alternative 1. Resources conserved.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Urban Quality, Historic and Cultural Resources and the Built Environment (see p. 260)</td>
<td>Historic and cultural resources protected. There would be no changes to urban quality or the built environment under Alternative 1.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Incomplete or Unavailable Information (see p. 261)</td>
<td>Knowledge about many of the relationships and conditions of wildlife, hydrology, forests, jobs and communities is evolving as research continues. However, the basic data and central relationships are sufficiently established in the respective sciences in order for the deciding official to make a reasoned decision to select an alternative and to adequately assess and disclose the possible adverse environmental consequences. Given the uncertainty of any modeling exercise, the results are best used to compare the relative effects of the alternatives, rather than as an indicator of absolute effects.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Air Quality Requirements – Local, State, and Federal (see p. H-1)</td>
<td>Consistent with State, Federal, and local requirements. No federal conformity determination needed. No change in attainment status for any criteria pollutant. Burn plan, smoke permit, and burn permit will be required prior to implementation.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Climate Change- Forest Service Strategic Plan and California AB 32 (see p. H-5)</td>
<td>FS Strategic Plan-Alternative 1 is consistent through improving the ability of the forest to remain healthy and resilient. CA AB-32 – Alternative 1 is consistent with AB 32 through sustainable management practices. Alternative 1 will not likely not have an adverse net effect on carbon cycling.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Current trends continue leaving the stands in the Project area less resilient.</td>
</tr>
<tr>
<td>Endangered Species Act (see p. H-6)</td>
<td>Compliant with section 7 consultation procedures under the Endangered Species Act. Determinations under Alternative 1 are: May Affect, Not Likely to Adversely Affect for the Threatened NSO and Likely to Adversely Affect its Critical Habitat; and May Affect, Not Likely to Adversely Affect the Endangered Gray Wolf and No Effect to Gray Wolf Critical Habitat</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Environmental Justice – E.O. 12898 (see p. H-6)</td>
<td>No disproportionate adverse effects on low income or minority populations because of implementation of any of the Elk Project action alternatives. There are expected to be no disproportionate adverse effects on Native Americans because of implementation of any of the Elk Project action alternatives.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Invasive Species – E.O. 13112, DR 955-10, FSM 2900 (see p. H-8)</td>
<td>In compliance. No known populations of any weed species rated moderate or high risk within the project area. Any new populations found will be excluded. Prevention of introduction measures are in place.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>No known populations of any moderate or high risk species I project area.</td>
</tr>
<tr>
<td>Migratory Birds – E.O. 13186 (see p. H-9)</td>
<td>In compliance with the 2008 and 2014 Migratory Bird MOU with the USDI-FWS. The project design, treatment prescriptions and RPMs will help ensure treated areas continue to provide necessary habitat to maintain a diversity of species at both the stand and landscape scale, and reduce the potential for adverse effects. See effects to TES bird species and MIAs.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Watch List Botanical Species (DR-9500-4) (see p. H-10)</td>
<td>In compliance with DR-9500-4. The Project will benefit Jones’ muhly through removal of dead thatch during burning. RPMs, SOPs, and BMPs in place for protecting soils and improving and protecting hydrological function will provide protection for this species.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>Clean Water Act and Water Quality-Basin Plan (see p. H-11)</td>
<td>In compliance with the Clean Water Act for controlling non-point pollution sources. Conditional Waiver of Waste Discharge Requirements, BMPs are applied to prevent impacts to water quality.</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>National Forest Management Act (NFMA) (see pp. H-12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. NFMA-Findings</td>
<td>Compliant with required NFMA findings for soil, slope, watershed conditions, regeneration, water conditions, harvesting system, and land suitability</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
<tr>
<td>b. NFMA-Forest Plan Consistency (see pp. H-13-H-32 and also individual resource sections in Chapter 3)</td>
<td>Consistent with Forest Plan</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Alternatives to the Proposed Action may be suggested by the public or other agencies or were considered by the interdisciplinary team during development of the proposed action. Alternatives are eliminated from detailed consideration if they are: Illegal, fail to meet the purpose and need for action, technologically infeasible, clearly unreasonable, duplicate actions within the existing range of alternatives, the decision has already been made, would cause unreasonable environmental harm, cannot be implemented, or are remote or speculative. The following alternatives were considered, but eliminated from detailed study.

The Original Proposed Action as Scoped

The original Proposed Action that was scoped in February of 2013 (USDA-FS, 2013b) and published in the Notice of Intent (USDA-FS, 2013) is similar to Alternative 1, the Modified Proposed Action. However Alternative 1 includes refinements in the description of the Purpose and Need for Action and modifications of the Proposed Action. Modifications and refinements were a result of public comment during the scoping period, corrections, changed circumstances (primarily ongoing spread of mortality), and further analysis. More information on why modifications to the original Proposed Action were made are included in the introduction of Alternative 1 (see p. 39). Since considering both the original Proposed Action and Alternative 1 would be redundant, this alternative was dropped from detailed consideration.

Alternative 5: No Treatments in Elk Flat Meadow

Issue 4 – Mushroom Collection, described on page 46, regarding negative impacts from the meadow enhancement treatment to edible mushroom growth and collection activities near and within Elk Flat. Alternative 5 would eliminate the 518-acre meadow enhancement treatment in unit 402.

Discussion

Alternative 5 was eliminated from detailed study because it would not reasonably meet the purpose and need for meadow restoration in Elk Flat. Encroaching conifer would not be removed, and the natural fire regime that helps sustain the meadow habitat would not be returned.

Although Alternative 5 as a whole was eliminated from detailed consideration, aspects of it were adopted into the Modified Proposed Action (Alternative 1), and protections for mushroom habitat would be implemented through soil and coarse woody debris protections. Some species of edible mushrooms also benefit from soil disturbance and fire. Alternative 1 preserves some forest vegetation in Elk Flat Meadow that would function as mushroom refugia. The Modified Proposed Action includes the following layout design, resource protection measures, standard operating procedures, and Best Management Practices that also help protect mushroom habitat:

- **UTP Placement** – Mushroom habitat was considered in the placement of the UTPs in Elk Flat meadow.

- **Soil and Organic Matter Protection** - Alternative 1 protects soils and organic matter at Elk Flat in the following ways:
  a. RPM 10 on page 86 restricts heavy equipment operation in Elk Flat to frozen ground or in areas where work on dry soils not result in significant adverse effects from soil displacement
  b. RPM 11 on page 86 protects embedded coarse woody debris in the Riparian Reserves in Elk Flat and elsewhere.
  c. RPM 24 on page 88 describes litter and duff retention requirements during underburning.
d. RPM 25 on page 89 describes protections for large predominant trees during underburning.

e. RPM 41 on page 92 describes snags, down logs and clumps of trees to be retained in the Meadow unit.

f. Required monitoring will provide information for before and-after-treatment effects for fungi (see Monitoring item 49 on page 94). Information learned from monitoring is applied to ongoing and future actions.

g. Standard Operating Procedures (SOPs) and Best Management Practices (BMPs) adhered to on similar projects also protect soil quality, which in turn helps protect edible mushroom habitat. In particular see Appendix C, SOP numbers 5, 6 and 7 on page C-2 for soil and duff protections and Best Management Practice implementation. The list of the most pertinent BMPs is provided starting on page C-3.

Effects to boletus mushrooms is included in Chapter 3 in the effects analysis for the botanical resources for the action alternatives. Additionally, No Action (Alternative 4) is considered in detail and shows the difference between the action alternatives in effects pertaining to Elk Flat meadow and boletus mushroom.

**Alternative 6: Limit Harvest to Trees Less than 10 Inches in Diameter**

Suggested by a commenter, Alternative 6 responds to Issue 1 – Large Trees and Snags (see page 45). Alternative 6 provides a 10-inch maximum DBH for thinning treatments. It is eliminated from detailed study because modeling shows that while it would reduce fuel ladders in the short-term, it would not meet or seriously diminish the project’s ability to meet major aspects of the purpose and need including: #1-Risk Reduction in Early, Mid and Late-Successional Habitat and Increased Stand Resilience to Disturbance; #2 Accelerate Development of Late-Successional and Old-Growth Forest Characteristics and Promote Late-Successional Habitat Connectivity; #3 Restore Meadow Habitat in Elk Flat; and compromise improving vegetative conditions in Riparian Reserves in #5 (Payne, 2015a).

**Discussion**

Alternative 6 would not address overstocking nor would it sufficiently reduce existing standing and dead fuels in the LSR, and the Riparian Reserves. Group selection and radial thinning treatments within plantations and natural stands would not be implemented since effective implementation of these prescription elements could not be achieved with a 10-inch diameter limit.

Trees within the natural stands and plantations range from less than 1-inch to 50 inches DBH with a very few remnant predominant trees. Many trees in both stand types over 10 inches DBH that are competing with the larger trees for site resources and some that are infected with black stain or annosus root disease. Because this alternative would retain all trees over 10 inches DBH, competition would not be sufficiently alleviated in treated stands and a large proportion of diseased trees would remain on the landscape. This alternative would result in continued stress-induced mortality with fewer large diameter trees and snags developing and persisting on the landscape over time. Suppressed conifer would continue to decline within stands at an unnatural rate as late successional habitat develops. Competition would not be effectively reduced in early, mid- and late-successional mixed conifer and pine dominated stands or plantations. Consequently, there would be minimal improvement to individual tree growth acceleration and larger diameter snag recruitment, indicating this alternative does not sufficiently develop a trend toward desired late-successional stand characteristics. The release prescriptions for oak and aspen would only be partially implemented leaving hardwoods overtopped and suppressed by conifers larger than 10 inches DBH.

The desired condition is derived from the Forest Plan, including the Late-Successional Reserve Assessment as required by the Northwest Forest Plan. The project is designed to improve the viability of the Elk Flat LSR, increase hardwood diversity, enhance meadow habitat and improve and maintain stream channel and Riparian Reserve function consistent with the Aquatic Conservation Strategy objectives of the Northwest Forest Plan.
Effects to the LSR, Riparian Reserves and Critical Habitat will be analyzed for each alternative in the resource specific effects analyses and as part of the analysis for compliance with vegetation diversity as required by the Forest Plan. The Forest Plan integrated the requirements of the Northwest Forest Plan. Compliance with the Forest Plan is covered in individual Chapter 3 resource sections and in section starting on page 259.

**Alternative 7: Eliminate the Use of Machine Piling within Treatment Units and Substitute Hand Piling**

Suggested by a commenter, Alternative 7 eliminates machine piling and substitutes hand piling. Alternative 7 responds to Issue 5 – Machine Piling regarding impacts to soil and watershed health from machine piling. Alternative 7 was not considered in detail because detrimental soil impacts from machine piling are not supported by the local monitoring data and best available science for soil types within the project area. Additionally elimination of machine piling would not meet the Purpose and Need for Action for “risk reduction in early, mid and late-successional habitat and increased resilience to disturbance” on those acres prescribed for machine piling.

**Discussion**

Alternative 1 utilizes machine piling as a pretreatment before underburning to increase consumption of excess fuels over what underburning alone would accomplish, and to limit adverse effects to wildlife habitat during the underburning (page 54). The units prescribed for machine piling have heavy concentrations of coarse woody debris, typically more than 40 tons per acre. Eliminating machine piling within the units (landings would still be piled) would not allow for safe and effective reductions of the larger sized material (>12 inches in diameter) within various treatment stands on up to 1,461 acres plus the landings on the remaining thinning units.

Soil surveys and past project monitoring completed within portions of the Elk Flat LSR Enhancement project area, and on the McCloud Flats, demonstrates there are no significant negative effects from machine piling on the soils resource. The design of the Proposed Action, resource protection measures, and standard operating procedures and Best Management Practices would be implemented to reduce, if not eliminate, the potential for adverse effects to soils, hydrologic and watershed function.

- Treatment-generated and natural fuels in excess of desired retention levels would be piled with mechanized equipment such as an excavator or tractor with a mounted brush rake or grapple designed to minimize soil disturbance (see page A-30).
- RPM 485On page 85 limits pile size to decrease potential for soil damage.
- Standard Operating Procedures (SOPs) and Best Management Practices (BMPs) adhered to on similar projects also protect soil quality. In particular see Appendix C, SOP numbers 5, 6 and 7 on page C-2 for soil and duff protections and Best Management Practice implementation. The list of the most pertinent BMPs is provided starting on page C-3. Practice 5.6 is of particular importance in decreasing the potential for soil compaction.

Effects to soils are analyzed in Chapter 3 under the action alternatives with respect to achieving the soil quality standards and in comparison to the no action alternative.
Alternative 8: Limit Harvest to Trees Less Than 20 Inches in Diameter within the Elk Flat Late-Successional Reserve

Suggested by a commenter, Alternative 8 responds to Issue 1 – Large Trees and Snags described on page 45. Thinning of trees with a 20 inch or less DBH would be the only silvicultural treatment applied. While not as restrictive as Alternative 6 in that it provides for a larger diameter limit that only applies to the LSR, Alternative 8 is dropped from consideration in detail because it would not meet the Purpose and need for Action in ways similar to those described for Alternative 6; stand heterogeneity would be reduced in all stands in the LSR compared to the Proposed Action, two thirds of the stands would not reach desired density, and hardwoods would continue to decline as a stand component.

Discussion

Modeling of Alternative 8 (Payne, 2015) predicts a 20 inch upper diameter limit would reduce stocking to desirable levels in roughly one third of natural stands in the LSR. The higher basal area retention resulting from a 20” upper diameter limit would not meet stand health objectives, result in decreased structural heterogeneity, and leave stands at a higher risk for continued black stain spread and mortality. In most stands basal area would be retained above 180 ft.²/ac, stand heterogeneity would be decreased by removing more trees less than 20 inches DBH to approach desired basal areas. Radial thin treatment would be dropped where release objectives could not be met and thinning would be less effective at promoting long-term health and survival of predominant pine. In the remaining two thirds of the stands, all trees less than 20” DBH would be removed and stand density would still be above a risk threshold for western pine beetle mortality.

The desired condition of structural heterogeneity for habitat would not be achieved when thinning to a 20” upper diameter limit. Prescribed selection criteria that would retain multiple canopy layers, smaller understory trees and a patchy understory would not be implementable. Few to no trees under 20 inches (excluding unthinned patches) would be retained resulting in a simplified stand structure of essentially a single layer of overstory trees. Isolation of healthy pine and increased sunlight to the forest floor would be hampered, decreasing the ability to reduce black stain spread, in turn resulting in greater future losses of larger pine.

Hardwoods, which are mostly within the LSR stands, would remain overtopped and continue to decline as a stand component. A substantially higher component of conifers would be left around oaks, leaving higher levels of shade and competition. Oak release would be less effective and last for a shorter duration, leading to earlier oak decline.

Alternative 9: No New Temporary Road Construction

Alternative 9 is responsive to the issue regarding road construction. It differs from Alternative 2 in that it also includes no temporary road construction to access the landings (landing driveways). Alternative 9 was dropped from detailed analysis in favor of consideration of Alternative 2 that is considered in detail, because Alternative 9 would require more construction of new landings than Alternative 2 as discussed below.

Discussion

Alternative 2 considers in detail the effects relative to resources and meeting the Purpose and Need for Action of no new temporary roads other than landing access driveways. Alternative 9, eliminating new temporary roads entirely was first considered but dropped from detailed analysis. Under Alternative 9, there is a reduced ability to meet the Visual Quality Objectives along the Pilgrim Creek Road. Landings would need to be placed to minimize the visual impact of the landings and landing piles along these sensitive viewing corridors. Without the use of temporary roads, the landings would be adjacent to the main roads creating a visual impact. Under Alternative 9, approximately 7 additional new landings over Alternative 2 may need to be created where existing FTS roads or unauthorized routes do not access existing openings or landings.
The Modified Proposed Action incorporates measures to protect soils, forest health and wildlife from the construction and use of temporary roads by:

- **Project Design** – The Modified Proposed Action is designed to minimize disturbance from temporary roads by:
  a. Previously created skid trails unauthorized routes would serve as temporary roads rather than constructing new temporary roads when possible to avoid new disturbance (see Appendix A page A-39).
  b. Sections of unauthorized routes used as haul routes would be improved for equipment access and hauling as needed (to decrease resource damage), and
  c. Existing unauthorized routes, new temporary roads, and landings would be decommissioned at the completion of the project.

- **Resource Protection Measures** would be implemented:
  a. RPM 15 on page 86 – Specifies revegetation and mulching during temporary road decommissioning.
  b. RPM 16 on page 87 – Requires road construction and maintenance (including temporary roads) be managed for consistency with LSR standards and guidelines and that they will be kept to a minimum, and routed through non-late-successional or low quality late-successional habitat where possible.
  c. RPMs 31-39 starting on page 90 – Limit timing of disturbance to protect wildlife.

- **Standard Operating Procedures and Best Management Practices** for resource protection would be followed (see Appendix C).

Effects to soils from temporary road construction, use and decommissioning are assessed in Chapter 3 on soils, forest health and wildlife. Forest Transportation System roads are not considered within the soils resource under the Forest Plan (pp. O-2) and are therefore not included in the soils resource effects.

**Alternative 10: Addition of Unauthorized Routes in Elk Flat to the Forest Transportation System with Seasonal Closures**

Comments on Alternative 1 presented in the DEIS requested certain unauthorized routes in Elk Flat be left open seasonally to facilitate motorized access during boletus mushroom gathering season were considered. Alternative 10 would incorporate Alternative 1 but would add approximately 1.27 miles of existing UA routes (U43N19HC, U41N52A, U41N04A, U41N10AC, U41N10AB, U41N10A, U41N52A) to the FTS as level 2 roads, with seasonal closures within Elk Flat Meadow. These routes would require road construction. The proposed action for hydrologic recontouring would be reduced or modified under Alternative 10 to accommodate the new roads.

Alternative 10 was dropped from detailed consideration because adding the routes and bringing the new roads up to standard would require considerable construction, and not meet the Purpose and Need for action for hydrologic and meadow restoration. The continued presence of the routes proposed under Alternative 10 (other than U41N52A) would hamper the restoration of the Meadow Habitat in Elk Flat. New roads would be added to the LSR and open road density would increase. The degree to which the project would meet Purpose and Need #6, which includes the need for decommissioning UA routes, would be reduced.

**Discussion**

**Background**

The 2010 Motorized Travel Management (MTM) Record of Decision (ROD) for the Shasta-Trinity National Forest prohibited cross-county motorized travel as required by Subpart B of the Travel Management Rule (36
CFR 261.13). The MTM ROD added some unauthorized routes to the FTS, but routes that had potential resource conflicts, required extensive repairs or mitigations, may have adversely affected critical habitat for ESA-listed species or would negatively impact cultural resources were not included (USDA-FS, 2010a pp. 5, 11-12). Subsequently, the Shasta-Trinity published a Motor Vehicle Use Map designating all Forest roads, trails and areas that are designated for motor vehicle use. The most current version is available at District Offices and online.65

The routes suggested in Alternative 10 were not added in the 2010 ROD, or formalized with the Motor-Vehicle Use Map (MVUM), and are considered cross-country travel and not legally open to motorized access.66 While UA routes are not designated for vehicle travel on the MVUM, they may still appear to be an open road. Without a barrier, these routes can be used unintentionally by uninformed drivers.

Decommissioning unauthorized routes protects other resources and prevents vehicles from leaving designated open roads and improves user conditions and safety in the project area (Bonivert, 2015 p. 15). Unauthorized routes not added to the FTS in the 2010 MTM ROD may be considered for removal from the landscape and restoration to the natural condition, conversion to foot or equestrian trails, or addition to the FTS and designation on a future MVUM. Decisions associated with changes to the FTS and MVUM depend on available staff and resources and may trigger the need for additional environmental analysis, public involvement and documentation (USDA-FS, 2010a p. 4).

**How UA Routes were Considered in Project Development**

The transportation analysis process (TAP) is tailored to local situations, landscape conditions and issues as identified by an interdisciplinary team (IDT) of resource specialists. The outcome of the TAP is a set of recommendations67 for management of the forest transportation system. TAP recommendations contain an identification of the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. Additionally, TAPs identify roads on lands under Forest Service jurisdiction that are no longer needed to meet forest resource management objectives and that, therefore, should be decommissioned or considered for other uses. The TAP undertaken for the project area recommends a 0.10 mile segment of UA route U40N10A for addition to the FTS (Bonivert, 2015a p. 1). This addition is included in the Proposed Action. Portions of the road analysis process (the Roads Analysis Process is similar to the RAP, used prior to the MTM ROD) completed for the Pilgrim project overlap the Elk project area (Huhtala, 2005). The Pilgrim recommendations included decommissioning of several of the UA routes proposed for inclusion in the FTS under Alternative 10.

**Existing Condition of the Alternative 10 Proposed UA Route Additions**

Most of these UA routes are in LSR (U41N52A and part of U41N10A are in Matrix). U41N52A was decommissioned as part of the Pilgrim Vegetation Management Project Decision. The other unauthorized routes capture stream channels and are rapidly eroding. These routes are currently entrenched below the natural grade of the meadow and may not be drivable in multiple locations. Most of the U41N10 routes (other than the 0.10-miles segment of UAN10A proposed for addition to the FTS in Alternative 1) are within

---

65 [http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5412723.pdf](http://www.fs.usda.gov/Internet/FSEDOCUMENTS/stelprdb5412723.pdf) The designations shown on this motor vehicle use map (MVUM) were made by the responsible official pursuant to 36 CFR 212.51; are effective as of the date on the front cover of this MVUM; and will remain in effect until superseded by next year’s MVUM. This motor vehicle use map identifies those roads, trails, and areas designated for the motor vehicle use under 36 CFR 212.51 for the purpose of enforcing the prohibition at 36 CFR 261.13 Subpart A.

66 It is prohibited to possess or operate a motor vehicle on National Forest System lands on the Shasta-Trinity National Forest other than in accordance with the designations on the MVUM (36 CFR 261.13) (except for over snow uses).

67 Recommendation does not indicate a decision by the responsible official or subsequent change on the ground. This is a suggestion as to what may be beneficial given the current circumstance.
Riparian Reserve and interact with Swamp Creek. U43N19C lies within the Riparian Reserve and likely channels water from Swamp Creek. U41N52A may be susceptible to flooding with higher runoff events.

See also the response to comments in Appendix I, Response to concern 26, comments 8-5, 8-9, 8-18, and 9-1).

**Alternative 11: Alter Configuration of Unthinned Patches in Elk Flat Meadow to Protect Additional Boletus Gathering Areas**

Comments on the DEIS requested the unthinned patches currently delineated in Elk Flat Meadow be expanded, shifted, and additional patches be incorporated to accommodate commenters’ boletus gathering areas. Alternative 11 would redefine the UTP boundaries and add additional UTPs based on public input for Boletus gathering areas in the Elk Flat meadow unit 402. While not as restrictive as Alternative 5, Alternative 11 would still decrease the degree to which the Purpose and Need for Action for meadow restoration is met, and the existing delineation of UTPs does generally include potential Boletus habitat. Specific gathering areas previously identified by the commenter were considered during UTP delineation. Alternative 11 is dropped from detailed analysis in part because it would not fully meet the Purpose and Need for Action for meadow restoration, and it was partially duplicated in the Proposed Action. (Also see Alternative 5).

**Discussion**

As noted in the DEIS pages 118 and 190 (FEIS p. 119 and 198), the UTP placements in Elk Flat meadow were previously delineated with consideration of public input during scoping and project development on Boletus gathering areas. Additional considerations in UTP placement in the Proposed Action took into account existing stand characteristics, stream channel locations, and other resource concerns. Adding additional UTP locations and expanding existing areas would decrease the ability of the project to meet the Purpose and Need for Action for meadow restoration while protecting resources.

As noted in the DEIS (p. 190) and FEIS (p. 198), Boletus are common on the Shasta-McCloud Management Unit and favorable conditions for them (trees over 30 years old with enough soil cover to maintain a cooler soil temperature) will shift locations over time through natural processes and management. It is difficult if not impossible for managers to hold the conditions that favor Boletus in any one location over time. The naturally occurring early seral stage of meadow habitat at Elk Flat has been negatively influenced through fire suppression and disruptions to the hydrologic processes. The project seeks to return the natural fire regime and hydrology, and restore the early natural condition of meadow early seral habitat. Early seral habitat is not Boletus habitat, even so, the Proposed Action will decrease effects to boletus habitat on 33 acres of unthinned patches there (see DEIS p. 192, FEIS p. 199).
Chapter 3. Affected Environment and Environmental Consequences

Introduction

This chapter describes aspects of the environment likely to be affected by the proposed action and alternatives. The direct, indirect and cumulative environmental effects that would result from undertaking the proposed action or alternatives are described. Effects are quantified where possible and qualitative discussions are included. Together these descriptions form the scientific and analytical basis for the comparison of effects displayed in chapter 2 (starting on page 97).

The planning record for the project includes project-specific information, including resource reports and results of other field investigations. Individual reports, input and analysis from the record are summarized and referenced in this chapter. Some reports are included in the appendices or are incorporated by reference. The planning record is located at the Mount Shasta Ranger Station.

Approach to Cumulative Effects Analysis

Past, present, and reasonably foreseeable future actions were considered, in order to assess accumulated impacts. According to the Council on Environmental Quality NEPA regulations, a “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7).

Spatial and temporal boundaries are the two critical elements to consider when deciding which actions to include in a cumulative effects analysis. Spatial and temporal boundaries set the limits for selecting those actions that are most likely to contribute to a cumulative effect. The effects of those actions must overlap in space and time for there to be potential cumulative effects (FSH 1909.15 (15.2)). Therefore the relevant boundaries and projects assessed for cumulative effects vary by resource. Each resources’ cumulative effect area can be different and possibly larger or smaller. Relevant cumulative effects are documented for the resource in the project specialist reports and summarized in this chapter.

The cumulative effects analysis for each environmental component or resource area is guided by and consistent with the Council on Environmental Quality letter “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis” of June 24, 2005. The current environmental conditions on the landscape reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and can be used as a proxy for the impacts of past actions (36 CFR § 220.4 (f) . The memo states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.” Cumulative effects are discussed here as changes in the existing condition due to present and future activities, including the effects of the alternative being discussed unless otherwise noted.

For each resource area, direct and indirect effects of the proposed action were reviewed, in accordance with the Forest Service Handbook, and relevant spatial and temporal boundaries for cumulative effects analysis were determined. For the Elk project, the longest relevant temporal boundary in this review was 30 years. The largest spatial boundary encompassed the 5th field watershed, Ash Creek, where the project is located. The wildlife cumulative effects buffer, however, extended just beyond the Ash Creek 5th field watershed boundary. As such, the largest combined boundary which is comprised of the Ash Creek 5th field watershed combined with areas where wildlife cumulative effects buffer boundaries extend outside the watershed boundary, was used (Elk Project general cumulative effects review area). Please refer to Refer to EIS
Appendix F-Ongoing and Future Activities Map for a spatial representation of this area. All other spatial and temporal boundaries either fell within the largest boundary or were unneeded.

Silviculture and Forest Health
A Vegetation Report (Payne, 2016b) was completed for this project and is incorporated by reference. Information relevant to this decision is summarized here.

Introduction

Purpose and Need Applicable to Silviculture and Forest Health
Silviculture treatments for the Elk Flat Late Successional Reserve Enhancement Project are designed to help achieve the following elements of the purpose and need: #1-Risk reduction in early, mid and late-successional habitat and increased stand resilience to disturbance; #2-Accelerate development of late-successional and old-growth forest characteristics; #3-Restore meadow habitat in Elk Flat; and #4-Retain hardwoods as a stand component at density levels commensurate with development of late-successional stands. Hydrologic function restoration (Purpose and Need #5) is also partially related to silviculture and forest health through the health of forest stands within Riparian Reserves, as described in the Hydrology Section (starting p. 201). The existing and desired conditions relating to the Purpose and Needs are provided in Chapter 1.

Issues Applicable to Silviculture and Forest Health
Issue #1 applies to Silviculture and Forest Health. Concern was raised that large tree and snag removal and group selection would negatively impact forest health and late-successional ecosystems in Late-Successional Reserves, Riparian Reserves and Critical Habitat. Concern was raised that these treatments would prevent rather than facilitate forest succession processes, and as such would not be consistent with the Northwest Forest Plan. The Environmental Consequences section discusses silviculture treatment effects relative to the above issues.

Methodology
Stand exam data was collected in spring of 2007 and 2010. Exam data, modeling using the Forest Vegetation Simulation (FVS) program, multiple field observations, remote aerial imagery and Forest GIS data analysis collectively were used to identify forest attributes including distribution of vegetation communities, forest structure, composition and density, and mortality from insect and disease activity. FVS modeling was used to analyze changes to stands over time under scenarios including: 1) implementing proposed thinning treatments, 2) with the advent of wildfire, and 3) with no management actions occurring. Further descriptions and discussion of the methodology can be found in the silviculture report (Payne, 2015b).

When discussing silviculture treatments and their effects, the effects are considered at the stand level. To achieve purpose and need objectives often more than one type of treatment is applied in a stand – for instance leaving unthinned patches, thinning to reduce density and thinning to release oak are distinct components of a silvicultural prescription that collectively help meet objectives of improving stand resilience and developing and retaining late successional forest characteristics. Typically, a forest stand is the smallest administrative unit used to describe forest conditions and implement and monitor treatments and conditions over time.

Silviculture treatments for Alternatives 1 through 3 are described in Chapter 2 with unit (stand) acres, timber harvest acres and acres of sub treatments (such as radial thinning and oak release) summarized in Table 7, Table 12, and Table 17, respectively. Table 22 summarizing the alternatives in Chapter 2 limits the display to harvest acres due to space constraints in the table. For clarification, tables used to display effects in this section are considering treatments at the stand level, or by delineated unit. For example, the effects of oak release are displayed in terms of the stands treated where oak is known to occur.
Indicators and Measures
Table 30 lists resource and key issue indicators and measures used to evaluate effects to Silviculture and Forest Health. Discussion of the rationale for each indicator follows.

**Table 30. Indicators and Measures of Effects for Silviculture and Forest Health**

<table>
<thead>
<tr>
<th>P&amp;N, Key Issue, or Resource Effect</th>
<th>Resource Element</th>
<th>Indicator</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>P&amp;N #1, Key Issue #1, Resource</td>
<td>Stand Resilience</td>
<td>Acres of stand density reduction that improves stand growth and resilience. SDI below pine-limiting threshold</td>
<td>LSRA objectives I and III (LSRA pp. 174-179, pp. 163) Forest Plan p. 4.63 Edson WA (p.22)</td>
</tr>
<tr>
<td></td>
<td>Risk from Large-Scale Disturbance</td>
<td>Acres of treatment and risk reduction of insect and disease outbreak</td>
<td></td>
</tr>
<tr>
<td>P&amp;N #2, Resource</td>
<td>Accelerated Development and Retention of Late-Serai Characteristics</td>
<td>Acres early and mid-successional treated to accelerate development of late successional characteristics Acres of natural stands thinned to retain late-successional characteristics and accelerate mid-successional development</td>
<td>Forest Plan (p. 4.63) LSRA (p. 164)</td>
</tr>
<tr>
<td>Key Issue #1, Resource</td>
<td>Large Trees and Snags</td>
<td>Number of trees greater than 24 inches diameter breast height (DBH) immediately post-treatment and projected in 20 years based on comparative modeling of the alternatives. Number of snags greater than 20 inches dbh projected in 20 years from comparative modeling.</td>
<td></td>
</tr>
<tr>
<td>P&amp;N #2 &amp; #4, Resource</td>
<td>Vegetation diversity</td>
<td>Development of stand level heterogeneity and species diversity Acres promoting growth and resilience of hardwoods including aspen, commensurate with late successional stand development.</td>
<td>Forest Plan pp. 4.4, 4.14), LSRA (p. 164) NWFP (p. B-2)</td>
</tr>
<tr>
<td>P&amp;N #3, Resource</td>
<td>Meadow</td>
<td>Acres of reduced conifer encroachment at Elk Flat meadow</td>
<td>FOREST PLAN (Forest Plan pp. 4.4, 4.14) LSRA (p. 205), Edson WA (p. 105)</td>
</tr>
</tbody>
</table>

**Discussion of Indicators**

**Acres of Reduced Stand Densities and Acres of Risk Reduction of Insect and Disease Outbreak**

Without disturbance, forest stands continually grow until die-back begins, largely from competition between trees for resources (e.g., water, nutrients, and sunlight). With increasing high density and competition for resources, tree growth slows, tree vigor declines and forest stands become increasingly at risk of large scale disturbance from events including insect outbreaks and high intensity fire (Kolb, et al., 1998; Agee, et al., 2005; Fettig, et al., 2007). Thinning reduces competition and frees up resources that support the vigor and resilience of the residual forest stand. Stand resilience in this context includes the capacity to persist through and re-organize after disturbance, adapt to shifting environmental conditions, and maintain basic ecosystem structure and function over time (Churchill, 2013). Acres of reduced stand densities can be compared across alternatives to gage their effectiveness at meeting Purpose and Need #1 Resilient stands in turn are better.
positioned to persist over time, retaining and promoting the development of late-successional stand characteristics (Key Issue #1).

**Acres of Early and Mid-Successional Forest treated to retain and accelerate development of Late-Successional Characteristics**

Thinning young stands to delay or reduce inter-tree competition speeds the development of large diameter trees as well as development of vertical diversity and species diversity (Garman, et al., 2003). Acres of thinning that accelerate and promote development of late successional characteristics in early and mid-successional plantations are compared across the alternatives to analyze effectiveness at achieving the purpose and need.

**Number of Trees Greater than 24 Inches Diameter Breast Height (DBH) Immediately Post-Treatment and Projected in 20 Years Based on Comparative Modeling of the Alternatives.**

Desired conditions of late-successional forest include having variability of vegetative characteristics reflective of differences in site capability and the environment (elevation, slope, aspect, soils, etc.) across the landscape (LSRA p. 162). Large overstory trees and snags are key attributes while not reflective of all desired characteristics of late successional forest. Structural and species diversity, as well as stand resilience (i.e. ability to maintain ecosystem structure and function over time) are also important attributes.

**Number of Snags Greater than 20 Inches DBH Projected in 20 Years**

Large trees per acre can be reasonably estimated using stand inventory data and aerial imagery. Recent and ongoing bark beetle mortality makes snag estimations challenging. Snag levels have changed markedly from one year to the next and are expected to continue changing as densities remain high and bark beetle activity continues. Average trees per acre over 24 inches DBH and snags per acre over 20 inches are used in this analysis for comparison across the alternatives to address issue #1 and analyze effectiveness at meeting the purpose and need.

**Development of stand heterogeneity and species diversity**

Stand diversity is a key element of forest resiliency and of late successional habitat (Churchill, 2013; Lutz, et al., 2013). In this context, diversity refers to stand level structural heterogeneity and species diversity. Stand heterogeneity (i.e. a fine-scale mosaic pattern at the stand level) promotes forest resilience by breaking up fuel continuity and continuity of conditions that support the spread of disease and epidemic insect outbreaks (Churchill, 2013). It is important to consider stand diversity in the context of the naturally occurring vegetation community or CWRH type[68]) and a natural disturbance regime of frequent fire. Forest stand structure has changed from open park-like stands dominated by large, fire-resistant trees to over-dense even-aged stands (Weaver, 1943; Covington & Moore, 1994; Moore, et al., 2004), that are more susceptible to crown fire (Weatherspoon, et al., 1992; Skinner, et al., 1996), and contain trees that are less likely to survive fire because of their smaller diameter, thinner bark and low hanging crowns (Fitzgerald, 2004).

**Acres Promoting Growth and Resilience of Hardwoods**

Acres of treatments that promote the survival and growth of hardwoods, promote the health and longevity of large overstory pine, and increase species and structural diversity are compared across the alternatives to analyze effectiveness at achieving the purpose and need and addressing resource concerns.

---

Meadow Enhancement

Conifer encroachment into Elk Flat is easily observed in comparative aerial imagery from the 1940s and today. Acres of reduced conifer encroachment are compared across the alternatives to analyze effectiveness at restoring early seral vegetation conditions.

Boundaries

To determine relevant past, present, and foreseeable future projects, spatial and temporal boundaries must be defined (36 CFR § 220.4 (f)). For the effects analysis the direct and indirect effects of the Elk project relative to Silviculture and forest health are conditions influencing stand structure and composition and stand density.

Spatial Bounding

Spatially, the conditions influencing stand structure, composition and stand density in the project affects forest conditions within and immediately adjacent to the treated units. As such, the spatial context being considered is the Elk Flat LSR Enhancement Project boundary. This is because this represents area potentially influenced by effects from proposed treatment activities.

Temporal Bounding

Temporally, effects of changes to stand structure, composition and density, including trees larger than 24 inches DBH and snags from project activities are expected to remain effective for about twenty years. Beyond this time, increases in density from stand growth will begin to cancel the improved resilience and accelerated development of late-successional characteristics associated with the silviculture treatments. Subsequent prescribed fire entries will reduce accumulations of surface and small ladder fuels but not appreciably affect forest structure, composition or density.

The baseline year used for this analysis is 2014 as the existing condition. The description of the existing condition includes the accumulation of past activities, which have influenced vegetation. In the effects discussion, “short-term” refers to effects over the twenty year period from the time the activity was accomplished. Beyond twenty years, effects are considered “long-term.” The current environmental conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects, and are a proxy for the impacts of past actions.

Affected Environment

The purpose and need in chapter 1 fully describes existing vegetation conditions. Of note is the intertwined relationship of natural fire exclusion, forest stand densification and subsequent insect and disease activity, and impacts on the development and sustainability of desirable late-successional habitat. While approximately 91 percent of the project area is identified as having historically experienced high frequency (0 to 35 years) low to mixed severity fire, there has been no recorded large scale fire in the project area for 100 years. The preponderance of small- and medium-sized trees, which account for about 80 percent of all forested vegetation, reflects a lack of differentiation that occurs under dense, stagnant growth conditions. The high levels of pine mortality from bark beetle outbreaks further reflect unsustainably high forest stand density. These conditions result when fire is excluded from an ecosystem that would otherwise be largely shaped by natural frequent fire.
Environmental Consequences

Alternative 1- Modified Proposed Action

Direct and Indirect Effects – Alternative 1

Risk Reduction and Increased Stand Resilience

Stand Density Reduction

Under Alternative 1, plantations and natural stands totaling 2,190 unit acres (1,857 of which is actually thinned after unthinned patches are subtracted) would be treated to reduce overstocking and promote resilience of the residual trees. Thinning would remove excess trees that compete for resources; trees that are generally smaller and serve as undesirable ladder and canopy fuels would be removed. Some larger intermediate and codominant trees would be removed in order to leave adjacent overstory trees at desirable density levels. All distinctly large predominant trees would be retained to the extent operationally feasible (e.g. human safety considerations). Prescription elements of group selections, radial thinning, oak release, and aspen release may remove some dominant trees. Thinning would support the health and survival of overstory pine, while tree selection would also retain a mix of species and tree sizes.

The measurement of stand density index (SDI) is used to describe existing stand density in relation to a empirically determined biological maximum and indicate the degree of competition for resources (Shaw, 2006; Woodall, 2005). Full site occupancy occurs beginning at 60 percent of maximum SDI where density induced mortality (self-thinning) begins to occur (Woodall, 2005). As stands reach and exceed 60 percent of maximum SDI, individual tree growth slows and the risk of mortality increases as competition for resources increases. Research in pure pine stands determined an SDI of 365 represented a pine-limiting threshold beyond which high levels of bark beetle mortality typically occurred (Oliver, 1995). Subsequent research has found that a limiting SDI for pine stands may be higher than determined by Oliver in 1995 but lower than other researchers determined, and it can vary by site index (Zhang, et al., 2013). Recent widespread pine mortality associated with western pine beetle outbreak bears evidence that stands have been exceeding their density threshold in the Elk project area.

1. Thinning can reduce the number of underground root-root contacts through which the pathogens can move from tree to tree.

2. Thinning can promote a mix of host and non-host species, reducing the overall effects of the pathogens.

3. *L. wageneri* prefers cool, moist conditions. Thinning can allow the sun to penetrate through the forest canopy, producing warmer soil conditions that are detrimental to the pathogen.

4. Thinning can reduce overall moisture stress on individual trees, allowing infected trees to better withstand the loss of root function from the root diseases.

Modeling of pre, post and post-20 year stand densities were compared to a pine limiting SDI of 365. An SDI of 230, or roughly 63 percent of the pine limiting SDI is considered the threshold or beginning of a “zone of imminent bark beetle mortality” (Oliver, 1995). All of the natural stands proposed for thinning exceed the density threshold, most by a large margin. Many of the stands remained near or just above the pine density threshold after thinning. Most of the stands exceeded the pine density threshold twenty years after thinning but densities were still considerably lower than present day densities. Other species present in the stands (for example Douglas-fir and white fir) can persist at higher densities than pure even-aged pine stands. Additionally, when there are more than one age class in a stand, SDI calculations may over-predict site occupancy (Woodall, et al., 2003). Desired species and structural diversity and health of pine overstory were considered collectively when analyzing stand density and thinning treatments.
Radial thinning around large predominant pine would be implemented in fourteen stands totaling 182 acres to promote the health and survival of these scarce and desirable large older trees. Some large predominant pine have recently died during the current pine beetle mortality outbreak, indicative that these trees are under stress and at risk in current stand conditions. Radial thinning would reduce competition for resources and create open stand conditions immediately adjacent to these predominant trees. Some dominant trees that are surrounding the predominant tree being released may be removed with radial thinning. Large older (160 years and more) ponderosa pine have been found to increase diameter growth and vigor in response to thinning (Latham, et al., 2002; Kolb, et al., 2007). Radial thin around large older pine frees up site resources that support the vigor of the large trees and creates conditions more consistent with those found around large ponderosa pine under a natural frequent fire regime.

Dense unthinned patches within the thinning stands would account for at least 10 percent of the stand areas. Unthinned patches provide functional and structural elements including thermal and visual cover, dense small trees, pockets of suppression and mortality, and undisturbed debris. Higher densities would also be retained where patches or groups of notably large trees occur in order to retain existing desirable late successional characteristics. Unthinned patches and high retention areas would remain at risk of density related and insect and disease mortality. These areas however would be smaller and less contiguous than they currently are. Adjacent thinning would provide growing space that would reduce competition along the edges of unthinned patches and high retention areas. When treatments are considered collectively at the stand level the risk of large scale disturbance is appreciably reduced and stand resiliency is increased. Treatments would create stand conditions where mortality is more likely to occur in smaller isolated patches consistent with endemic (non-episodic) conditions.

Dense stands totaling 335 acres would not be thinned under Alternative 1. Surface and small ladder fuels would be treated in these stands by underburning but overall density will not be appreciably reduced. These stands would remain susceptible to insect and disease attack and to density related mortality. These current stand conditions are not expected to persist in the long term.

Table 31 and Table 32 summarize density reduction.

<table>
<thead>
<tr>
<th>Table 31. Alternative 1 Acres of Stand Density Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Seral Stage</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>3b</td>
</tr>
<tr>
<td>3c</td>
</tr>
<tr>
<td>4a</td>
</tr>
<tr>
<td>4b</td>
</tr>
<tr>
<td>4c</td>
</tr>
<tr>
<td><strong>subtotals</strong></td>
</tr>
</tbody>
</table>

| Table 32. Alternative 1 Average % of Pine-Limiting SDI in Thinning Stands |
|-----------------------------|-----------------|-------------------|----------------|
| **Seral Stage**             | **Pre-thin**    | **Immediately Post-thin** | **Year 20 Post Thin** |
| 3a                          | 40%             | 38%               | 60%             |
| 3b                          | 76%             | 41%               | 59%             |
| 3c                          | 141%            | 40%               | 51%             |
Insect and Disease Treatment and Risk Reduction

Thinning selection would favor removal of trees that show advanced symptoms of disease, dwarf mistletoe infection or insect activity except when this criteria is superseded by other objectives, such as retaining all predominant trees, retaining trees in unthinned patches and retaining trees that provide distinct wildlife habitat (e.g. large broken limbs, cavities and other distinct features). By removing heavily infected trees as feasible, as well as reducing density, thinning would reduce disease activity closer to endemic levels (Fiddler, et al., 1989; Otrosina, et al., 2007).

Symptoms of black stain root disease (*Leptographium wageneri*) have been observed in several stands and is likely present in adjacent stands showing elevated pine mortality. Thinning to lower densities in these areas helps discourage spread of the disease by allowing sunlight to reach the forest floor, creating conditions less favorable for the disease and by breaking up root-to-root contact between susceptible host trees (Oetrosina, et al., 2007; Snyder, 2012a). While the disease is short lived once a host tree dies, interplanting a mix including non-host species in the larger mortality areas will help curtail future spread of black stain in these areas. Patches of extensive mortality indicative of black stain disease are present in four plantations approximately 28 years old. These areas would be interplanted with a mix of species to both reduce further mortality from black stain and promote development of future late successional forest.

Heterobasidion root disease (*Heterobasidion annosum*) has been observed in white fir to a more limited extent in the project area. Unlike black stain disease in pine, heterobasidion can persist on site for decades after a host tree has died, continuing to infect new trees through direct contact and spread of aerial spores. In areas of pure or nearly pure white fir heterobasidion is expected to persist and mortality patches expand. Removal of symptomatic trees in favor of interplanting non-host species, treating cut stumps with Sporax® and underburning are designed to slow the spread of heterobasidion and develop more resilient stand conditions (Schmitt, et al., 2000; Snyder, 2012a).

Insect and disease activity has been observed in stands that currently provide high quality nesting and roosting habitat, and are not thinned. Underburning in these stands may improve insect and disease conditions to a limited extent but will not reduce stand density or treat infection centers. Underburning can provide some control of dwarf mistletoe, primarily dependent on the level of crown scorch. Low intensity underburning that produces little to no crown scorch has little effect on controlling dwarf mistletoe (Conklin, et al., 2008).

Treatments that improve stand resiliency by reducing excessive density also reduce the risk of undesirable insect and disease activity. Most of the stands thinned to reduce excess density have elevated insect and disease activity and are reflected in the treatment acres below. Density reduction thinning that is preventative (i.e. risk reduction) is included in Table 33 below.
Table 33. Alternative 1 Acres of Insect and Disease Treatment and Risk Reduction

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres with Elevated Insect and Disease Activity</th>
<th>Acres At Risk of Elevated Insect and Disease Activity</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insect and Disease Activity Reduced Through Thinning Treatments</td>
<td>Objective Not Met</td>
<td>Risk Reduced Through Thinning Treatments</td>
</tr>
<tr>
<td></td>
<td>Planted Natural Stands Underburn Only</td>
<td>Planted Natural Stands Underburn Only</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>37 130</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>276 32</td>
<td>634</td>
<td></td>
</tr>
<tr>
<td>3c</td>
<td>62 33</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>179</td>
<td>0</td>
<td>179</td>
</tr>
<tr>
<td>4b</td>
<td>849 150</td>
<td>232 185</td>
<td>1081 335</td>
</tr>
<tr>
<td>4c</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>313 1,190</td>
<td>150 341</td>
<td>2,169 335</td>
</tr>
</tbody>
</table>

Accelerated Development and Retention of Late-Successional Characteristics

Acres Treated to Retain Late-Successional Characteristics

Thinning to reduce elevated stand density in 1,385 acres of natural stands (refer to Table 31) will both retain existing late successional characteristics where present and accelerate their development elsewhere. The majority (over 78 percent) of these stands are defined as seral stage 4b which corresponds to a dense mid or late successional condition as defined in the LSRA (LSRA pp. 22). Thinning predominantly smaller trees provides resources for the resilience and accelerated growth of residual large overstory trees as well as creates growing space for development of increased structural diversity (Latham and Tappiener 2002, Garman, 2003, Kolb, 2007)

Acres of Early and Mid-Successional Treated to Accelerate Development

A total of 692 acres of plantations are treated under Alternative 1 to accelerate the development of late successional characteristics and are displayed in Table 34 below. Thinning in dense early successional (seral 3b and 3c) stands will accelerate the development of large diameter trees by reducing competition as well as speed development of vertical diversity and species diversity (Garman, et al., 2003). Thinning and interplanting in open early successional (seral 3a) stands will accelerate the development of species and structural diversity.

Table 34. Alternative 1 Plantation Treatments to Accelerate Development

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Interplanting</th>
<th>Plantation thin</th>
<th>Subtotals</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>28</td>
<td>37</td>
<td>65</td>
</tr>
<tr>
<td>3b</td>
<td></td>
<td>565</td>
<td>565</td>
</tr>
<tr>
<td>3c</td>
<td></td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td>692</td>
</tr>
</tbody>
</table>

Number of Trees Greater than 24 Inches DBH

Large diameter overstory trees are largely retained, and the likeness of their survival over time is improved, by removing excess density, primarily in smaller size classes. Table 35 displays modeling estimates of...
average trees per acre over 24 inches DBH in all seral stages for thinning units prior to treatment, immediately after thinning and at 20 years post-thin.

Modeling projections show thinning would retain approximately 77 to 80 percent of trees over 24 inches DBH in seral stage 4b and 4c stands immediately after thinning. By year 20, trees over 24 inches DBH approximate 89 to 96 percent of current levels prior to treatment. While it is clear that thinning will reduce the number of trees per acre over 24 inches DBH from current levels, it is important to consider the relevance of this metric in the context of current stand densities and the risk they pose for large-scale disturbance. The current widespread mortality of pine in the project area, including desirable large overstory trees considerably over 24 inches DBH, underscores this risk.

Tree selection—which criteria selects trees for retention versus removal—is an important consideration when discussing numbers and sizes of trees removed. For example, a 26 inches DBH white fir would be selected for removal if it is growing under a 40 inches ponderosa pine being radially released, but would be selected for retention where it is a healthy dominant overstory tree. Modeling was conducted to try and mimic tree selection criteria that would leave some trees in the smaller size classes, thin heaviest in the suppressed and intermediate sized trees, and thin some codominant trees where needed to reduce density and promote adjacent larger trees.

While some trees over 24 inches DBH are removed by thinning, average stand overstory diameter increases by approximately 4 inches immediately after thinning (see Table 36 below). Thinning that result in an immediate post-thin increase of average overstory diameter indicates a “thinning from below” where tree removal focuses on smaller size classes. When comparing action alternatives including Alternative 1 to the No Action Alternative, modeling indicates that unthinned stands would have notably higher levels of trees greater than 24 inches DBH at year 20 than thinned stands. However, modeling results do not reflect extensive and ongoing density related mortality that has been directly observed in the field. This is further discussed under the No Action alternative.

### Table 35. Alternative 1 Average Trees Per Acre Over 24 Inches DBH In Thinning Units Pre and Post-Thinning

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Trees Per Acre Greater than 24 Inches DBH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Thin</td>
</tr>
<tr>
<td>3b</td>
<td>0</td>
</tr>
<tr>
<td>3c</td>
<td>0</td>
</tr>
<tr>
<td>4a</td>
<td>16</td>
</tr>
<tr>
<td>4b</td>
<td>23</td>
</tr>
<tr>
<td>4c</td>
<td>24</td>
</tr>
</tbody>
</table>

### Table 36. Alternative 1 Average Overstory Tree DBH in Thinning Units Pre and Post-Thinning

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Average Diameter of Overstory Trees in Thinning Units (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Thin</td>
</tr>
<tr>
<td>3a</td>
<td>14&quot;</td>
</tr>
<tr>
<td>3b</td>
<td>13&quot;</td>
</tr>
<tr>
<td>3c</td>
<td>9&quot;</td>
</tr>
<tr>
<td>4a</td>
<td>29&quot;</td>
</tr>
<tr>
<td>4b</td>
<td>26&quot;</td>
</tr>
<tr>
<td>4c</td>
<td>25&quot;</td>
</tr>
</tbody>
</table>
Number of Snags Greater than 20 Inches DBH

As discussed throughout this document, tree mortality and subsequent snag levels have increased dramatically within the project area over the last several years. Inventory data and modeling forest stands through time provide tools for effects comparison between alternatives, but may not accurately reflect changing snag levels – both because of recent increases in mortality, and because snag densities tend to be patchy and highly variable across the project area. Table 37 shows modeled estimated snags per acre over 20 inches DBH before and after thinning and at 20 years.

Snag levels are expected to decrease after thinning treatments in order to provide for human safety during operations. Snags would be retained where they are not an operational safety risk and in unthinned patches. Snags would remain at levels consistent with LSRA guidelines for mixed conifer forest after thinning. Open mid-successional (seral stage 4a) stands have a projected marked decline in snags at year 20 under all Alternatives. These are open stands with fewer trees over 20 inches DBH and current elevated snag levels. As existing snags fall, there are low numbers of trees over 20 inches that can recruit into snags and open stand conditions that do not lend to density-induced mortality. Model projections may underestimate numbers of snags at year 20 in light that ongoing mortality from pine beetle will likely persist until beetle populations decline and tree vigor improves. Approximately half of present day snags are projected to fall from natural decay by year 20.

Under Alternative 1, snags would continue to develop from disease and insect activity but at more endemic levels. Higher levels of mortality would continue to be likely in dense stands where thinning is not undertaken to retain existing late successional habitat.

Table 37. Alternative 1 Average snags per acre over 20 inches DBH in Thinning Units Pre and Post-Thinning

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Average Snags Per Acre Greater Than 20 inches DBH in thinning units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Thin</td>
</tr>
<tr>
<td>4a</td>
<td>3.6</td>
</tr>
<tr>
<td>4b</td>
<td>2.5</td>
</tr>
<tr>
<td>4c</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Vegetation Diversity

Development of Stand Level Heterogeneity

Thinning and reforestation treatments are designed to increase stand level heterogeneity as well as reduce density, in the case of thinning. Stand heterogeneity is increased by thinning to a varying range of density and promoting the health and survival of trees or conditions that are sparse such as large pine overstory trees or hardwoods. Unthinned patches retain a dense structural component while fuel continuity is broken up and excess density is treated in adjacent thinning areas. Creating and reforesting group selections in plantations and areas of homogenous white fir, and interplanting mortality areas increases stand level species diversity and structural diversity. Table 38 displays acres of treatments that increase vegetation diversity.

69 The thinning modeling is limited in that it does not reflect the unique tree selection and current snag retention that are in the marking guidelines and likely underestimates snags. See further discussion of modeling limitations on snags under the No Action Alternative.
Table 38. Alternative 1 Acres of Increased Heterogeneity

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Increased Heterogeneity</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interplanting</td>
<td>Plantation Thinning</td>
<td>Natural Stand Thinning</td>
</tr>
<tr>
<td>3a</td>
<td>28</td>
<td>37</td>
<td>141</td>
</tr>
<tr>
<td>3b</td>
<td>565</td>
<td>79</td>
<td>644</td>
</tr>
<tr>
<td>3c</td>
<td>62</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>4a</td>
<td>1,165</td>
<td>1,165</td>
<td>335</td>
</tr>
<tr>
<td>4b</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>subtotals</td>
<td>28</td>
<td>664</td>
<td>1,526</td>
</tr>
</tbody>
</table>

Hardwood Species Release

Hardwoods are in decline throughout the project area because of crowding and over-shading from conifers. Thinning will improve the vigor and long-term survivability of hardwoods by increasing site resource availability, particularly sunlight and growing space. Table 39 displays total stand acres with oaks or aspen detection and acres treated. Table 7 on page 61 shows the actual estimated acres within these stands that treat the hardwoods.

Table 39. Alternative 1 Acres of Hardwood Release

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Hardwood Release</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oak Release</td>
<td>Aspen Release</td>
<td>Subtotals</td>
</tr>
<tr>
<td>1</td>
<td>6*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>207</td>
<td></td>
<td>207</td>
</tr>
<tr>
<td>3b</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>3c</td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>4a</td>
<td></td>
<td></td>
<td>360</td>
</tr>
<tr>
<td>4b</td>
<td></td>
<td></td>
<td>360</td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td></td>
<td>45</td>
</tr>
</tbody>
</table>

The Meadow Enhancement treatment will also release aspen.

Meadow Enhancement

Left unchecked, conifer encroachment changes the structure and function of meadows and can result in the loss of a distinct and valuable habitat (Halpern, et al., 2010). While a number of factors may influence conifer encroachment, fire exclusion appears to play a major role in some instances (Coop, et al., 2007). As discussed in Chapter 1 and the Fire and Fuels section of this chapter, the project area has significantly departed from a natural frequent fire regime. Under Alternatives 1 and 3, thinning and underburning would remove conifer encroachment and reintroduce fire into the meadow ecosystem. These treatments would encourage the growth of perennial and annual herbaceous plants and grasses. Scattered large pine as well as unthinned patches would be retained within the meadow to provide a mix of habitat for other species including mushrooms. Effects of thinning for meadow enhancement are further discussed in the Botany and Hydrology sections of this chapter. Approximately 379 acres of conifer encroachment would be thinned under Alternatives 1 and 3.
Other resource effects

Sporax® Application

Sporax® (Na2B4O710H2O, Sodium tetraborate decahydrate) is used as a registered pesticide (fungicide) for forestry to prevent the spread of Heterobasidion root disease (Wilbur-Ellis, N.D.). Treatment of conifer stumps 14 inches or greater in diameter (outside bark) is recommended (USDA-FS, 2013a p. 11). Sporax® (or a similar commercial formulation) will be applied to freshly cut stump surfaces at a rate of approximately one pound per 50 square feet of stump surface. Based on an estimate of square feet of basal area removal and local experience with Sporax® application in stands with similar prescriptions, it is estimated that about 1 pound of Sporax® per acre would be applied to treated stands. Under Alternative 1 Sporax® would be applied on approximately 2,040 acres of thinning.

An assessment on human health and ecological risks associated with applying borax for stump treatment was completed by the Forest Service in 2006 (USDA-FS, 2006). The report concludes the use of Sporax® in the control of Heterobasidion root disease does not present a significant risk to humans or wildlife species under most conditions of normal use, even under the highest application rate. Given the highly focused application method for Sporax®, application of granular product to cut tree stump surfaces, exposures considered for both the human health and environmental risk assessments are limited to those which are expected to result in significant exposure. The most significant risk of toxicity in both humans and wildlife species results from the direct consumption of Sporax® applied to tree stumps. For terrestrial species, risk associated with the application of Sporax® to tree stumps, appear to be very low. For aquatic animals and plants, hazard quotients (HQ) marginally exceed the level of concern for amphibians for the worst-case accidental spill of 25 pounds of Sporax® into a small pond (HQ, 1.3) and for the sensitive species of microorganisms for all accidental spill scenarios (HQs ranging from about 1 to 4).

Climate Change

The climate in California is predicted to become much warmer in the next three decades with little change in annual precipitation rates (CCCC, 2006). Under some predictive scenarios, changes in climate may occur that exceed the capacity of existing forest tree populations to adjust physiologically and developmentally (Anderson, 2008).

Being relatively long-lived, trees retained or planted as part of this project will likely compose much of the forests in the project area over the next century. Long-term adaptation to climate changes requires healthy and productive forests in the short term. Declined vigor stemming from environmental stresses of climate change may make stands more susceptible to large-scale insect and disease attacks and more frequent or severe fires. Existing species or genotypes may be poorly adapted to future climate conditions during all or various parts of their life cycles; resulting in altered trajectories of forest growth, development, and productivity.

Cumulative effects to forest vegetation from climate change in the project area may result in decreased tree vigor and productivity as well as increase disturbances from insects, disease, and fire. Proposed treatments that reduce stand density levels may increase the resilience of the stands to climate change (Anderson, 2008).

Compliance with Law, Regulation and Policy

Alternative 1 meets Forest Plan direction, watershed analyses desired conditions and regional direction regarding silviculture and timber harvesting as summarized in the Vegetation report, across the project area.

Cumulative Effects – Alternative 1

Some past actions and natural events may overlap in time and space with the proposed action. However, past actions are not being considered individually. The current environmental conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and are a proxy for the impacts of past actions.
Under the Pilgrim Vegetation Management project, thinning of mostly small diameter trees less than 14 inch DBH is planned for approximately 147 acres in stand 401, south of Elk Flat. Historic photos showed this stand to contain open meadow areas contiguous with Elk Flat mixed with stringers and dense pockets of trees, primarily larger diameter pine. This treatment will support the Elk LSR meadow enhancement treatments by removing conifer encroachment. Small tree removal will create stand conditions that more closely reflect those of a dry pine forest under frequent natural fire.

Firewood cutting of downed wood is allowed within the LSR to a limited extent and felling and collecting of firewood is allowed on the 490 acres of matrix lands within the project area. This activity could potentially remove a minor portion of dead fuels but would have no appreciable effect to the forest stand conditions and resource indicators discussed in this section.

The felling of snags for hazard tree abatement would remove a component of snags in the project area as described in Chapter 2 (see hazard reduction, p. 59). Snags would be retained elsewhere in the project area including in thinning units, unthinned patches within treatment units and in unthinned stands. Collectively, the treatments and untreated stands would leave a mosaic of snag distributions and snag densities consistent with desired conditions described in the LSRA (p.164).

**Alternative 2- No New Temporary Road Construction Other Than Those Required for Landing Access**

**Direct and Indirect Effects – Alternative 2**

**Risk Reduction and Increased Stand Resilience**

**Stand Density Reduction and Resilience**

Under Alternative 2, plantations and natural stands totaling 1,846 acres would be thinned to reduce overstocking and promote resilience of the residual trees. This is a decrease of 166 acres from Alternative 1 and reflective of a decrease in road access to conduct thinning. Effects from thinning are those described under Alternative 1.

Radial thinning around large predominant pine would be implemented in fourteen thinning stands totaling 188 acres. This is a decrease of five acres compared with Alternative 1 and reflects stands left unthinned due to limited access.

As described in Alternative 1, approximately 12 percent of thinned stands would remain in unthinned patches at stocking levels that pose a risk for density related and insect and disease mortality as described under Alternative 1.

Dense stands totaling 400 acres would not be thinned under Alternative 2. This leaves 65 acres of dense stands not thinned, compared to Alternative 1. Surface small ladder fuels would be treated in these stands by underburning but overall density will not be appreciably reduced. These stands would remain susceptible to insect and disease attack and to density related mortality. Presently, 335 acres of these unthinned stands provide quality nesting and roosting habitat in their current condition however, these conditions are not expected to persist in the long term.
Table 40. Alternative 2 Acres of Stand Density Reduction

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Stands at High Density</th>
<th>Plantation Thinning</th>
<th>Natural Stand Thinning</th>
<th>Subtotals</th>
<th>Objective Met Through Thinning</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>3b</td>
<td></td>
<td>539</td>
<td>79</td>
<td>618</td>
<td>16</td>
<td>634</td>
<td></td>
</tr>
<tr>
<td>3c</td>
<td></td>
<td>62</td>
<td>33</td>
<td>95</td>
<td></td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td></td>
<td></td>
<td>174</td>
<td>174</td>
<td>5</td>
<td>179</td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td></td>
<td>1,036</td>
<td>1,036</td>
<td></td>
<td>379</td>
<td>1,415</td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td>13</td>
<td>13</td>
<td></td>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>subtotals</td>
<td></td>
<td>601</td>
<td>1,335</td>
<td>1,936</td>
<td>400</td>
<td>2,336</td>
<td></td>
</tr>
</tbody>
</table>

_Insect and Disease Treatment and Risk Reduction_

Alternative 2 thinning acres in stands with elevated insect and disease activity are the same as Alternative 1. As discussed under Alternative 1, treatments that improve stand resiliency also reduce the risk of undesirable insect and disease activity. Table 41 displays stand acres treated with active insect and disease mortality, and acres treated to reduce the risk of undesirable insect and disease mortality.

A total of 401 acres of stands are not treated and remain at density levels that are at risk of undesirable insect and disease mortality under Alternative 2. This is an increase of 166 untreated acres compared to Alternative 1. Underburning in these dense unthinned stands may improve insect and disease conditions to a limited extent but will not appreciably reduce stand density. Underburning can provide some control of dwarf mistletoe, primarily dependent on the level of crown scorch. Low intensity underburning that produces little to no crown scorch has little effect on controlling dwarf mistletoe (Conklin, et al., 2008).
Table 41. Alternative 2 Acres of Insect and Disease Treatment and Risk Reduction

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres with Insect and Disease Activity</th>
<th>Acres of Insect and Disease Risk Reduction</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Objective Met Through Thinning Treatments</td>
<td>Objective Not Met</td>
<td>Objective Met Through Thinning Treatments</td>
</tr>
<tr>
<td></td>
<td>Plantations</td>
<td>Natural Stands</td>
<td>Underburn Only</td>
</tr>
<tr>
<td>3a</td>
<td>37</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>3b</td>
<td>260</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>3c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>174</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>804</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>297</td>
<td>1,139</td>
<td>217</td>
</tr>
</tbody>
</table>

Accelerated Development and Retention of Late-Successional Characteristics

*Acres Treated to Retain Late-Successional Characteristics*

Thinning to reduce elevated stand density in 1,335 acres of natural stands under Alternative 2 (refer to Table 40) will both retain existing late successional characteristics where present and accelerate their development elsewhere. This is a decrease of 50 acres compared to Alternative 1.

*Acres of Early and Mid-Successional Treated to Accelerate Development*

A total of 676 acres of plantations are treated under Alternative 2 to accelerate the development of late successional characteristics (see Table 42). Thinning in dense early successional (seral 3b and 3c) stands will accelerate the development of large diameter trees by reducing competition as well as speed development of vertical diversity and species diversity (Garman et al, 2003). Thinning and interplanting in open early successional (seral 3a) stands will accelerate the development of species and structural diversity.

A total of 400 acres of dense mid and late successional natural stands and plantations are not treated and would not meet this objective under Alternative 2 (see acres of “Underburn Only” in tables Table 40 and Table 42).

Table 42. Alternative 2 Plantation Treatments to Accelerate Development

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Plantations Treated to Accelerated Development of Late-Successional Characteristics</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interplanting</td>
<td>Plantation Thinning</td>
<td>Subtotals</td>
</tr>
<tr>
<td>3a</td>
<td>28</td>
<td>37</td>
<td>65</td>
</tr>
<tr>
<td>3b</td>
<td></td>
<td>548</td>
<td>548</td>
</tr>
<tr>
<td>3c</td>
<td></td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>4a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>28</td>
<td>648</td>
<td>676</td>
</tr>
</tbody>
</table>
Number of Trees Greater than 24 Inches DBH and Snags Greater than 20 Inches DBH

On a per acre basis, the retention of late successional characteristics (i.e. trees per acre greater than 24 inches DBH, stand average overstory tree diameter and snags greater than 20 inches) in mid and late-successional stands are the same across all Action Alternatives, including Alternative 2 (see Table 35 to Table 37). Effects are the same as described under Alternative 1 except thinning in mid and late successional stands (both plantations and natural stands) is reduced by a total of 58 acres compared to Alternative 1

Vegetation Diversity

Development of Stand Level Heterogeneity

The effects of developing stand level heterogeneity are the same as described in Alternative 1. Treatments will increase heterogeneity on a total of 2,152 acres of plantations and natural stands Under Alternative 2 (see Table 43).

Under Alternative 2, there are 66 fewer acres treated towards this objective compared to Alternative 1. Most of the stands left unthinned are natural stand thinning, however this also includes four acres of group selections in plantations, and five acres of radial thinning in plantations and natural stands. Group selections and radial thin are conducted concurrently with thinning and collectively increase stand heterogeneity. Where thinning treatments are not undertaken, stands would remain dense and growth rates slow until disturbance or instances of tree mortality occur to free up site resources. While stands remain in a dense overstocked condition, little species or structural diversification occurs as site resources are fully captured by existing vegetation.

Table 43. Alternative 2 Acres of Increased Heterogeneity

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Increased Heterogeneity</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interplanting</td>
<td>Plantation Thinning</td>
<td>Natural Stand Thinning</td>
</tr>
<tr>
<td>3a</td>
<td>28</td>
<td>37</td>
<td>140</td>
</tr>
<tr>
<td>3b</td>
<td>548</td>
<td>79</td>
<td>627</td>
</tr>
<tr>
<td>3c</td>
<td>62</td>
<td>33</td>
<td>95</td>
</tr>
<tr>
<td>4a</td>
<td>90</td>
<td>90</td>
<td>180</td>
</tr>
<tr>
<td>4b</td>
<td>1,120</td>
<td>1,120</td>
<td>379</td>
</tr>
<tr>
<td>4c</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>subtotals</td>
<td>28</td>
<td>647</td>
<td>1,475</td>
</tr>
</tbody>
</table>

Hardwood Species Release

Effects of thinning on hardwood species release are the same as described in Alternative 1. Treatments totaling 555 acres would promote the survival and growth of hardwoods under Alternative 2 (see Table 44). This is a decrease of 38 acres in stands of natural thinning compared to Alternative 1. A total of 76 acres would not meet the objective for oak release and 5 acres would not meet the objective for aspen release under Alternative 2.

Where left untreated, shade intolerant hardwoods would continue to decline due to overtopping and crowding by conifers. Over time, barring disturbance that removes competing conifers, individual oak and aspen will die out as they receive insufficient sunlight and site resources. Current mortality in overstory pine is providing release of hardwoods including aspen to a limited extent. While this is providing sunlight and growing space...
for hardwood release, as snags fall heavy fuel loadings will accumulate. With heavy fuel loads high intensity fire can burn with sufficient intensity and residence time to kill off and prevent sprouting in oak and aspen.

Table 44. Alternative 2 Acres of Hardwood Release

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Hardwood Release</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Oak Release</td>
<td>Aspen Release</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>6*</td>
<td>6</td>
</tr>
<tr>
<td>3b</td>
<td>207</td>
<td></td>
<td>207</td>
</tr>
<tr>
<td>3c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>18</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>4b</td>
<td>327</td>
<td>327</td>
<td>76</td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>subtotals</td>
<td>534</td>
<td>24</td>
<td>555</td>
</tr>
</tbody>
</table>

*Meadow Enhancement treatment also releases aspen

Meadow Enhancement

The effects of thinning conifer encroachment in Elk Flat would be the same as discussed for Alternative 1 however there would be 25 less acres of conifer encroachment thinning under Alternative 2. Underburning would likely remove a minor portion of smaller understory trees in the unthinned areas but larger trees would persist and serve as a seed source for further conifer encroachment. Much of the conifer encroachment would be largely treated under Alternative 2 however retained forested patches (including the unthinned patches under all action alternatives) provide both the seed source and ecotone (i.e. “edge effect”) that can encourage a relative rapid expansion of conifer encroachment when other environmental factors are favorable (Halpern et al, 2010). Under Alternative 2 the purpose and need of meadow enhancement would be met to an incrementally lesser degree, with the consideration that retained forest patches can have a broader impact than a simple accounting of forested acres.

Other resource effects

Sporax® Application

Effects of Sporax® application are those described under Alternative 1. Sporax® would be applied to cut stumps 14 inches in diameter and greater on approximately 1,958 harvest acres under Alternative 2.

Climate Change

Effects of climate change are those described in Alternative 1.

Compliance with Law, Regulation and Policy

Alternative 2 meets Forest Plan direction, watershed analyses desired conditions and regional direction regarding silviculture and timber harvesting as summarized in the Vegetation report, across the treated area.

Cumulative Effects – Alternative 2

Cumulative effects for Alternative 2 would be the same as those described for Alternative 1.

Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl
**Direct and Indirect Effects – Alternative 3**

**Risk Reduction and Increased Stand Resilience**

*Stand Density Reduction and Resilience*

Under Alternative 3, plantations and natural stands totaling 1,698 acres would be thinned to reduce overstocking and promote stand resilience (see Table 45). Effects from thinning are those described under Alternative 1.

Dense stands totaling 639 acres are not thinned under Alternative 3. Radial thin treatments decrease by 26 acres compared to Alternative 1, these radial thin treatments fall within stands left unthinned under this alternative. Under Alternative 3, more contiguous dense forest conditions would be retained than in Alternatives 1 and 2. Conditions would remain conducive to insect and disease outbreaks and spread from these larger contiguous areas.

As in all Action Alternatives, approximately 12 percent of treated stands would be retained as unthinned patches dispersed throughout the stands. Higher densities would also be retained where groups of notably large trees occur in order to retain existing desirable late successional characteristics. Dense unthinned patches and high retention areas within the thinned stands would remain at a higher risk of density related mortality but their dispersed less contiguous distribution would be more reflective of endemic conditions.

**Table 45. Alternative 3 Acres of Stand Density Reduction**

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Plantation Thinning</th>
<th>Natural Stand Thinning</th>
<th>Subtotals</th>
<th>Underburn Only</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>3b</td>
<td>555</td>
<td>37</td>
<td>592</td>
<td>42</td>
<td>634</td>
</tr>
<tr>
<td>3c</td>
<td>62</td>
<td></td>
<td>62</td>
<td>33</td>
<td>95</td>
</tr>
<tr>
<td>4a</td>
<td>179</td>
<td></td>
<td>179</td>
<td></td>
<td>179</td>
</tr>
<tr>
<td>4b</td>
<td>853</td>
<td></td>
<td>853</td>
<td>563</td>
<td>1,416</td>
</tr>
<tr>
<td>4c</td>
<td>13</td>
<td></td>
<td>13</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>subtotals</td>
<td>617</td>
<td>1,082</td>
<td>1,699</td>
<td>638</td>
<td>2,337</td>
</tr>
</tbody>
</table>

**Insect and Disease Treatment and Risk Reduction**

Insect and disease conditions are the same as described in Alternative 1. As discussed under Alternative 1, treatments that improve stand resiliency also reduce the risk of undesirable insect and disease activity (Fiddler, et al., 1989). Table 46 displays stand acres treated with active insect and disease mortality, and acres treated to reduce the risk of undesirable insect and disease mortality.

There is a decrease of 157 acres of treatments in stands with active insect and disease mortality compared to Alternative 1. Thinning that provides risk reduction for insect and disease mortality is decreased by 168 acres compared to Alternative 1. Underburning in these dense unthinned stands may improve insect and disease conditions to a limited extent but will not appreciably reduce stand density. Underburning can provide some control of dwarf mistletoe, primarily dependent on the level of crown scorch. Low intensity underburning that produces little to no crown scorch has little effect on controlling dwarf mistletoe (Conklin, et al., 2008).
Table 46. Alternative 3 Acres of Insect and Disease Treatment and Risk Reduction

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres with Insect and Disease Activity</th>
<th>Acres of Insect and Disease Risk Reduction</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Objective Met Through Thinning Treatments</td>
<td>Objective Not Met</td>
<td>Objective Met Through Thinning Treatments</td>
</tr>
<tr>
<td></td>
<td>Plantations</td>
<td>Natural Stands</td>
<td>Underburn Only</td>
</tr>
<tr>
<td>3a</td>
<td>37</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>276</td>
<td>32</td>
<td>279</td>
</tr>
<tr>
<td>3c</td>
<td></td>
<td></td>
<td>62</td>
</tr>
<tr>
<td>4a</td>
<td>179</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>713</td>
<td>286</td>
<td>140</td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>313</td>
<td>1,022</td>
<td>318</td>
</tr>
</tbody>
</table>

Accelerated Development and Retention of Late-Successional Characteristics

*Acres of Early and Mid-Successional Treated to Accelerate Development*

Natural stands totaling 1,081 acres are thinned under Alternative 3 to both retain and accelerate development of late successional characteristics (see Table 45). The majority (approximately 79 percent) of these stands are defined as seral stage 4b which corresponds to a dense mid or late successional condition as defined in the LSRA (pp. 22).

Within thinning units, snags would continue to develop from disease and insect activity but at more endemic levels. Higher levels of mortality would continue to be likely in dense stands where thinning is not undertaken to retain existing late successional habitat. Growth of large overstory trees would remain suppressed in untreated dense stands.

Plantations treated to accelerate the development of late successional characteristics under Alternative 3 are the same as Alternative 1 (see Table 34) Thinning in dense early successional (seral 3b and 3c) stands will accelerate the development of large diameter trees by reducing competition as well as speed development of vertical diversity and species diversity (Garman, et al., 2003). Thinning and interplanting in open early successional (seral 3a) stands will accelerate the development of species and structural diversity.

A total of 638 acres of dense mid and late successional natural stands and plantations are left unthinned, and would not meet the objective under Alternative 3 (see Table 45).

*Number of Trees Greater than 24 Inches DBH and Snags Greater than 20 Inches DBH*

On a per acre basis, the retention of late successional characteristics (i.e. trees per acre greater than 24 inches DBH, stand average overstory tree diameter and snags greater than 20 inches) in dense mid and late successional stands are the same across all Action Alternatives, including Alternative 3 (see Table 35 to Table 37). Effects are the same as described under Alternative 1 except thinning in mid and late successional stands (both plantations and natural stands) is reduced by a total of 267 acres compared to Alternative 1.
Vegetation Diversity

Development of Stand Level Heterogeneity

The effects of developing stand level heterogeneity are the same as described in Alternative 1. Treatments will promote stand heterogeneity on a total of 1,194 acres of plantations and natural stands under Alternative 3 (see Table 47).

Under Alternative 3, there are 303 fewer acres treated towards this objective compared to Alternative 1 and a total of 639 acres left unthinned. Where thinning treatments are not completed, stands would remain dense and growth rates slow until disturbance or instances of tree mortality occur to free up site resources. While stands remain in a dense overstocked condition, little species or structural diversification occurs as site resources are fully captured by existing vegetation.

Table 47. Alternative 3 Acres of Increased Heterogeneity

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Increased Heterogeneity</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interplanting</td>
<td>Natural Stand Thinning</td>
<td>Subtotals</td>
</tr>
<tr>
<td>3a</td>
<td>28</td>
<td>37</td>
<td>141</td>
</tr>
<tr>
<td>3b</td>
<td>565</td>
<td>37</td>
<td>602</td>
</tr>
<tr>
<td>3c</td>
<td>62</td>
<td></td>
<td>62</td>
</tr>
<tr>
<td>4a</td>
<td></td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>4b</td>
<td>937</td>
<td>937</td>
<td>937</td>
</tr>
<tr>
<td>4c</td>
<td></td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>subtotals</td>
<td>28</td>
<td>664</td>
<td>1,223</td>
</tr>
</tbody>
</table>

Hardwood Species Retention

Effects of thinning on hardwood species release are the same as described in Alternative 1. Stand treatments totaling 445 acres would promote the survival and growth of hardwoods under Alternative 3 (see Table 48). This is a decrease of 148 acres identified for oak release in natural stand thinning compared to Alternative 1.

Where left untreated, shade intolerant hardwoods would continue to decline due to overtopping and crowding by conifers. Over time, barring disturbance that removes competing conifers, individual oak and aspen will die out as they receive insufficient sunlight and site resources. Current mortality in overstory pine is providing release of hardwoods including aspen to a limited extent. While this is providing sunlight and growing space for hardwood release, as snags fall heavy fuel loadings will accumulate. With heavy fuel loads high intensity fire can burn with sufficient intensity and residence time to kill off and prevent sprouting in oak and aspen.
Meadow Enhancement

The effects of meadow enhancement under Alternative 3 are the same as those described in Alternative 1, above.

Other resource effects

Sporax® Application

Effects of Sporax® application are those described under Alternative 1. Sporax® would be applied to cut stumps 14 inches in diameter and greater on approximately 1,773 harvest acres under Alternative 3.

Climate Change

Effects of climate change are those described in Alternative 1.

Compliance with Law, Regulation and Policy

Alternative 3 meets Forest Plan direction, watershed analyses desired conditions and regional direction regarding silviculture and timber harvesting as summarized in the Vegetation report, across the treated area.

Cumulative Effects – Alternative 3

Cumulative effects for Alternative 3 would be the same as those described for Alternative 1.

Alternative 4 - No Action

Under No Action, the proposed management activities would not be implemented. No direct, indirect, or cumulative effects are expected. Although there would be no actions undertaken with this alternative, ongoing trends would continue. Chapter 1 describes the existing condition and trends in Purpose and Need #1 and #2.

Under the No Action Alternative, stands would remain at high mortality risk and large tree growth would be slow due to inter-tree competition for site resources. While stand modeling is useful for comparing trends across Alternatives and through time, it is important to understand modeling limitations when interpreting results. For instance, under the No Action Alternative, modeling suggests there would be an increase in the average number of trees over 24” DBH and snags over 20” by year 20, compared to the Action Alternatives.

Modeling results do not account for the insect and disease activity and mortality patterns that have recently occurred and are ongoing. As noted elsewhere in this document, a complex of bark beetles and root disease, further exacerbated by several years of drought, have caused elevated mortality above endemic levels.

Table 48. Alternative 3 Acres of Hardwood Release

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Acres of Hardwood Release</th>
<th>Objective Not Met</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oak Release</td>
<td>Aspen Release</td>
<td>Subtotals</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>3a</td>
<td>170</td>
<td>170</td>
<td>38</td>
</tr>
<tr>
<td>3b</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>3c</td>
<td>250</td>
<td>250</td>
<td>154</td>
</tr>
<tr>
<td>4a</td>
<td>419</td>
<td>24</td>
<td>444</td>
</tr>
<tr>
<td>4b</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td>subtotals</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Meadow Enhancement treatment will also release aspen
throughout much of the project area. There is a loss of large diameter trees not accounted for in the No Action modeling results. The model results reflect a more typical pattern of density related mortality where smaller trees die off from competition. The No Action modeling results do not reflect the observed pine mortality and widely held research findings of a pine mortality threshold (Oliver, 1995; Otrosina, et al., 2007; Egan, et al., 2010; Snyder, 2012).

In natural stands, ponderosa pine is primarily a component of large overstory trees (30” DBH and greater) growing with a dense shade tolerant understory and mid-story, primarily of white fir and incense cedar. As most of the mortality is occurring within the pine, including large trees, it is likely that the number of large trees and average stand diameter would decrease over time under the No Action alternative, contrary to modeling results. This would be due to the loss of large overstory pine and persistence of smaller white fir and incense cedar.

With current mortality trends, future stands under the No Action alternative would be characterized by a dense layer of smaller shade tolerant trees with fewer large diameter trees and areas of high concentrations of fuels conducive to high intensity fire.

The increased risk of further stand loss from heavy fuel accumulation, slow growth of large trees due to high stand densities, and continued loss of large overstory pine from insects and disease under the No Action alternative do not meet the purpose and need of promoting stand resilience, and retaining and accelerating the development of late successional characteristics.

Since there are no direct or indirect effects with No Action, Alternative 4 would result in no cumulative effects.

Summary and Conclusions

**Comparison of Modeling Projections for Indicators of Stand Resilience and Late Successional Forest Characteristics Development and Retention**

Table 49 through Table 52 below display modeling results for Silviculture resource indicators under the No Action alternative and show a comparison with modeling results for thinning treatments.

**Table 49. Average Percent of Pine-Limiting SDI**

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>No Action Year 1</th>
<th>No Action Year 20</th>
<th>Action Alternatives - post-thin</th>
<th>Action Alternatives - year 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>40%</td>
<td>66%</td>
<td>38%</td>
<td>60%</td>
</tr>
<tr>
<td>3b</td>
<td>73%</td>
<td>102%</td>
<td>41%</td>
<td>59%</td>
</tr>
<tr>
<td>3c</td>
<td>141%</td>
<td>138%</td>
<td>40%</td>
<td>51%</td>
</tr>
<tr>
<td>4a</td>
<td>70%</td>
<td>85%</td>
<td>46%</td>
<td>57%</td>
</tr>
<tr>
<td>4b</td>
<td>112%</td>
<td>128%</td>
<td>60%</td>
<td>79%</td>
</tr>
<tr>
<td>4c</td>
<td>117%</td>
<td>130%</td>
<td>66%</td>
<td>82%</td>
</tr>
</tbody>
</table>

**Table 50. Average Trees Per Acre, > 24” DBH**

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>No Action Year 1</th>
<th>No Action Year 20</th>
<th>Action Alternatives - year 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>3b</td>
<td>0</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>3c</td>
<td>0</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>4a</td>
<td>16</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>4b</td>
<td>23</td>
<td>31</td>
<td>22</td>
</tr>
</tbody>
</table>

Shasta-McCloud Management Unit 149
Table 51. Average Overstory DBH

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>No Action Year 1</th>
<th>No Action Year 20</th>
<th>Action Alternatives - year 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>14</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>3b</td>
<td>13</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>3c</td>
<td>9</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>4a</td>
<td>29</td>
<td>26</td>
<td>32</td>
</tr>
<tr>
<td>4b</td>
<td>25</td>
<td>28</td>
<td>31</td>
</tr>
<tr>
<td>4c</td>
<td>26</td>
<td>29</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 52. Average Snags ≥ 20” DBH

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>No Action Year 1</th>
<th>No Action Year 20</th>
<th>Action Alternatives - year 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3b</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3c</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4a</td>
<td>3.6</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>4b</td>
<td>2.5</td>
<td>2.2</td>
<td>1.7</td>
</tr>
<tr>
<td>4c</td>
<td>4.4</td>
<td>4.6</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Silviculture treatments under Action Alternatives 1 through 3 are designed to address issues of stand health and densification that have developed largely from decades of natural fire exclusion, while promoting a mosaic of stand conditions that support the development and retention of late successional forest characteristics. The differences in the Action Alternatives are in the number of acres treated. Along with a direct comparison of treated acres, it is important to consider the influence of the spatial arrangement of treatments and forest conditions as well. For example, large contiguous areas of susceptible hosts for insects or pathogen are more likely to support epidemic outbreaks as compared to forests where there are a mosaic of conditions including gaps or openings.

Table 53 below displays a direct comparison of treated acres between the alternatives as well as a summary and comparison of effects.
Table 53. Summary of Effects to Silviculture and Forest Health

<table>
<thead>
<tr>
<th>P&amp;N, Key Issue, or Resource Effect</th>
<th>Indicator</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4 No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>P&amp;N #1, Key Issue #1, Resource</td>
<td>Acres of reduced stand densities that support stand growth and resilience</td>
<td>Stands totaling 2,002 acres treated</td>
<td>Stands totaling 1,936 acres treated</td>
<td>Stands totaling 1,699 acres treated</td>
<td>No stands treated</td>
</tr>
<tr>
<td></td>
<td>Density (SDI) reduced below pine mortality threshold post-thin</td>
<td>Same average reductions in SDI but on 66 fewer acres</td>
<td>Same average reductions in SDI but on 303 fewer acres</td>
<td>Density (SDI) well above pine mortality threshold at year 1 and year 20 - However projections do not account for insect and disease outbreak. Field observations and research indicate the high densities will not persist for 20 years</td>
<td></td>
</tr>
<tr>
<td>P&amp;N #1, Key Issue #1, Resource</td>
<td>Acres of treatment and risk reduction of insect and disease outbreak</td>
<td>Stands totaling 2,169 acres treated to address elevated insect and disease outbreaks, or reduce the risk of additional outbreaks</td>
<td>Stands totaling 2,103 acres treated, This is 66 fewer acres of risk reduction treatment, but all stands with elevated insect and disease are still treated</td>
<td>Stands totaling 1,866 acres treated, This is a total of 303 less acres; of which 169 acres are stands with elevated insect and disease outbreak, and 135 acres are stands at risk of outbreak. See No Action discussion of contiguous untreated stands</td>
<td>No Stands Treated. Under both Alternative 3 and 4, contiguous dense stands are left intact, including those with elevated insects and disease. These areas will continue to be active infection centers and keep adjacent stands at risk by providing conditions that support epidemic outbreaks</td>
</tr>
<tr>
<td>P&amp;N #2, Key Issue #1, Resource</td>
<td>Acres early and mid-successional treated to accelerate development of late successional characteristics</td>
<td>692 Acres of Plantations 1,385 acres of natural stands (of which nearly half are in a mid-successional condition)</td>
<td>676 Acres of Plantations; this is 16 fewer acres 1,335 acres of natural stands; this is 50 fewer acres</td>
<td>692 Acres of Plantations – no change 1,083 acres of natural stands; this is 304 fewer acres</td>
<td>No stands treated</td>
</tr>
<tr>
<td>P&amp;N, Key Issue, or Resource Effect</td>
<td>Indicator</td>
<td>Alternative 1</td>
<td>Alternative 2</td>
<td>Alternative 3</td>
<td>Alternative 4 No Action</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>----------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td>Number of trees per acre greater than 24 inches diameter breast height (DBH) immediately post-treatment and projected in 20 years based on comparative modeling of the alternatives. (in the 4a,b,c Seral stage classes)</td>
<td>Post thin ranges 16-19 TPA &gt; 24&quot; DBH (varies by density class) Year 20 ranges 17-22 TPA &gt; 24&quot; DBH (varies by density class)</td>
<td>Same as Alt. 1</td>
<td>Same as Alt. 1</td>
<td>Year one ranges 16 – 24 TPA &gt; 24&quot; DBH (varies by density class) Year 20 ranges 16-31 TPA &gt; 24&quot; DBH however mortality observations and research on pine density threshold do not support these upper projected numbers at year 20</td>
</tr>
<tr>
<td></td>
<td>Number of snags greater than 20 inches DBH immediately post treatment and projected in 20 years from comparative modeling. - Refer to discussion of modeling limitations – particularly with snags. Numbers are more suited for analysis of trends rather than absolutes</td>
<td>Post-thin ranges 2.0 to 3.5 snags/acre depending on stand density class Year 20 ranges 0.3 to 3.6 snags/acre depending on density class</td>
<td>Same as Alt. 1</td>
<td>Same as Alt. 1</td>
<td>Year 1 ranges 2.5 – 4.4 snags/acre depending on stand density class Year 20 ranges 0.4 – 4.6 snags/acre depending on density class</td>
</tr>
<tr>
<td>P&amp;N #2 &amp; #4, Resource</td>
<td>Acres promoting growth and resilience of hardwoods including aspen, commensurate with late successional stand development.</td>
<td>Oak released in stands totaling 567 acres (i.e. oak has been detected and will be promoted throughout these stands) Aspen released on 24 acres</td>
<td>Oak released in stands totaling 534 acres; this is 33 fewer acres than Alt. 1 Aspen – same as Alt. 1</td>
<td>Oak released in stands totaling 419 acres; this is 148 fewer acres than Alt. 1 Aspen – same as Alt. 1</td>
<td>Aspen and oak continue declining in stands due to competition and shading out by overtopping conifers</td>
</tr>
<tr>
<td></td>
<td>Acres of increased stand heterogeneity</td>
<td>Treatments in stands totaling 2,218 acres will promote stand heterogeneity</td>
<td>Treatments in stands totaling 2,150 acres will promote stand heterogeneity; this is 68 fewer acres than Alt. 1</td>
<td>Treatments in stands totaling 1,915 acres will promote stand heterogeneity; this is 303 fewer acres than Alt. 1</td>
<td>Dense stand conditions with little structural diversity will persist until and as forest disturbance events occur</td>
</tr>
</tbody>
</table>

Meadow Enhancement
### Compliance with Law, Regulation and Policy (includes Forest Plan under NFMA)

All silvicultural treatments in the action alternatives follow Forest Plan direction, are consistent with watershed analyses recommendations and comply with regional direction regarding silviculture and timber harvesting as summarized in the Vegetation report, across the project area. Appendix H provides the NFMA compliance consistency and other vegetation-related consistency. Specifically refer to discussions starting on pages H-12 (NFMA), H-17 (LSR), and H-28 (Vegetation Diversity).

### Fire and Fuels

A Fire and Fuels Specialist Report (McRae, 2016) was completed for this project and is incorporated by reference. Information relevant to this decision is summarized here.

#### Introduction

**Purpose and Need Applicable to Fire and Fuels**

Purpose and Need for Action #1 - Risk Reduction in Early, Mid and Late-Successional Habitat and Increased Stand Resilience to Disturbance is applicable to fire and fuels. The existing and desired conditions relating to fuels are provided in Chapter 1, starting on page 24. The departure between the existing condition and desired conditions for fire regime, fuel loading and fire behavior contribute to the identification of the Purpose and Need for Action. Secondary purposes, applicable to fire and fuels include #3 - Restore Meadow Habitat in Elk Flat described in Chapter 1 starting on page 30.

#### Issues Applicable to Fire and Fuels

Issue #5, Machine Piling, described on page 47, indirectly applies to fire and fuels since machine piling is proposed for fuels reduction. The acres of machine piling by alternative is the issue indicator; however, the issue and indicator relate to effects to soils. Effects to fuel loading from machine piling is addressed here.

#### Methodology

Stand exam data was collected in spring of 2007, including Brown’s method (Brown, et al., 1982) fuels sampling. Modeling assumptions, limits and other specifics can be found in the silviculture report (Payne, 2015b). In fall 2011 additional data using the photo series (Maxwell, et al., 1979) was collected to assess ongoing mortality observed in the project area.

Stand exam data was processed through the FVS, Fire and Fuels Extension (FFE), to derive pre- and post-treatment fuel loading, and vegetation characteristics that influence fire behavior (canopy base height and crown bulk density), the results of which were used in the effects analysis. FVS/FFE models fire spread through the stands before and after treatment where other fire models such as Flam Map, Behave, and FSPro do not.

---

<table>
<thead>
<tr>
<th>P&amp;N, Key Issue, or Resource Effect</th>
<th>Indicator</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4 No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>P&amp;N #3, Resource Acres of reduced conifer encroachment</td>
<td>Stand totaling 518 acres treated for meadow enhancement (thinning to reduce conifer encroachment)</td>
<td>Stand totaling 494 acres treated for meadow enhancement; this is 24 fewer acres than Alt. 1</td>
<td>Same as Alt. 1</td>
<td>With no treatment, conifer encroachment will continue and lead to further loss of meadow habitat over time</td>
<td></td>
</tr>
</tbody>
</table>
Weather parameters from 23 years of observations at the Ash Creek Remote Automated Weather Station (RAWS) were used for modeling. The date range for weather observations used was July 1 – October 1, which represents when the most severe fire behavior conditions are likely to occur. Ninety-seventh percentile weather conditions were utilized to evaluate alternatives against the most extreme fire behavior.

**Indicators and Measures**

Criteria were developed to evaluate how well each alternative meets the project Purpose and Need and follows policy and direction as follows:

**Indicators of Purpose and Need #1**

- **Fuel Loading** - Acres of reduced ladder and overstory fuels, and surface fuels that meet Forest Plan standards (average of 5 tons per acre in Matrix and average between 5 and 35 tons per acre in LSR) within the constraints of the resource protection measures that require higher levels in specific areas.

- **Fuel Models** – Fuel models present within the project area. Fuel models 2 and 9 (with limited surface fuel loading) are desired.

- **Potential Fire Behavior** - Fire behavior characteristics expressed as a measure of expected flame length on a 97th percentile fire weather day. Table 54 summarizes fire behavior by flame length category. The desired flame length is 0-4 feet for fireline safety and the use of mostly handline during wildfire conditions.

<table>
<thead>
<tr>
<th>Flame Length (feet)</th>
<th>Interpretations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>Fires can generally be attacked at the head or flanks by persons using hand tools. Handline should hold the fire</td>
</tr>
<tr>
<td>4-8</td>
<td>Fires are too intense for direct attack on the head of the fire by persons using hand tools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.</td>
</tr>
<tr>
<td>8-11</td>
<td>Fires may present serious control problems – torching out, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.</td>
</tr>
<tr>
<td>11+</td>
<td>Crowning, spotting, and major runs are common. Control efforts at the head of the fire are ineffective.</td>
</tr>
</tbody>
</table>

Source: (NWCG, 2006 p. Appdx. B)

- **Fire type anticipated under extreme fire conditions.** The desired fire type is surface fire with limited torching and no running crown fire.

In addition to measuring how well the desired condition pertaining to the Purpose and Need for Action for fire restoration and fuels reduction, the ability to manage a fire, firefighter safety, impacts to private property, and WUI objectives can all be estimated utilizing these evaluation criteria.

**Boundaries**

To determine relevant past, present, and foreseeable future projects, spatial and temporal boundaries must be defined (CFR § 220.4 (f)). For the effects analysis the direct and indirect effects of the Elk project relative to fire and fuels are conditions influencing fuel loading and ladder and crown fuel characteristics. Direct and
indirect effects from the Elk project that influence these conditions are changes to surface fuel accumulations, small tree and brush growth or density, overstory tree density, tree crown heights, and tree mortality (and resultant deadfall).

**Spatial Bounding**

Spatially, direct and indirect effects of changes to fuel loading, ladder and crown fuel characteristics from project activities are within and nearby the treated units. As such, the spatial context being considered is the Elk Flat LSR Enhancement Project boundary. This boundary represents the area potentially influenced by effects from proposed treatment activities.

**Temporal Bounding**

Temporally, direct and indirect effects of changes to fuel loading, ladder and crown fuel characteristics from project activities are expected to remain effective for about ten about years. Multiple prescribed fire entries would be used to restore the historical fire return interval and maintain the stands throughout time. The burn entries would be timed to ensure effectiveness of treatments was not lost. The cumulative effects analysis timeline of 30 years would encompass 3 burn entries, which coincides with the proposal for 2 to 3 incremental underburns, repeated every 5 to 10 years. As such, the temporal context is 30 years into the future.

The baseline year used for this analysis is 2014 as the existing condition. The description of the existing condition includes the accumulation of past activities, which have influenced vegetation. In the effects discussion, “short-term” refers to effects over the 10-year period from the time the activity was accomplished. Beyond 10 years effects are considered “long-term.” The current environmental conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and are a proxy for the impacts of past actions.70

**Affected Environment**

The purpose and need in Chapter 1 wholly describes the fire and fuels affected environment beginning on page 24. Approximately 1,490 acres of natural stands and approximately 675 acres of older plantations are susceptible to high severity fire effects due to suppression and exclusion of naturally-occurring fire, which has led to dense accumulations of live and dead fuels that have combined with fuels from the recent bark beetle-caused mortality.

In summary:

- **Fire Regime** - The entire project area has departed from the natural fire regime; most of the project area (91%) historically experienced a high frequency (0-35 years) low to mixed severity fire return interval. Currently, it is unlikely fire could play its natural role (short interval, low to moderate intensity fire regime) in the project area.

- **Fuel Loading** - Current surface fuel loadings in portions of the project area range from 5 to 60 tons per acre. Where there are high levels of existing and ongoing mortality, it is expected to increase to 35 to 100 plus tons per acre when these dead and dying trees fall over the next 3-5 years. Approximately 10 percent of the Elk Flat LSR is currently comprised of large pockets (up to 80 acres) of standing dead trees that present a current and future threat due to increasing fuel loads and safety considerations. Estimated acres of machine piling needed based on fuel loading is approximately 944 acres. The maximum acreage, pending deadfall, approximates 1,461 acres.

70 This approach is consistent with CFR § 220.4 (f) and the Council on Environmental Quality June 24, 2005 memorandum regarding analysis of past actions.
• Fuel Models - Fuel models present within the project area include the following:

  FM 10 – Fuel model 10 can be characterized by dense late-successional conifer stands with heavy amounts of dead and down woody fuels. The understory is densely populated with intermediate size conifers. A wildfire carried by these fuels would be intense enough to cause crowning, spotting and rapid rates of spread. Large stand replacing fires can be expected.

  FM 9 – Fuel model 9 is characterized by closed canopy conifer stands with densely stocked pole size trees in the understory. Typically, these stands contain pockets of dead and down woody fuels. These fuels create high fire intensities during surface fires that can easily spread through the understory to the crowns of the dominant conifers.

  FM 2 – Fuel model 2 is characterized by poorer timbered stands and young plantations with grass and brush. Surface fires can spread easily with pockets of fuels generating high heat intensities.

**Environmental Consequences**

**Alternative 1- Modified Proposed Action**

*Direct and Indirect Effects – Alternative 1*

Reducing surface and ladder fuels and crown density in the project area would directly change the fuel profile and fire behavior. Activity fuels (slash generated from harvest and thinning activities), along with natural fuels such as standing excess snags, dead and down woody debris and shrubs, would be treated through a variety of methods including: removal, piling and burning and underburning. This, when combined with the raising of the canopy base heights (by reducing ladder fuels and reducing stand density through thinning and prescribed burning) will reduce the ability of surface fires to transition into the tree crowns.

Fire modeling results show a decrease in anticipated fire behavior under 97th percentile weather conditions following treatment. Flame lengths would be less than 4 feet, allowing for ground forces to manage the fire. The likelihood of passive crown fire would be reduced. Models indicate surface fire would be most probable. Stand mortality is expected to be less than 10 percent under a wildfire scenario in the most extreme weather conditions, following the initial treatment (thinning, slash treatment, underburn). Pockets of mortality resulting in excessive fuel loading would be treated allowing for reduced fire intensity and improved safety for firefighters.

Fuel loading would be managed with repeated fire entries. Fuel models 2 and 9 would be present in the project area. Fuels model proportions would shift to less than 15 percent fuel model 10 (unthinned patches).

Fule et al. (2012), (2001) and Prichard et al. (2010) indicate the most appropriate fuel treatment strategy is thinning (removal of ladder fuels and decreased crown density) followed by prescribed fire and other appropriate slash treatments. These treatments provide the best protection from undesirable impacts from fire during extreme conditions. Both Fule et al. papers emphasize the importance of continued prescribed fire treatments to maintain the achieved condition.

The underburn only treatment areas (including leave islands) will benefit from increased nutrient cycling and reduced surface fuel loading. These areas will still have interlocking canopy and ladder fuels. This will be the area most susceptible to torching, crown fire initiation, and increased mortality during a wildfire. The repeated burn treatments would create some pockets, through thinning with fire. The distribution of these areas through the project area would provide for a mosaic pattern across the landscape. In the event of a wildfire, any crown fire should be short duration and drop back to the surface when it reaches an area that has received mechanical and burn treatment.
Proposed activities include the repeated prescribed fire entries to mimic the historic fire regime. Following the initial entry, fire managers would have more (and safer) options for managing fire in the project area. Opportunities will exist for fire moving across the landscape to meet multiple resource objectives. This may be utilized in place of second or third entry prescribed fire treatments. Re-introducing fire back into a fire adapted ecosystem through prescribed fire treatments and wildfire with desirable effects, moves the project area towards restoration of ecological processes as directed by current fire policy. Stand composition and structure would be maintained through fire, as occurred under the historic fire regime.

The combination of an initial mechanical treatment in most stands, followed by repeated fire entries, would move the project area toward a condition class 1. This is defined as fire regimes within the natural historic range. The risk of losing key ecosystem components is low. Vegetation attributes are intact and functioning within the natural range.

Unthinned patches would be retained in up to 15 percent of the project area. Some of these patches would be underburned, while others would not. The effects in the unburned patches will be similar to what is described in the no action alternative, for unburned patches; while the burned patches will result in effects similar to the burn only treatment described above. Since these pockets are scattered throughout the project area, overall project objectives will be met. A fire response and corresponding management actions may be influenced by where the fire starts (in a treated vs. untreated portion of the project area). Resulting fire effects will also vary depending on where the fire is located.

**Effects relative to Purpose and Need for Action**

Alternative 1 provides for the most area treated in the most strategic areas such as adjacent to private property. This alternative treats the landscape within the project area providing for the greatest area of restored forest. The maximized treatment would provide for the most manageable wildfire behavior following the treatments. This alternative also maximizes safety for fire managers implementing prescribed fire treatments and management of wildfire.

By reducing surface and ladder fuels and crown density in the project area, thereby changing the fuel profile and fire behavior, Alternative 1 would reduce the risk of loss of early, mid and late-successional habitat. Treated stands would be more resilient, having the capacity to better withstand and survive disturbances such as wildfire, especially under changing conditions such as climate change.

Underburning would reintroduce fire processes in elk flat and help restore meadow habitat.

**Compliance with law, regulation and policy**

Alternative 1 meets Forest Plan direction, watershed analyses desired conditions, regional direction regarding ecological restoration, and national fire management policy that was summarized in the Fire/Fuels report, across the project area.

**Cumulative Effects – Alternative 1**

In elk flat, Pilgrim Vegetation Management Project treatments would be completed71 to meet the objectives of returning the area to a pine savannah by substantially reducing stand density in order to restore the more open conditions that existed historically and more mimic historical fire regimes.72 When combined with treatments

---

71 Thinning 4"-14" dbh encroaching conifers on approximately 147 acres down to 80 square feet of basal area per acre with underburning on 25 acres of those acres.

72 The area was partially thinned but retains too many trees to meet the objectives of 80 square feet of basal area per acre. As such, trees would be thinned down to 80 square feet of basal area per acre.
in Alternative 1, overall fire behavior will be improved. It will break up the continuity of fuels, helping to reduce fire behavior in the event of a wildfire. This will also create a healthier stand, reducing the chances of mortality in the residual trees. Less mortality results in less surface fuel accumulation in the future.

**Alternative 2- No New Temporary Road Construction Other Than Those Required for Landing Access**

Direct and Indirect Effects – Alternative 2

Fire behavior would not be completely modified on 98 acres under alternative 2. Passive crown fire and flame lengths greater than four feet are anticipated during extreme summer conditions on a portion of the un-thinned acres. Prescribed burning is planned on these 98 acres, but there would not be any mechanical vegetation removal. Underburning would reduce surface fuels and potentially thin some of the canopy. Repeated fire entries would continue to move these stands toward the desired condition. It would take several fire entries to reach the desired state.

Dropping these units totaling 98 acres from thinning of which 58 acres were to be piled, results in anticipated effects slightly better than those discussed in the no action alternative. As described in the Alternative 1 description, a combination of overstory and understory treatment is the best approach for modifying fire behavior during extreme conditions. While no thinning or machine piling would be undertaken on the acres eliminated due to no temporary road construction, underburning would still be applied resulting in a slight improvement over no action, but less effective than in Alternative 1. Some of the areas dropped for thinning in this alternative are adjacent to private property, which increases risk of wildfire crossing in either direction between the LSR and adjoining private lands.

Resulting fuel models would be 2, 9 and 10. The 98 acres that shift to underburn-only would remain a fuel model 10, but may move to a fuel model 13 over time. As mortality occurs and the fuels fall to the ground, fire behavior would likely be high intensity. Active flaming is sustained for long periods and a wide variety of firebrands can be generated under the fuel model 13 due to the large amounts of surface fuel accumulation. This contributes to spotting problems as weather conditions become more severe (NWCG, 2006).

This alternative moves the project area toward the historical fire regime and makes the area safer for fire managers. Fire policy and national direction would be met under this alternative and fire managers would have more options for future treatments. Repeated fire entries are achieved under this alternative. The primary difference from Alternative 1 is the 98 acres that would not have overstory thinning completed, a portion of which is adjacent to private property. The impacts in the unthinned patches are the same as Alternative 1.

Effects relative to Purpose and Need for Action

Alternative 2 moves the project area toward desired conditions but provides treatments on fewer acres. Objectives would be met on the acres being treated. However, Alternatives 2 leaves 98 acres treated through underburning only. Underburning will return the ecological process to the ecosystem, but safety will not be modified. Fire behavior within these areas would be consistent with the no action alternative. Crown fire will still carry through these areas not treated with thinning. Ladder fuels will remain, allowing fire to get into the canopy if a fire were to start in the unthinned pockets. By reducing surface and ladder fuels, as well as crown density, in the project area (thereby changing the fuel profile and fire behavior), Alternative 2 would help reduce the risk of loss of early, mid and late-successional habitat in the project area in thinned areas. Like Alternative 1, stands that are thinned and burned would be more resilient.

Compliance with law, regulation and policy

Alternative 2 meets Forest Plan direction, watershed analyses desired conditions, regional direction regarding ecological restoration, and national fire management policy that was summarized in the Fire/Fuels report, across the project area.
Cumulative Effects – Alternative 2
In elk flat, Pilgrim Vegetation Management Project treatments would be completed\textsuperscript{73} to meet the objectives of returning the area to a pine savannah by substantially reducing stand density in order to restore the more open conditions that existed historically and more mimic historical fire regimes.\textsuperscript{74} When combined with treatments in Alternative 2, overall fire behavior will be improved on the acres being treated. It will break up the continuity of fuels, helping to reduce fire behavior in the event of a wildfire. This will also create a healthier stand, reducing the chances of mortality in the residual trees. Less mortality results in less surface fuel accumulation in the future.

Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl

Direct and Indirect Effects – Alternative 3
Fire behavior will not be modified across approximately 268 acres compared to Alternative 1. Fire will not be returned to the landscape on 716 acres and surface fuel loading will not be sufficiently reduced on 96 acres, compared to alternative 1. These areas removed from treatment, in comparison to the proposed action, would see effects as described under the no action alternative. During the summer fire season, it is possible the area could experience passive crown fire since it would not be treated with this alternative. Flame lengths are likely to exceed 4 feet, requiring equipment to be utilized to manage a wildfire. The area not being treated under this alternative is located next to private property and a portion is within the Wildland Urban Interface.

The area excluded from treatment would not meet the desired future condition. It does not meet the requirements outlined in the Forest Plan, or current fire policy. The recommendations outlined in the watershed analyses will not be implemented in this area. This area would also not be treated according to the best available science for fire and fuels management.

The direct and indirect effects to the remaining portion of the project area are the same as described under Alternative 1. The portion of the project area proposed for treatments with this alternative would meet current fire policy, Forest Plan direction and watershed analyses recommendations.

Effects relative to Purpose and Need for Action
Alternative 3 moves the project area toward desired conditions but provides treatments on fewer acres. Objectives would be on the acres being treated. However, Alternatives 3 leaves areas un-treated on more acreage than Alternatives 1 or 2, resulting in effects constant with no action. Fire behavior, safety and ecological process are not modified on a portion of the project area.

\textsuperscript{73} Thinning 4”-14” dbh encroaching conifers on approximately 147 acres down to 80 square feet of basal area per acre with underburning on 25 acres of those acres.

\textsuperscript{74} The area was partially thinned but retains too many trees to meet the objectives of 80 square feet of basal area per acre. As such, trees would be thinned down to 80 square feet of basal area per acre.
By reducing surface and ladder fuels, as well as crown density, in the project area (thereby changing the fuel profile and fire behavior), Alternative 3 would help reduce the risk of loss of early, mid and late-successional habitat in the project area in treated areas. Like Alternative 1, where treated, stands would be more resilient.

**Compliance with law, regulation and policy**

Alternative 3 meets Forest Plan direction, watershed analyses desired conditions, regional direction regarding ecological restoration, and national fire management policy that was summarized in the Fire/Fuels report, across the treated areas.

**Cumulative Effects – Alternative 3**

In elk flat, Pilgrim Vegetation Management Project treatments would be completed\footnote{Thinning 4”-14” dbh encroaching conifers on approximately 147 acres down to 80 square feet of basal area per acre with underburning on 25 acres of those acres.} to meet the objectives of returning the area to a pine savannah by substantially reducing stand density in order to restore the more open conditions that existed historically and more mimic historical fire regimes.\footnote{The area was partially thinned but retains too many trees to meet the objectives of 80 square feet of basal area per acre. As such, trees would be thinned down to 80 square feet of basal area per acre.} When combined with treatments in Alternative 3, overall fire behavior will be improved, in the areas treated. It will break up the continuity of fuels, helping to reduce fire behavior in the event of a wildfire. This will also create a healthier stand, reducing the chances of mortality in the residual trees. Less mortality results in less surface fuel accumulation in the future.

**Alternative 4 - No Action**

Under No Action, the proposed management activities would not be implemented. No direct, indirect, or cumulative effects are expected. Although there would be no actions undertaken with this alternative, ongoing trends would continue.

Surface, ladder and crown fuels would continue to accumulate in the absence of fire or treatment. With no modification of forest structure and fuels, fire behavior under normal, summer conditions would be as described in the current conditions, threatening resources within the project area and potentially private property. The mortality in the pine may continue to spread. The standing dead that currently exist in the project area will fall in the next five to ten years adding to the current surface fuel loading. Wildfire management options in these areas with standing dead would be limited. Fire management will not put people at risk in these areas. The fire would be allowed to burn until it left the mortality pockets allowing firefighters to safely engage. This will add to fire size and under extreme conditions, could create fire control issues.

Once the trees have fallen, surface fuel loadings are estimated to exceed 100 tons / acre in the mortality pockets. These areas would be characterized as a fuel model 13. Appendix B of the Fireline Handbook (NWCG, 2006) describes fire activity in a fuel model 13 as “fire is generally carried by a continuous layer of slash. Large quantities of greater than 3 inches material are present. Fires spread quickly through the fine fuels and intensity builds up as the large fuels start burning. Active flaming is sustained for long periods and a wide variety of firebrands can be generated.” A wildfire in these pockets with high fuel loading will be high intensity. This may require firefighters to back off to an area where intensity will be less. Equipment would have a difficult time working in these areas. As a result, the creation of control lines with dozers is not a likely tactic.

In the natural stands, where mortality is not yet occurring, fire behavior is going to remain an issue under the no action alternative. Some areas in the project are expected to experience passive crown fire and flame
lengths greater than 4 feet. This will not allow ground forces to directly attack the flanks or head of a fire. Equipment or aircraft will be needed to manage a fire under these conditions. Modeling indicated up to 40 percent mortality from a wildfire in the natural stands under 97th percentile weather conditions. With these conditions, fire managers are limited to the tactics that could be utilized and would be effective. This has the potential to impact our neighbors, as a fire that starts on the forest, within the project area, could move onto private lands.

In the absence of management actions, no progress would be made towards initiating the restoration of ecological processes that include the natural fire regimes, high frequency (0 to 35 years) low to mixed severity fire return intervals. The no action alternative does not follow the national fire policy direction, the Forest Plan, Watershed Analysis or LSRA. It would not contribute to the desired condition, purpose and need, or respond to policy aimed at reducing hazardous fuels to modify current fire behavior that would increase fire management operations. The ability of firefighters to safely and effectively suppress a wildland fire would become more difficult as fire behavior characteristics intensify. Opportunities to return fire back into the ecosystem will be limited.

**Cumulative Effects**

Alternative 4 does not alter the fuels profile nor minimizes fire behavior. There would be no additional direct effects in regard to reducing forest fuels or modifying fire behavior. There would be no cumulative effects. Ongoing trends would continue.

Elk flat treatments from the Pilgrim Vegetation Management Project would improve overall fire behavior and fire regime processes on those treated acres (147 acres) within the project area boundary.

**Summary and Conclusions**

All action alternatives provide some level of reduced surface fuel loading, ladder and crown fuel characteristics as well as breaking up fuel continuity over the project area. Table 55 provides a summary of fuels effects by indicator and alternative.

<table>
<thead>
<tr>
<th>Table 55. Summary of Fire and Fuels Effects by Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Fuel Loading Reduced</td>
</tr>
<tr>
<td>Acres Thinned</td>
</tr>
<tr>
<td>Acres Underburn</td>
</tr>
<tr>
<td>Acres Piled</td>
</tr>
<tr>
<td>Fuel Models</td>
</tr>
<tr>
<td>Trending to 13</td>
</tr>
<tr>
<td>Potential Fire Behavior</td>
</tr>
<tr>
<td>Flame Lengths</td>
</tr>
<tr>
<td>Fire Type</td>
</tr>
</tbody>
</table>

Alternative 1 provides for the most area treated and in the most strategic areas such as adjacent to private property. This alternative treats the landscape within the project area, providing for the greatest area of restored forest. The maximized treatment will provide for the most manageable wildfire behavior following the treatments. This alternative also maximizes safety for fire managers implementing prescribed fire treatments and managing wildfire. Alternative 1 meets the Land and Resource Management Plan direction,
Watershed Analyses desired conditions, regional direction regarding ecological restoration and national fire management policy across the project area.

Alternatives 2 and 3 move the project area toward desired conditions. These alternatives do provide treatments across limited acres in the project area. They meet objectives on the acres being treated. However, both alternatives leave areas un-treated, resulting in effects constant with no action. Fire behavior, safety and ecological process are not modified on a portion of the project area.

The no action alternative does not provide for firefighter safety, modify fire behavior, respond to national fire direction, or meet the Land and Resource Management Plan direction.

Wildlife
A wildlife Biological Assessment (BA) that assess the predicted effects to listed species under the preferred alternative (Jordan, 2016) and Biological Evaluation (BE) for sensitive wildlife species (Jordan, 2016c) was completed for this project. These analyses are incorporated by reference, and the BA is included as Appendix E. Information relevant to this decision is summarized here.

Introduction
Purpose and Need Applicable to Wildlife
#1- Risk reduction and increased stand resilience; #2-Accelerating development of late-successional and old-growth forest characteristics; and #4- Retaining hardwoods as a stand component are all relative to wildlife. #5- Restoration of hydrologic function and #6- Managing the National Forest transportation system and decommissioning unauthorized routes are also related in terms of protecting and enhancing late-successional and connectivity habitat in Riparian Reserves, and reducing route density in the LSR. The existing and desired conditions relating to these Purpose and Needs is in Chapter 1.

Issues Applicable to Wildlife
Issue #1- Large tree and snag removal and group selection logging directly harms late-successional ecosystems in Late-Successional Reserves, Riparian Reserves and Critical Habitat; and Issue #3- Treatments within designated critical habitat for the northern spotted owl violate the 2011 Revised Recovery Plan and the 2012 Final Critical Habitat Rule for the Northern Spotted Owl (NSO).

The Environmental Consequences section discusses the effects of various thinning, and other treatments designed to improve NSO, fisher and northern goshawk habitat resilience, function and diversity (group selection in plantations, black oak release) and fuels treatment relative to the purpose and need. How these treatments are expected to influence designated critical habitat for the NSO is addressed (Key Issue #3). Issues not carried forward in this section include a portion of #2 and a portion of #3. Relative to Key Issue #2, no permanent road construction is proposed, but the effects of Alternative 2 (no new temporary road construction) on wildlife will be compared. Relative to Key Issue #3, recovery plans are not regulatory and therefor they cannot be violated (USDI-FWS, 2011 pp. I-3 to I-4). The Forest has prepared a consistency assessment for the project and the Recovery Plan in terms of meeting standards and guidelines under the Forest Plan (Forest Plan p. 4.30) and it is included in the project record.

Methodology
Throughout project design and analysis, the best available scientific and commercial data applicable to the project area was utilized. This includes direct observations in and near the analysis areas and the most recent

---

77 Purpose and need and issue statements are paraphrased for brevity and applicability to the wildlife resource.
and appropriate scientific research or species information. Data sources include but are not limited to the Revised Recovery Plan for the NSO and Final Rule for NSO Critical Habitat; and information from the State of California, FWS and research literature as it applies to the gray wolf. For sensitive species, the FWS’ species profile\(^78\) and Forest-level monitoring and research was utilized for the fisher; and local, regional and national research and literature was used for the northern goshawk, Pacific marten, fringed myotis and pallid and Townsend’s big-eared bats, Shasta hesperian and the western bumble bee. This information, combined with field reviews and stand modeling described below, was used to design the project treatments, locations and resource protection measures, and to determine the likely effects on federally and proposed listed species, Forest Service sensitive species and for other wildlife compliance topics (see Appendix H – Compliance and Consistency).

A species list was obtained December 22, 2015 from the Yreka Fish and Wildlife Service field office through IPaC\(^79\) at [https://ecos.fws.gov/ipac/gettingStarted/index](https://ecos.fws.gov/ipac/getting Started/index). Based on review of the list, species assessed in detail in the BA include the threatened northern spotted owl and endangered gray wolf. The Consultation section in BA Appendix C fully describes the streamlined consultation process to date with the FWS and the development and modification of treatment prescriptions and project design features (see Appendix E).

Field reviews and habitat validation was completed from August 2009 through May 2013. These reviews were used to establish a spatial layer and acreage of habitat type and quality for the NSO and sensitive species. They were also used to inform the IDT where mechanical treatments should be excluded (in high quality habitats) and where fireline may be needed to protect these habitats or areas of documented species use (northern goshawk territory areas, fisher denning habitat, NSO nesting/roosting and high quality foraging habitat). Reviews were completed in the project area and on surrounding private and NFS lands, with additional field and vegetation analysis work completed in fall 2015 to assess the existing condition for the listed gray wolf. Field reviews were supplemented by the draft NSO Habitat EVEG model for SMMU (NSO action area and fisher analysis area), the Forest’s existing vegetation layer from the Remote Sensing Lab (USDA-FS, 2007a) (NSO and gray wolf action areas), aerial photo interpretation (2012 and 2014 NAIP), and NSO habitat maps provided by private landowners. Management Unit survey records for NSO and goshawk (1989-2009) and the 2014 and 2015 carnivore surveys on the Unit (USDA-FS 2014, 2015) were reviewed; and species data from the California Natural Diversity Database (CNDDB) and Forest’s Natural Resources Information System (NRIS) was queried (2013-2015; March 2016). Protocol surveys and activity center stand searches for NSO (1990-2015), northern goshawk surveys (1985-2015) and forest carnivore surveys (2002/2003, 2014-2015) have also informed the project design and analysis.

Common stand exams (CSE) (USDA-FS, 2007) for natural stands and FACTS data for plantations in the project area was used to supplement field reviews for habitat type and quality. Fuel loading data was assessed in 2007 using Browns Transects, and again in 2011 using ocular estimation and photo series methods (Maxwell, et al., 1979). Predicted future stand attributes were modeled from the CSE and fuels data, using the Forest Vegetation Simulator (FVS) Inland California and Southern Cascades variant (Keyser, 2008, 2013). The FVS Fire & Fuels Extension (FVS-FFE; (Reinhardt, et al., 2003) was used to model pre- and post-treatment fuel loading, vegetation characteristics that influence fire behavior (canopy base height and crown bulk density) and flame lengths. These methods are fully described in the Silviculture and Forest Health, and Fire and Fuels sections of this EIS. The FVS-FFE modeling assumptions, limitations and applicability to the

---

\(^{78}\) At the time the Draft Biological Evaluation and analysis for the DEIS was prepared, the West Coast Distinct Population of fisher was proposed for listing. The FWS decision to not list the DPS under the ESA is expected to publish in the Federal Register on April 18, 2016.

\(^{79}\) IPaC refers to the USDI Fish and Wildlife Service’s Information for Planning and Conservation. It is a tool to assist project proponents in increasing the compatibility of activities with the conservation of FWS trust resources. It is meant to assist in implementation of all activities proposed under section 7 or 10 of the ESA.
indicators and information regarding the three action alternatives considered in detail and no action alternative are also described in the silviculture report (Payne, 2015b) and Fire and Fuels resource report (McRae, 2015).

Wildlife Specific Assumptions

- Acres and stand conditions are approximate and in some cases, existing conditions (basal area, canopy closure, tree size classes) are averaged across a combination of similar stands.
- Minor differences in acreage effects may exist between this analysis and other documents or appendices due to rounding and/or differences in resource analysis areas and methodologies employed for assessing impacts. These differences do not invalidate this analysis or conclusions.
- Prey assessments or surveys have not been completed for the project, but during fieldwork and NSO habitat typing, abundant woodrat nests were observed. It is assumed that based on habitat conditions, and observations during fieldwork, that woodrats are abundant and northern flying squirrels are present to a limited extent in the higher quality habitat areas.
- New landing sizes are approximated to range between 0.5 - 0.75 acre, with the maximum acreage assessed to account for the maximum potential effect. Depending on unit acreage, alternative, and layout, units smaller than 30 acres may require their own landing. Existing landings and natural openings would be used as feasible to reduce new disturbance, and in accordance with RPMs, though final landing location is approved during sale administration.
- Landing construction, reconstruction or construction of mechanical fireline would not affect (remove, degrade, downgrade) habitat function, though these activities could remove, reduce or disturb habitat components.
- Temporary road widths would not exceed 14 feet.
- Under all proposed activities, trees or snags that are a safety hazard to the public or operations may be felled (USDA-FS 2012). Falling/removal of hazard trees or snags would reduce snag density in certain areas (along roads, near private property lines, in the extensive mortality area). Residual snags and down logs would not be below the levels specified in the project's design (RPM 40 on page 91) or the levels directed by the LSRA, which states that the numbers of snags, and down logs, can vary on any particular acre (LSRA, 1999 p. 164).

Incomplete and Unavailable Information

For the natural stands not included in the 2007 CSE and Browns Transects, similar stand data was utilized to extrapolate thinning and fire effects for treatment and ‘no action’. Extrapolation was applied based on field reconnaissance to compare stand conditions, stand history and aerial photo comparisons (Payne, 2015b). There are some assumptions and limitations in the analysis regarding the effects of thinning and fuels treatments under both ‘no action’ and treatment scenarios (see the Silviculture and Forest Health section for a full description of assumptions). In summary, while the 2007 CSE data and FVS-FFE modeling program work in concert, the data is just under nine years old. The subsequent field reviews in 2010-2014, and additional sampling of fuel loading in 2011, further informs the existing condition for down wood, the analysis for snags “modeled” over time, and the expected fire effects under 90th and 97th percentile weather conditions. However, the age of the CSE data and the rapidly changing conditions and increased mortality, notably in the ponderosa pine component, between 2009 and 2012 is such that the conclusions presented in the modeling results reflect trends, and not absolute numbers (as is typical with most modeling). This is particularly relevant for the indicator of snags larger than 20 inches in diameter.

Current stand exam data for species, size classes and associated tons per acre of down wood in each stand is also not available. The existing condition for down wood is approximated based on the 2007 CSEs and Browns Transects in the 13 inventoried stands (11 with mechanical treatment), the 2011 field review of
mortality areas in other stands, soils monitoring (Rust, et al., 2015), and subsequent field reviews across the project area from 2012-2015. This data provides the best available information of down wood conditions, as well as snags, in the project area.

The current modeling results of ‘no action’ and treatment alternatives considered in detail for fire effects (flame lengths, rates of spread, severity) is not available to be spatially displayed, though the Fire and Fuels section discusses these effects in general terms and for the project area as a whole. The wildlife analysis uses these general terms, and the output results from individual stand modeling in FVS-FFE, to describe expected fire behavior in certain stands and extrapolate it to similar stands. The Map 6 data set in the BA displays predicted fire behavior under ‘no action’ based on the 2007 CSEs, Browns Transect data and Flammmap modeling that was completed in 2009 and 2010 (see Appendix E, Map 6). A similar mapping effort has not been updated to reflect the current FVS-FFE modeling, changed/changing stand conditions or higher levels (40-100+ tons per acre) of down wood in the eastern and southeastern portions of the project area. The 2010 ‘no action’ analysis and Map 6 data set also does not account for the increase in mortality pockets in young and old plantations (including in the ST-215 core), or the increase in mortality pockets in the mixed conifer-pine natural stands in other portions of the project area. The 2010 ‘no action’ analysis and spatial output of fire behavior modeling is used, however, to demonstrate what the potential effects could be in discrete portions of the project area and different habitat types, including critical habitat. In the absence of newer mapped data from the current FVS-FFE modeling effort, the 2010 information is considered the best available data in terms of displaying ‘no action’ effects to habitat at smaller scales within the project area.

Indicators and Measures

When considering effects on wildlife, the primary factors of change and impact include those factors that either influence habitat suitability, use or species behavior. Predicted direct, indirect and cumulative effects (as defined under the ESA for NSO, as well as NEPA cumulative effects) are evaluated using a combination of qualitative and quantitative indicators. These indicators help determine the degree (magnitude, duration and intensity) to which treatments may affect individuals and their habitat components; including predicted changes in an individual species’ response to a disturbance or habitat manipulation, or changes in habitat function at various spatial scales.

Integral to the indicator effects analysis is how specific prescription elements, project design, and resource protection measures (RPMs) reduce the potential for direct, indirect or cumulative effects (including short-term adverse or long-term beneficial effects). This analysis is based on research, local and regional monitoring and other applicable best available science. These indicators are also used to compare how alternatives meet the purpose and need and the key issues.

Issue indicators applicable to wildlife are listed in Table 56 as they relate to achievement of the purpose and need, and key issues. See Table 29 PART II in Chapter 2 for the comparison of Key Issue #3 and the same table PART III for the comparison of general habitat indicators for late-successional associated species. There are no purpose and need or key issue indicators relative to the gray wolf or sensitive species (other than northern goshawk and fisher). Therefore, an analysis for these species is not included here. For the full analysis of project effects on these other species, refer to the BA (Appendix E) and the wildlife BE (available in the online project record). For Key Issue #3, indicators listed in Table 56 are used to measure the scale of how the alternatives considered in detail meet the management guidance, and special management considerations described for critical habitat subunit ECS-3 (East Cascades South), in the 2012 Final Critical Habitat Rule (USDI-FWS, 2012).
### Table 56. Indicators for NSO and sensitive species Relative to Purpose and Need and Key Issues

<table>
<thead>
<tr>
<th>Species</th>
<th>Indicator</th>
<th>Scales Assessed</th>
<th>Measurement for how project actions inform the indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct Effects to Individuals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>Potential for direct disturbance to breeding pairs, young, and/or dispersing individuals</td>
<td>Known Core/ Territory</td>
<td>-Distance (miles) to breeding pairs/individuals and location of treatments (i.e., proximity to nests, high quality habitat)</td>
</tr>
<tr>
<td>Fisher</td>
<td></td>
<td>At the Stand Scale, Presence of Denning Habitat</td>
<td>-Duration (time) of silviculture, fuels, hydrology treatments and road actions</td>
</tr>
<tr>
<td><strong>Direct and Indirect Effects to Habitat and Achieving Purpose and Need</strong>: Risk Reduction and Increased Stand Resilience (Issue #1 and 3); Late-Successional Habitat Enhancement including Hardwood Diversity, Connectivity and Riparian Reserve function (Issue #1 and 3); and Temporary Road Construction and Route Decommissioning (Issue #2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSO</td>
<td>-Acres of suitable habitat (nesting, roosting, foraging) benefitted/maintained, degraded, downgraded or removed</td>
<td>0.5-mile core</td>
<td>-Size class, density, species composition and canopy cover of the resultant stands pre, immediately post and 20-years after treatment (informs habitat acres)</td>
</tr>
<tr>
<td></td>
<td>-Acres of dispersal habitat affected</td>
<td>1.3-mile home range</td>
<td>-Stand variability and structural complexity, including understory layering, snags and CWD (informs habitat acres)</td>
</tr>
<tr>
<td></td>
<td>-Acres of capable habitat moved toward dispersal/suitable</td>
<td>Treatment Unit</td>
<td>-Flame lengths and fire type as a measure of intensity and severity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Area</td>
<td>-Route density reduction and changes in access and potential conflicts with humans</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>-Acres of suitable habitat benefitted/maintained, degraded, downgraded or removed</td>
<td>Known Territory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Acres of capable habitat improved</td>
<td>Treatment Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Area</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elk Flat LSR-Connectivity</td>
<td></td>
</tr>
<tr>
<td>Fisher</td>
<td>-Acres of denning, resting, foraging (RDF) habitat benefitted/maintained, degraded, downgraded or removed</td>
<td>Denning Structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Acres of capable habitat improved</td>
<td>Stand Level RDF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Treatment Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Area</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elk Flat LSR-Connectivity</td>
<td></td>
</tr>
<tr>
<td><strong>Key Issue #3 – Effects to NSO Critical Habitat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSO</td>
<td>-Acres maintained/benefitted</td>
<td>0.5-mile core</td>
<td>Acres of PCE1, PCE2, PCE3, PCE4 affected are measured by:</td>
</tr>
<tr>
<td></td>
<td>-Acres degraded, downgraded or removed</td>
<td>1.3-mile home range (HR)</td>
<td>-Size class, density, species composition and canopy cover of the resultant stands pre, immediately post and 20-years after treatment (informs habitat acres)</td>
</tr>
<tr>
<td></td>
<td>-Acres suitable habitat projected in 20 years (PCE2/PCE3)</td>
<td>Project Area</td>
<td>-Stand variability and structural complexity, including understory layering, snags and CWD (informs habitat acres)</td>
</tr>
<tr>
<td></td>
<td>-Acres dispersal habitat projected in 20 years (PCE4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Acres capable habitat projected in 20 to 30 years (PCE1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Boundaries

To determine relevant past, present, and foreseeable future projects, spatial and temporal boundaries must be defined (CFR § 220.4 (f)). Wildlife use and distribution in and across an area is primarily influenced by availability of suitable habitat and connectivity within and between habitat areas. Use is influenced by site-
specific factors such as structure or physical features (e.g., tree/shrub species, size class, canopy closure; CWD and snags; decadence and cavities; water; caves; forage base) as well as by landscape considerations such as proximity to other suitable habitat or the need for isolation or seclusion. A multi-scale analysis that assesses site-specific conditions within stands proposed for treatment, and on the larger landscape in terms of proximity to and availability of other suitable habitat, is generally considered.

**Spatial Bounding**

For the direct and indirect effects of the project relative to NSO, northern goshawk and fisher, these conditions influence these species: disturbance to breeding, feeding and sheltering behaviors and habitats; tree and shrub species composition and juxtaposition on the landscape; stand structure (layering, canopy cover, decadence); down wood and recruitment; existing snags and large snag recruitment; prey base; and connectivity. For all action alternatives, direct and indirect effects are evaluated at the treatment unit and project area scale as this reflects the physical footprint where activities would occur, and therefore, potential direct effects (e.g., mechanical thinning/fuels treatments, hand thinning, prescribed fire, road management and noise-generating activities).

Other biologically meaningful scales are utilized as described in Table 56, including the NSO core and home range, known northern goshawk territories, and at the stand level for the fisher (resting or denning structure or known denning areas based on field surveys). Effects analyses can also occur across multiple analysis units that frequently overlap and are relevant to conservation concerns for species, including larger conservation units such as critical habitat or LSR designation. Spatial bounding for cumulative effects is generally unique to each species considered. For cumulative effects to occur, the effects of the actions must overlap in space and time for there to be potential cumulative effects; determined by how long, and how far reaching an action’s direct and indirect effects are felt on a given resource area. While there may be an overlap in two or more project cumulative effects spatial (or temporal) boundaries, where there are no direct or indirect effects that overlap in time and space, there are no cumulative effects.

The ESA defines the spatial boundary for analysis as the action area, which includes all areas likely to be affected directly or indirectly by the proposed Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area is generally larger than the project area, but only encompasses the geographic extent of environmental changes (i.e., the physical, chemical and biotic effects) that may result directly and indirectly from an action, and elicit a response in an individual (USDI-FWS, 2015). For the NSO, a 1.3-mile buffer on Alternative 1\(^{80}\) silviculture, fuels treatments and road actions defines the spatial bounds of the action area. This bounding is an appropriate scale, as it is equivalent to the radius of the estimated median annual NSO home range size in northern California, based on radio-telemetry data (Thomas, 1990) (USDI-FWS, 2011). It allows for an analysis of any other adjacent or overlapping territories/home ranges and potential effects to connectivity, thereby framing the context and significance of potential impacts to those other areas. It is also the accepted range by the FWS for NSO effects analysis, and it includes managed private timberlands that may influence NSO habitat use in and outside the project area. The NSO critical habitat analysis area is simply the portion of the action area that overlaps critical habitat designations.

For the northern goshawk, spatial bounding also consists of all areas within 1.3 miles of the Alternative 1 silviculture, fuels treatments and road actions. This area is appropriate as it is equivalent to the radius of a typical NGO home range in this region, though territory size is generally 200-250 acres and home ranges can include multiple territories for an individual pair (Woodbridge, B. and Hargis, C.D., 2006). It allows for analysis of any adjacent known territories of other pairs, framing the context and significance of potential impacts to those other areas or individuals. It also includes managed private timberlands that may influence

---

\(^{80}\) This alternative affects the most acres, and therefore accounts for all treatment activities that could occur.
NGO habitat use in and outside the project area and it is large enough to assess potential effects to connectivity.

For the fisher, since there are no telemetry studies in this part of the fisher’s range on which to base an average female home range size, a habitat-based approach was agreed to with the FWS81 (Jordan, 2016) (Jordan, 2016c). The spatial bounding encompasses the entire project area, and extends north, up to the ~6,500-foot elevation range. Then it extends northwest and northeast to the extent of available reproductive habitat, based on stand conditions, age class, species composition and cover. This approach is biologically meaningful for this species, and this analysis area is likely adequate to support approximately three female home ranges. Similar to the NSO and northern goshawk, this analysis area includes managed private timberlands that may influence fisher habitat use in and outside the project area and is large enough to assess potential effects to connectivity. The “fine-scale” spatial analysis area for effects consist of treatment unit, stand level and resting/denning structure (see Table 56).

**Temporal Bounding**

Temporal bounding for effects consists of both short- and long-term timeframes. Short-term consists of when treatments occur and vegetation begins to respond, usually within one season to 10 years of treatment implementation, depending on the treatment. Long-term effects extend for approximately 20 or more years after treatment and correspond to the modeled changes and effectiveness of thinning and fuel treatments described in this EIS and respective analyses. Direct effects are defined by the period that actions would be occurring in/near treatment units, reproductive areas, and habitat (short-term). Indirect effects occur over both the short- and long-term.

It is estimated that it will take 5 to 10 years for initial thinning, fuels treatments, reforestation activities and road actions to be completed, including starting the first entry for underburning. Fuels treatments are likely to occur within approximately one season to 10 years after thinning/harvest treatments start, given that some pile burning could occur a few years after the last units are harvested. Three entries of prescribed fire for the entire project area are proposed (incremental burn entries over the total 30-year project activity timeframe).

Temporal bounding for cumulative effects under the ESA82 consists of the period when all proposed treatments and activities are expected to be completed, and when any effects from foreseeable future State or private actions can be reasonably predicted and felt on the landscape in combination with the project’s effects. For NEPA cumulative effects, the effects of past, ongoing and reasonably foreseeable future projects on Federal, State or private lands is assessed.

The baseline year used for this analysis and the existing condition is 2014. The description of the existing condition in Chapter 1 for the project area, the Affected Environment section below for the three species, and the existing condition sections in the BA and BE, includes the accumulation of past activities, which have influenced vegetation and species use in the analysis areas. The current environmental conditions reflect the

---

81 As the fisher was a proposed listed species at the time the draft analysis was completed, the Forest discussed fisher analysis area scales and supporting rationale.

82 Those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. [50 CFR §402.02] This definition applies only to section 7 analyses and should not be confused with the broader use of this term [cumulative effects] in the National Environmental Policy Act or other environmental laws (March 1998 ESA Consultation Handbook, p. xiii).
aggregate impact of all prior human actions and natural events that have resulted in the current environmental conditions, and might contribute to cumulative effects and are a proxy for the impacts of past actions.\textsuperscript{83}

Based on the modeled and expected treatment effectiveness and that past projects maintained a higher tree density, allowing for canopy recovery in 15 to 20 years (Fleming, 2012), it is reasonable to establish temporal bounding by a 20 to 30 year window of recovery. This timeframe is adequate to encompass several NSO, northern goshawk and fisher breeding attempts, and potential disturbances to those attempts, notably since NSO and northern goshawk do not attempt to breed every year and the number of years varies between each attempt (Forsman, et al., 1984); USDA-FS 1989-2015 NGO records). This is also the timeframe when project actions and effects would be occurring, and potentially overlapping with effects of private, state, or federal activities. A comprehensive review of past, ongoing and reasonably foreseeable future actions on private and NFS lands within the NSO, northern goshawk and fisher spatial and temporal bounding was completed and is included in the project record (Jordan, 2016c; Jordan, 2016b).

**Affected Environment**

As described in Chapter 1, the ongoing and increasing risk to late-successional stand conditions, NSO and other late-successional species habitat, and critical habitat in the project area is the direct result of an elevated, epidemic natural ecological process; black stain and Heterobasidion root disease combined with pine and white fir overstocking, prolonged drought conditions and bark beetle attacks in pine. These conditions have resulted in down wood levels ranging from 5-60 tons per acre, and in some portions (units 162, 176, 206) it is 100+ tons per acre. Other factors contributing to the existing condition include past management actions and a departure from the low- to moderate-intensity, frequent fire return interval. Most plantation and natural stands identified for mechanical thinning and other restoration and diversity treatments are either uniformly dense in the mid and understory (i.e. pine, white fir and cedar regeneration) or lack horizontal and vertical complexity (stands are pole to medium trees with stagnated growth and no under or midstory). In the ponderosa pine-dominated stands, the overall stand is at risk due to overstocking, root disease, drought conditions, bark beetles or a combination of these factors. The natural stands and older plantations have scattered predominant legacy trees that range from 42-80”+ DBH. The 20-40+ year old plantations are predominantly ponderosa pine, comprised of tightly spaced trees with interlocking crowns that limit growth potential and put surrounding stands at risk due to the dense canopy and mortality patches. These older plantations have little to no understory shrub or other vegetation, with exception of along the edges and are situated within the ST-215 core and home range adjacent to higher value NSO, northern goshawk and fisher habitats.

NSO, fisher and northern goshawk (NGO) habitat, particularly NSO nesting/roosting and high quality foraging, fisher resting/denning, and NGO nesting habitat are typically equated with late-successional and old-growth forest conditions. Foraging and dispersal habitats provide source habitat for prey base, protection from avian and carnivorous (bobcat) predators and contribute to connectivity. Connectivity as defined in the NWFP is a measure of the extent to which the landscape pattern of the late-successional and old-growth ecosystem provides for biological and ecological flows that sustain late-successional and old-growth associated animal and plant species. It does not necessarily mean late-successional and old-growth areas have to be physically joined in space, as many late-successional associated species can move across areas not in late-successional ecosystem conditions. In dry forest landscapes, retaining structural legacies (large trees that tend to be fire tolerant, snags and down wood created through stand development or disturbance events) is important to maintaining habitat and connectivity over time. These structural legacies serve valuable functions and can provide for reproductive structure, cooler microclimates, prey and forage base, or help maintain or improve within- and between-stand connectivity depending on conditions (Franklin, et al., 2007). Restoring ecosystem function that provides for increased resiliency will necessitate maintaining and restoring

\textsuperscript{83} This approach is consistent with CFR § 220.4 (f) and the Council on Environmental Quality June 24, 2005 memorandum regarding analysis of past actions.
these biological legacies that typically persist through disturbance events and can help influence stand recovery processes in a post-disturbance landscape (Franklin, et al., 2000).

The NSO action area is approximately 15,960 acres in size; consisting of NFS lands (8,303 acres; 52%) and private lands (7,657 acres; 48%). Elevation ranges from 3,000 to 5,200 feet. There is one NSO activity center (AC) and associated core and home range in the action area, designated ST-215 (see Appendix E for the full survey history of this AC, including an updated March 2016 CNDDB data search).

Based on survey and stand search data, the ST-215 AC has not been occupied by a reproductive or territorial NSO pair or a verified resident single NSO84 since 1990, when the last nesting attempt failed. In 2003, a single subadult female NSO was detected and verified during a nighttime calling survey; and in 2011, a probable NSO feather was found in the core during a stand search (Farber, 2013). In both cases, an aural or visual detection of NSO did not occur during follow-up surveys. Annual stand searches (2-3) have been completed in the core since 2007, with 3-visit protocol surveys of the action area completed from 2003-2005 and 2007-2011. Starting in 2012, and continuing through 2014, six nighttime calling visits were completed; with a modified 3-visit spot check completed in 2015. This is in accordance with the January 2012 NSO Survey Protocol, and its guidance for annual survey coordination with the FWS and landowners (USDI-FWS, 2012). An adult male barred owl was detected in the project area in 2004, and a barred owl pair was detected intermittently during the 2012-2014 nighttime calling surveys. Barred owls were not detected or observed during the daytime stand searches and the Forest Service biologists and private land surveyors did not locate the barred owl nesting area. In fall 2014, the barred owl pair was removed (Feamster, et al., 2014). During the 2015 surveys and stand searches, no NSOs, barred owls or sign (pellets, whitewash, feathers) were detected or observed. The BA describes the survey history (1989 to 2015).

While there are currently no known or verified barred owls or NSOs in the project area or action area based on surveys, this does not mean a barred owl or NSO could not re-colonize, or disperse through the ST-215 core, home range or other portion of the action area, regardless of implementation. It is also well described in NSO research that barred owls can reduce the probability of NSO detection (response behavior), site occupancy, reproduction, and survival (USDI-FWS, 2011 p. B.10). Regardless of the removal of the barred owl pair or project implementation, it is possible that dispersing juvenile, subadult or non-territorial NSO(s) could be in the project area or action area, but be non-responsive during survey efforts. The project includes multiple Limited Operating Periods and surveys to reduce, if not eliminate, the potential for direct or adverse effects to NSOs (described below and in the BA for Direct Effects and in the BA Table 6).

Approximately 458 acres (92%) of the ST-215 NSO core is on NFS lands in the project area, with the remaining 42 acres on private lands to the north, owned by Olympic Resource Management (previously Hancock).85 Conversely, approximately 1,409 acres (41%) of the home range is on NFS lands, with the remaining 59% on private lands to the north and west (owned by Sierra Pacific Industries).

NSO habitat types in the action area include suitable (nesting, roosting and foraging, including high quality foraging), dispersal, capable and non-habitat. The BA fully describes habitat types, habitat quality, quantity and connectivity of NSO habitat in the action area, project area and treatment units. Habitat in the action area was identified and quantified using a combination of sources (see the Methodology section above). Habitat suitability on NFS lands and private lands in the action area are primarily non-functional, followed by a combination of dispersal, foraging and pockets of nesting/roosting. This is primarily due to vegetation types in the eastern and southern portions of the action area (ponderosa pine-dominated natural stands and plantations that do not support NSO habitat) and private lands management (regeneration harvests, small


85 Lands are managed by Black Fox Timber Management Group, Inc.
The project area encompasses the 3,074-acre Elk Flat LSR (RC-360) and approximately 445 acres of matrix lands in Commercial Wood Products emphasis. The break in land allocation bisects the meadow at Elk Flat and the meadow and matrix lands are primarily non-functional NSO habitat, with unit 177 providing some foraging habitat. Approximately 36% of the project area provides suitable habitat (nesting, roosting, foraging); 9% is dispersal; and another 9% is considered capable of transitioning to dispersal and suitable with treatment. The remaining 46% of the project area is not capable of supporting NSO habitat as they generally avoid forest stands with overstories dominated by ponderosa pine and the relative probability of use declines within increasing basal area of ponderosa pine (USDI-FWS, 2011; Irwin, et al., 2007; Irwin, et al., 2012). Non-functional habitat in treatment units includes areas proposed for salvage adaptive management, hazard reduction and the extensive mortality area, though these areas do support woodrats and other potential prey due to open or lacking canopy, large down wood, and regeneration of small trees and shrubs.

As described in the Assumptions section above, prey assessments were not completed. Based on habitat conditions and fieldwork, woodrats likely constitute the majority of NSO prey in the project area, with other minor species such as deer mice and voles. In some stands (nesting/roosting, high quality foraging, RA32 areas), northern flying squirrels may be present, but at lower densities. There may also be some flying squirrel/woodrat overlap at the higher elevation ranges of the action area and within the denser, contiguous mixed conifer/fir stands in the northwestern portion of the project area (see Appendix D of the BA).

Habitat quality and suitability in the project and treatment area was evaluated closely, particularly in the 60-120 year-old natural stands proposed for mechanical thinning and other restoration treatments, or underburning-only. Suitable habitat in the project area is variable and quality and function are wholly dependent on the unique, local stand attributes. This includes but is not limited to basal area ranges, tree species composition and canopy closure – where there is a mix of incense cedar, sugar and ponderosa pine, Douglas fir, black oak, and white fir ranging from 180-260+ basal area, layering and canopy closure of 70+ percent, stands are considered high quality foraging or nesting/roosting. Where basal areas are lower, or natural stands are primarily composed of ponderosa pine and white fir in smaller overall average tree size classes (~16”) and canopy closure of 40-70%, stands typically type out as moderate or lower quality foraging or dispersal. Canopy closure and presence of other stand attributes that may support foraging NSOs also contribute to the habitat typing. Where natural stands are predominantly composed of ponderosa pine, they are considered non-functional habitat (Thomas, 1990; Thomas, et al., 1990a; USDI-FWS, 2011; Irwin, et al., 2007; Irwin, et al., 2012; Zabel, et al., 1992; USDI-FWS, 2009).

Other factors that determine habitat type and quality are average diameter class, species, layering or density of mid and understory trees - is stand development stagnate, or is the understory too dense for owls to fly through? How many trees (and species composition) per acre >26”DBH and 20-24” DBH with cavities, broken tops, or large limbs? Are there large (>20”diameter) snags with cavities? Is there abundant large down wood in combination with under, mid and overstory tree species and canopy cover that support foraging and dispersing NSOs, including perching sites for hunting, thermoregulation sites for roosting and overstory protection from avian predators? Are there openings, edges, hardwood and shrub species or earlier seral stands that support dusky-footed woodrat or other NSO prey and what are the abiotic factors contributing to habitat suitability in the project area include elevation, slope position and distance to water?

There are 240 acres of Riparian Reserves that overlay LSR and matrix, and the approximate 105 acres of Riparian Reserves along Ash Creek in the LSR primarily function as nesting/roosting, high quality foraging or foraging habitat. As elevation increases in the project area, stand suitability increases. Another key factor influencing use of foraging habitat, and subsequent evaluation of effects of treating such habitat, is its proximity and connectivity to nesting/roosting habitat. It is well-documented that during the breeding season, foraging decreases with increasing distance from the nest stand, and therefore stands greater than one mile away are less likely to be used by and therefore not support a population.
from suitable nesting/roosting habitat have a low probability of use by foraging NSOs (Bart, 1995; Bingham, et al., 1997; USDI-FWS, 2009; USDI-FWS, 2011). Refer to BA Appendix D for a complete description of habitat conditions in the action area and project area, and the classifications utilized to type nesting/roosting, high quality foraging, dispersal, capable and non-habitat. Table 57 below displays habitat types in the action area and respective smaller analysis areas (Elk Flat LSR, treatment unit, project area, core/home range scales).

Based on the preceding general conditions, field reviews for habitat validation, and 2007 CSE data, the nesting/roosting habitat currently exists in the northern portion of the project area, within one large block, and pockets along Ash Creek to the southeast. In the western, northern and central portions of the project area, there are stands and patches of low, moderate and high quality foraging habitat (foraging habitat trending toward nesting/roosting conditions) interspersed with early and mid-seral plantations (10-40+ years old). The older, dense, monotypic ponderosa pine plantations are considered capable of transitioning to dispersal or suitable foraging habitat with treatment. These stands are primarily in the core and home range on NFS lands, with few stands of foraging and dispersal in the eastern portion.

The NSO action area contains approximately 797 acres of designated critical habitat within Unit 8, Subunit 3 (East Cascades South [ECS-3]) (USDI-FWS, 2012). 720 acres are in the project area, all in the western portion of the Elk Flat LSR. The remaining 77 acres are located approximately four miles east of the project area’s critical habitat, along the base of Black Fox Mountain. Critical habitat is not designated on surrounding private lands or within the project area’s ponderosa pine-dominated stands or meadow at Elk Flat. The BA in Appendix E contains numerous maps displaying habitat, critical habitat, project treatments and other modeling results. Table 57 below includes the critical habitat designation acres.

The NGO analysis area is the same spatial area as the NSO action area. There are two NGO territories in the analysis area, ST-205 Elk Flat (in the LSR) and ST-259 Cramer (northeast of project area on Matrix lands). Based on annual surveys and territory checks, ST-205 has been active since 1985, though not reproducing every year (USDA-FS 1989-2015 NGO survey records). This territory is located in the south-central portion of the project area and approximately 289 acres of NGO habitats and known territory use areas are excluded from mechanical treatment (see the wildlife BE for additional detail).

Northern goshawks nest in dense, mid-mature and-late successional conifer forests and typically forage in these and mid-successional stands. For purposes of this analysis, suitable NGO habitat is considered the same as NSO NRF habitat, and includes more variable NSO dispersal habitat in the project area, depending on stand conditions, presence of small natural and man-made openings and forest edges. Approximately 39% of the project area is suitable habitat for the NGO and 9% is capable of providing suitable habitat over time or with treatment. The remaining 52% is non-suitable due to small tree size or lack of cover, but the extensive mortality area and other areas of large-scale pine mortality also provide prey base for NGO and other sensitive and special status species (refer to the wildlife BE, and the migratory bird, cavity-nesting bird, and project-level management indicator assemblage reports).

The fisher analysis area is 10,112 acres, comprised of NFS and private industrial timberlands. There are approximately 649 acres of resting/denning habitat and 4,725 acres of foraging habitat with the remaining considered non-functional due to clearcuts or other meadow openings that lack cover. For the purposes of this analysis, NSO nesting/roosting and high quality foraging is considered a proxy for fisher denning and resting habitat. This is due to presence of large trees, denser canopy closure and structural complexity (large limbs, cavities) that provide resting and denning structure (USDI-FWS, 2014). While canopy closure may be less dense than that found in NSO N/R habitat, NSO foraging habitat is also a proxy for suitable fisher foraging habitat also given the presence of large trees, variability in the under and midstory, and proximity to higher quality stands. As described above, the majority of matrix lands in the project area are not considered suitable habitat for NSO, but some portions of the forested stands along the eastern boundary of the project may provide foraging or resting habitat for NSO, NGO or fisher. See Table 58 for the acres of habitat in the analysis area and project area for both NGO and fisher.
Female fisher home ranges in the analysis area are unknown, though based on field observations and baited-camera station surveys, there is at least one, if not two, in the project area (USDA-FS 2014-2015). Where fisher detections have occurred the most frequently, and in denning habitat areas, no mechanical treatments are proposed and direct ignition during prescribed fire would not be used in these areas. These areas are concentrated in the NSO nesting/roosting habitat and areas along Ash Creek where there are large trees and snags that provide den sites (cavities), abundant down wood and 60% or more canopy closure.

In the NSO action area and NGO/fisher analysis areas, private lands are intermixed with NFS lands. The harvest practices on industrial timberlands directly west and north of the project area have significantly reduced the amount and recruitment of important key habitat features used by late-successional associated species, including large diameter snags and down wood. Even-aged management, sanitation, and selection harvest has been moderately extensive on private lands, resulting in a landscape dominated by early-or mid-serial stands with significantly fewer structural features associated with northern spotted owl, goshawk and fisher use. Connectivity to the north is provided in small patches of foraging, or nesting/roosting habitat, to federal lands within the Mt. Shasta LSR area (refer to the BA in the online project record for maps).

Table 57. Acres of Suitable, Dispersal, and Capable Habitat and Acres of Critical Habitat (CH) in NSO Action Area

<table>
<thead>
<tr>
<th>Habitat</th>
<th>ST-215 0.5-mile core^</th>
<th>ST-215 1.3-mile home range^</th>
<th>Treatment Unit^</th>
<th>Project Area^</th>
<th>Elk Flat LSR^</th>
<th>Action Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nesting/Roosting (N/R)</td>
<td>125</td>
<td>126</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>265</td>
</tr>
<tr>
<td>High Quality Foraging (HQB)</td>
<td>24</td>
<td>82</td>
<td>89</td>
<td>89</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>Foraging (F)</td>
<td>196</td>
<td>1048</td>
<td>1044</td>
<td>1053</td>
<td>1048</td>
<td>3329</td>
</tr>
<tr>
<td>Dispersal (Di)</td>
<td>9</td>
<td>958</td>
<td>301</td>
<td>317</td>
<td>301</td>
<td>3801</td>
</tr>
<tr>
<td>Capable (Cap)</td>
<td>96</td>
<td>334</td>
<td>329</td>
<td>331</td>
<td>331</td>
<td>335</td>
</tr>
<tr>
<td>Non-Habitat (Non)</td>
<td>50</td>
<td>850</td>
<td>1600</td>
<td>1609</td>
<td>1185</td>
<td>8141</td>
</tr>
<tr>
<td>Total NSO Habitat</td>
<td>500</td>
<td>3398</td>
<td>3483</td>
<td>3519</td>
<td>3074</td>
<td>15,960</td>
</tr>
<tr>
<td>PCE1 (Cap)</td>
<td>91*</td>
<td>165</td>
<td>164</td>
<td>165*</td>
<td>165</td>
<td>165</td>
</tr>
<tr>
<td>PCE2 (N/R)</td>
<td>120*</td>
<td>120</td>
<td>120</td>
<td>120*</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>PCE3 (HQB)</td>
<td>13*</td>
<td>22</td>
<td>22</td>
<td>22*</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>PCE3 (F)</td>
<td>154*</td>
<td>308</td>
<td>308</td>
<td>308*</td>
<td>308</td>
<td>308</td>
</tr>
<tr>
<td>PCE4 (Di)</td>
<td>0*</td>
<td>76</td>
<td>15</td>
<td>15*</td>
<td>15</td>
<td>76</td>
</tr>
<tr>
<td>Non-Habitat in CH</td>
<td>46</td>
<td>106</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>106</td>
</tr>
<tr>
<td>Total CH Designation</td>
<td>424</td>
<td>797</td>
<td>629</td>
<td>720</td>
<td>720</td>
<td>797</td>
</tr>
</tbody>
</table>

^ Portions of core, home range and action area are located on private lands. Acres are reported at varying scales and not meant to be summed (i.e. core habitat acres may overlap with other areas). Treatment unit habitat is the existing condition, not the amount proposed for mechanical treatment, though all treatment areas are subject to prescribed fire in accordance with burn objectives and RPMs. The 2-acre difference is due to slivers/areas that overlap roads and is not CH

*Scale of Affected Area Examined for Key Issue #3

Table 58. Acres of Suitable and Capable Habitat in NGO and Fisher Analysis Areas and Project Area

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Analysis Area</th>
<th>Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable NGO Habitat</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Environmental Consequences

Alternative 1- Modified Proposed Action

Direct and Indirect Effects – Alternative 1

The project’s design features (how the project was designed to minimize or avoid direct effects to individuals and habitats, including excluding treatment units and high habitat quality areas from mechanical treatment) and the Resource Protection Measures or RPMs (measures taken during implementation that also minimize the potential for direct or indirect effects) are described in Chapter 2. The RPMs specific to the NSO, northern goshawk and fisher include limited operating periods (LOPs) for habitat altering and noise and smoke-generating activities in critical breeding areas, as well as the NSO home range, and limiting the use of direct ignition in high quality habitat areas. The project design and RPMs were developed through the interdisciplinary process and discussed during streamlined consultation with the FWS. Refer to Appendix C of EIS Appendix E for a full account of the consultation to date.

Direct Effects to Individuals

Direct effects to individuals are not expected, as there are no mechanical treatments proposed in the ST-215 core, the ST-205 northern goshawk territory, suspected or known fisher denning areas, NSO nesting/roosting habitat or high quality habitats that may be used as reproductive sites. RPMs in Chapter 2 (31, 32, 33, 34, and 39) describe the limited operating periods (LOPs) and other measures that will be implemented to minimize or eliminate direct effects to potential breeding individuals during critical periods. These RPMs explain the start times for LOPs and the criteria that must be met to lift them. Surveys, activity center searches and spot checks per the 2012 NSO survey protocol will be continued prior to, and throughout project implementation. Carnivore monitoring and NGO surveys will also be continued (see the Monitoring Common to All Action Alternatives section for wildlife and silviculture at the end of the RPMs in Chapter 2).

Adult and sub-adult NSOs and goshawks, and adult fishers are mobile and generally able to move away from disturbances (noise from heavy equipment use; falling of trees; smoke from pile burning or underburning; noise from road actions and hauling of logs or chips). These stressors have a higher likelihood of affecting adults, juveniles and kits during the breeding season however, when adults are closely associated with a core, territory or multiple natal and maternal den sites. Juvenile NSOs and NGOs are not yet able to fly, and fisher kits are not mobile enough to travel with their mothers until about 4 months of age (Aubry and Raley 2006). Adults expend high amounts of energy defending their territories during critical breeding periods (typically extending from February 1 through: 1) the end of July for fisher; 2) mid-August for NGO; and 3) mid-September for nesting NSOs. The LOPs and other measures developed in coordination with the FWS, and the
IDT, are expected to minimize, if not eliminate, the likelihood that project activities will have direct effects on single or breeding NSOs, goshawks, fisher or their young. The project, in accordance with standard operating procedure, includes provisions for limiting activities in the event of any new discoveries. Smoke from pile burning and underburning may cause foraging or dispersing individuals to move away from smoky areas, though this potential effect would be of short duration, several days or less in any single location.

All action alternatives include applying a registered borate compound to stumps ≥14 inches diameter within four hours of cutting to reduce or inhibit the spread of *Heterobasidion* root disease (annosus). The solid Sporax® or liquid Cellu-Treat or possibly other brands or formulations may be used. Based on the analysis of where the compound may need to be applied (stands with expected stumps >14”), approximately 2,040 acres may receive treatment under Alternative 1. If Sporax® is used; it would be applied at a rate of approximately one pound/acre under. Application of any compound will follow all state and federal rules as they apply to pesticides and will not be applied during precipitation events. The potential toxicity of Sporax® and boron to mammals, birds, fish, amphibians and terrestrial and aquatic invertebrates and fungi is discussed in several publications (EPA, 1993); (USDA-FS, 2006). Based on this research, Sporax® application to cut stumps is not expected to have adverse effects on wildlife or surrounding plants, invertebrates or microorganisms (USDA-FS 2006). At high concentrations, it is toxic to plants and measurements of soil, plants and litter at distances up to five meters from stumps at various times post-application do not indicate treatment-related increases in boron content. While the potential exists for an NSO, NGO or fisher to consume contaminated prey or water, risks to avian and terrestrial species are low with most acute and chronic risk quotients well below levels of concern (USDA-FS, 2006). Direct effects to wildlife are not expected based on the following rationale: 1) it is unlikely for an NSO, goshawk, fisher (or other wild animal/livestock) to ingest Sporax® granules from treated stumps; 2) none of the hazard quotients exceed levels of concern for contaminated water (even at application rates 10 times those proposed); and 3) the 2006 risk assessment indicates boric acid is practically non-toxic to avian and mammalian species.

Barred owl and NSO interactions are thoroughly described in the BA (EIS Appendix D and other sections including Direct Effects) including ongoing demographic study area research in the NSO’s range, information from demographic study areas similar to the project area and management Unit, and recent findings regarding NSO recolonization and occupancy rates after barred owl removal (Diller, et al., 2016). Information relative to the decision to be made is summarized here. Appendix B of the Recovery Plan also contains numerous references regarding barred owl competitive interactions with NSOs, and is hereby incorporated by reference.

While the current, primary source of NSO habitat loss is high-severity uncharacteristic wildfire (USDI-FWS 2011, (Davis, et al., 2015), competition from barred owls is a significant, if not the primary current cause, of NSO population decline, as discussed below (Dugger, et al., 2015). Due to similar dietary and habitat preferences, the barred owl is competitor and known predator (USDI-FWS 2011). While details on habitat interactions are not well understood, they have a broader diet, may reduce NSO detectability and may occupy former NSO activity centers (Irwin, et al., 2010; USDA-FWS, 2011; Wiens, 2012). Their range completely overlaps with the NSOs range (Gutierrez, et al., 1995) and they can negatively affect NSO site occupancy, reproduction and survival (Livesey, et al., 2007). Similar effects may occur on any NSO from barred owls utilizing the action area, regardless of project implementation.

---

86 This research was published December 2, 2015, but appeared in Volume 118 and a 2016 issue of the Condor. It is referenced throughout this EIS as Duggger et al. 2015.

87 Confirmed predation of spotted owls by barred owls is known from one direct observation and predation is not considered a significant issue. Note that competition is considered a significant threat per the Revised Recovery Plan for the Northern Spotted Owl.
NSO populations have continued to decline in all parts of their range, even with maintenance and restoration of suitable habitat (USDI-FWS 2011, Dugger, et al., 2015). The recent December 2015 meta-analysis, based on the 11 demographic study areas established (or used) for NSO monitoring under the NWFP, indicates a range wide average 3.8% annual decline rate of the population. The analysis concludes that the results from 1985 through 2013 indicate competition with barred owls may be the primary cause of NSO population decline across their range. It also concludes that nesting and roosting habitat loss, and climatic patterns, were related to survival, occupancy, recruitment, and fecundity. The author’s findings provide support for previous recommendations to preserve as much high-quality habitat in late-successional forest as possible across the range of the subspecies (Forsman et al. 2011, Dugger et al. 2011).

The analysis also cautions, “barred owl densities may now be high enough across the NSOs range that, despite continued management and conservation of suitable NSO habitat on federal lands (Davis et al. 2011, 2015), the long-term prognosis for NSO persistence may be in question without additional management intervention.” Finally, it notes that barred owl removal may be able to slow or reverse population declines on at least a localized scale, as was observed in the GDR study area (Dugger et al. 2015). The recovery objectives listed in the Recovery Plan for dry forests include maintaining sufficient NSO habitat in the short-term to allow NSOs to persist in the face of threats from barred owl expansion and habitat loss from wildfires.

While the barred owl constitutes a significantly greater threat to NSO recovery than originally thought at the time of NSO listing in 1990, it is unclear whether forest management has an effect on the outcome of interactions between barred owls and NSO (Courtney, et al., 2004). Data relevant to the relationship between NSO survival and reproduction response and barred owl interactions specific to forest management also remains limited. Even without fully understanding effects of forest management, the recent research demonstrates the importance of maintaining high quality nesting/roosting habitat and decreasing habitat fragmentation to minimize NSO interactions with barred owls (Dugger et al. 2005, 2011, 2015; Forsman et al. 2012; Wiens et al. 2014).

It is recognized that when barred owls and NSOs do co-occur, a reduction in habitat availability and quality may exacerbate interactions between the two subspecies. Dugger and others (2011) suggest that in environments where the two species compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help NSOs to persist in the short term. This recommendation was supported again in the 2015 meta-analysis described above.

The key vital rates that barred owls are influencing the most in NSO populations appear to be apparent survival and local extinction rates (Dugger et al. 2015). Additionally, Dugger and others (2015), along with Diller and others (2016) found a positive association between barred owl removal and spotted owl vital rates. Wiens and others (2014) predicted that competitive release from barred owls would result in decreases in space use and energy expenditure with corresponding increases in site occupancy and reproductive output of NSOs, but only if sufficient nesting, roosting and foraging habitats are available for re-occupancy by NSOs and their prey. Wiens and others (2014) also found a strong potential for exploitation and interference competition between NSOs and recently established barred owls, and that availability of old forests and associated prey species are likely to be the most strongly limiting factors in the competitive relationship between the two subspecies. Therefore, the evaluation of direct and indirect effects from barred owl focuses on whether the proposed treatments under the Elk LSR project could potentially exacerbate competitive interactions between the two subspecies by reducing availability of high-quality habitat or prey availability.

The project is designed in accordance with recommendations from the Recovery Plan for Recovery Action 10 and 32, through consultation with the FWS (USDI-FWS, 2011), (Dugger, et al., 2011). There are no

88 One exception to decline in the demographic study areas was the treatment area within the GDR, where NSO populations started increasing after barred owl removals were initiated in 2009.
mechanical treatments proposed in nesting/roosting habitat, or high quality foraging habitats in the project area. Reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function, but benefit it over time and would not exacerbate any competitive interactions between NSO and barred owl. As there is no current evidence that thinning treatments in foraging habitat creates conditions favorable to barred owls that could subsequently facilitate expansion into a treated area, and thinning treatments would not occur in nesting/roosting or other high value habitat, it is also unlikely that thinning treatments will exacerbate competitive interactions between the two subspecies. Foraging habitat is well-distributed in the western and central portion of the project area and the majority of thinning treatments would maintain habitat function, downgrading a minor proportion of foraging habitat that currently has low intrinsic value for NSOs due to dense stand conditions of small trees. Foraging habitat function would not be removed by the project treatments and the thinning and underburning treatments are not expected to significantly impact foraging opportunities or prey base for NSOs (see the ‘Effects to Foraging Habitat’ section in EIS Appendix E).

With the removal of the barred owl pair in fall 2014, a greater potential now exists for the AC to be used by dispersing or territorial NSOs in the future (Dugger et al. 2015, Diller et al. 2016). Barred owls have been observed on the SMMU since 1997 and the removal of the pair in 2014 does not mean barred owls could not re-occupy the action area or project area. At this time however, and based on current best available information, direct effects to NSO from competitive interactions with barred owls is not expected as a result of the project. Contributing to this determination is the fact that the ST-215 activity center has been unoccupied by a verified territorial or reproducing NSO pair since 1990, the last verified detection of a resident single NSO was in 2003, and NSOs were not detected or sign observed during the 2015 survey season (after the barred owl pair was removed). It is possible, given the pressure that barred owls exert on NSOs in terms of responsiveness during surveys as described from literature above, that NSO may have been present in the project area during the 2012-2014, 6-visit surveys, or may have dispersed through/temporarily occupied the home range during fall dispersal periods. As described above and in the Chapter 2 RPMs, NSO surveys, spot checks and stand searches will be conducted in accordance with the 2012 protocol, or modification of the protocol, as agreed to by the US-FWS/STNF Level 1 team. These survey efforts will continue prior to and during implementation in and adjacent to the ST-215 core and home range, and habitats likely to contain NSO. The pre, during and post-implementation surveys will be used to evaluate for any NSO individual or pair occupancy or barred owl presence. LOPs are also in place to reduce the potential for direct or adverse effects to any reproducing NSOs.

While the Recovery Plan concedes there are still substantial information gaps regarding ecological interactions between NSOs and barred owls (p. III-62), the effects of forest management their interactions is not fully understood at this time (Courtney, et al., 2004). Ongoing and future monitoring may provide for further understanding and no additional conclusions are made in regards to the project’s effects in terms of barred owls and NSO competitive interactions.

Effects relative to Purpose and Need for Action

Effects of the proposed treatments on NSO, their habitat, and their prey are fully described in the BA (EIS Appendix E); and similarly for NGO and fisher, in the wildlife BE in the online project record. These analyses are incorporated by reference. Effects as they relate to the purpose and need for action, and those relative to the decision to be made, are summarized below.

As described in the Silviculture and Forest Health section, and indicator comparison tables in Chapter 2 (Table 29), Alternative 1 best meets the purpose and need for action for reducing the continued risk of losing early, mid and late-successional habitat, increasing stand resilience, and accelerating development of late-successional habitat in the Elk Flat LSR. For the wildlife indicators, meeting the need is measured by the amount of capable, foraging, nesting/roosting, resting/denning habitat benefitted, maintained in its current condition, degraded, downgraded or removed. Predicted effects to habitat are based on a comparison of pre-
treatment stand and habitat conditions, the modeled immediate and 20-year post treatment stand conditions, and the project design and marking guides that maintain important habitat elements. Conclusions regarding post-treatment habitat function are supported by published descriptions of forest structure associated with NSO, northern goshawk and fisher habitat in dry forest types, their prey and local monitoring data on similar treatments and habitat function effects.

Terms used to categorize the degree of predicted change in habitat function and quantify of affected habitat include:

- Maintain/Beneficial: Indicates changes in habitat may be neutral or beneficial to habitat function even though habitat elements may be modified.
- Degrade: Signifies when treatments have a negative influence on habitat quality due to removal or reduction of habitat elements but not to the degree where the existing or pre-treatment habitat function is changed.
- Downgrade: Signifies when treatments reduce habitat elements to the degree that habitat will not function in the capacity that existed pre-treatment, but activities will not remove habitat entirely (i.e., downgrade from nesting/roosting to foraging or foraging to dispersal).
- Remove: Pertains to treatments that reduce habitat elements to the degree that habitat will no longer function as suitable for a species.

Given the range of habitat variability in and between the natural stands described in Chapter 1, the wildlife Affected Environment section and the incorporated analysis reports, the pre-and post-treatment FVS-FFE stand modeling and measurements in suitable habitat may indicate higher or lower values of basal area or canopy closure, but these projections are based on averages. See Appendix E of the BA for a summary table of these stands and the FVS-FFE modeling. While helpful at providing data on general stand conditions, the modeling represents averages and trends and provides for a comparison of alternatives. It does not account for the high degree of expected post-treatment variability in treated suitable foraging or dispersal habitat, including tightly grouped clumps of large and small trees, the unthinned patches and high quality habitat areas excluded from thinning, the tree selection criteria that maintains predominant and most dominant trees, and large snag and down wood retention. Treatments will be variable at the fine stand scale and landscape scale. They will not remove important structural components such as predominant legacy trees, dominant trees with old-growth characteristics such as large boles, decadent branching, cavities and flattened tops, large snags or large down wood, unless necessary for operational safety.

Table 29 in Chapter 2 summarizes the predicted effects by action alternative to each species’ habitat type. Rationale for treatment effects to suitable habitat is summarized below. Connected actions of hazard reduction will not occur in suitable habitats for these three species, so are not discussed here. They are discussed in the respective incorporated resource reports for wildlife, along with the adaptive management for salvage of dead and dying pine and treatment of biomass.

**Effects to High Quality Habitat**

NSO nesting/roosting, high quality foraging and fisher resting/denning habitats will be benefitted through the reintroduction of low-intensity prescribed fire. Surface and small ladder fuels would be reduced in these stands, but overall density or habitat quality and function would not be appreciably reduced. Low-intensity prescribed fire would reintroduce a lacking disturbance element and would be carefully applied and monitored. Table 27 in Chapter 2 fully describes the limits of acceptable mortality for tree size class 4” diameter and larger, shrubs and understory. RPMs 24, 25, 38, 42 describe limiting the amount of burning in the ST-215 core/home range and the measures taken to reduce injury or mortality to predominant trees and other
habitat elements (snags, large down wood). This measure also benefits the ST-205 NGO territory and known denning habitat areas for fisher.

Low-intensity prescribed fire (applied at levels prescribed in the RPMs) in nesting/roosting, resting/denning and high quality foraging habitats is expected to result in both short-term negative effects to prey and down wood levels, depending on burn timing (disturbance, repeated disturbance, seasonality of burning and wood consumption) and beneficial effects. Increased understory vegetation diversity, grass, forbs, and potential increases in prey base over the long term aer predicted, while reducing surface fuel loading (Anthony 2007; Beche et al. 2005; Innes et al. 2006; Knapp et al. 2007, 2005; Roberts et al. 2015). While this treatment is predicted to maintain and benefit habitat by reducing surface and small ladder fuels (based on relevant research and monitoring of prescribed burn effects on the Management Unit), there is some uncertainty associated with these predicted effects. The burning effects would be monitored closely to see if changes in burning prescriptions or seasonal timing are needed. The effects of prescribed fire treatement on habitat, and prey base, are fully described in the BA and the BE.

See Table 29 for Wildlife in Chapter 2 for a summary of effects to habitat by alternative.

Effects to Foraging Habitat
Efforts Foraging habitat would be degraded or downgraded, though will not significantly impact how NSOs, goshawk or fisher utilize the landscape for foraging. Foraging habitat for NSO and northern goshawk will either be degraded by variable density thinning, or downgraded through variable density thinning combined with radial release around black oak or predominant legacy pine. Foraging habitat for fisher would only be degraded, as the treatments that downgrade NSO and NGO habitat result in a reduction in some habitat elements for fisher but do not change the stand quality such that fisher could not forage in them post-treatment. This is due to the fisher’s wider range of foraging habitat characteristics (USDI-FWS 2014).

The Recovery Plan for NSO discusses silvicultural practices that promote forest resilience that can be applied to various forest types. Short-term decisions to increase a forest ecosystem’s ability to adapt to climate-driven drought stresses may include vegetation management around older individual trees to reduce competition for moisture. Longer-term strategies may include promoting heterogeneity among and within forest stands. In many areas, fire could be encouraged to perform its ecological role of introducing and maintaining landscape diversity, though it may be desirable to manage fire severity or return intervals through vegetation management at various temporal and landscape scales (pp. III-21). As variable-density thinning is a silvicultural technique intended to promote biological diversity and structural heterogeneity characteristic of old-growth forests, it induces fine-scale variation in homogeneous second-growth forest canopies ( (Aukema, et al., 2008); (Muir, et al., 2002). It consists of thinning a forest stand at different intensities in patches at a scale of approximately 0.1 to 0.5 ha to mimic the scale of patchiness found in old growth and late-successional forests and create a mosaic of overstory and midstory tree densities (Carey, et al., 1999; Carey 2003).

In the dry forest landscapes that support NSO habitat, increasing resiliency of a stand or landscape also includes reducing conditions that contribute to stand vulnerability. This includes reducing stand density and surface and ladder fuels, especially in areas likely to experience fire. Many recent studies in mixed conifer forests have found the effectiveness of thinning or fuels treatments designed to modify or change fire behavior or suppression efforts is highest when tree thinning is combined with prescribed fire (Agee, et al., 2005), (Lehmkuhl, et al., 2007), (Lehmkuhl, et al., 2015), (Prichard, et al., 2010). Some of these authors acknowledge the potential for direct and indirect effects on resources while recognizing difficulty in balancing what may be opposing management objectives. Others debate methodologies that evaluate the actual risk to forests in the dry forest regions from high intensity, uncharacteristic wildfires (Spies, et al., 2010), (Odion, et al., 2014).
Efforts that enhance forest resilience to wildfire at the stand level often focus on a set of management objectives for fuels, including reducing woody surface fuels, ladder fuels, and crown densities, and retaining large trees of fire resistant species. Reducing woody surface fuels helps reduce the potential for surface fire intensity (heat release), flame lengths and fire severity (Lehmkuhl et al. 2015). Reducing ladder fuels can also disrupt vertical continuity of fuels and reduce the probability of surface fire transitioning to crown fire. Retaining large trees of fire-resistant species in seeks to maintain stand structural and compositional stability by keeping existing trees that are most likely to persist through future fires and retaining seed sources that facilitate regeneration of fire-resistant species.

The variable density thinning, combined with follow-up prescribed fire and other surface fuel treatments meet the recommendations in the Recovery Plan for restoring dry forest ecosystems. These treatments would degrade foraging habitat function on 697 acres for NSO, 893 acres for northern goshawk and 990 acres for fisher. These treatments represent approximately 62 percent of the available foraging habitat for these species in the project area.

Where foraging habitat is degraded, it will continue to provide foraging opportunities post-treatment. This determination is based on the post-treatment condition of basal areas ranging from 125-200+ sq. ft./acre (when combined with the roost and rest clump retention and unthinned patches), 40-60 percent or more canopy cover, a patchy mosaic of burned and unburned areas, including unburned piles where fuels are piled, and mid and understory layering. The group selection and small gap creation in white fir (2 to <0.25-acre openings in homogenous white fir) would result in increased vertical and horizontal heterogeneity from a younger age class and species diversity. These conditions are well within the range of foraging habitat conditions frequently used by NSO (Irwin, et al., 2007), (Irwin, et al., 2012). Additionally, the retained species diversity, residual large trees, snags and down wood would contribute to habitat functioning as foraging post-treatment.

The unthinned patches and larger stand areas set aside for no treatment would continue to provide functional and structural elements including thermal and visual cover, dense small trees, pockets of suppression and mortality, and undisturbed debris. Higher stand densities would be retained where patches or groups of notably large trees occur in order to retain existing desirable late successional characteristics, and provide roosting or resting sites. While the unthinned patches and high basal area retention areas would remain at risk from density-related and insect and disease mortality, these areas would be smaller and less contiguous than the current conditions.

The temporary change in the quality but not function of foraging habitat would last for approximately 5 to 20 years, depending on treatment location and type. Degraded foraging habitat would continue to function at pre-treatment habitat levels as primary habitat elements of at least 40% canopy cover, abundant down logs and large snags, multi-layering, vertical and horizontal structure are maintained in the post-treatment condition. Other important habitat elements such as roosting structure, thermal refugia, shrubs and openings for dusky-footed wood rat and other prey base would also be retained in the post-treatment condition. The variable density thinning treatments are designed to maintain important habitat elements and benefit foraging structure, composition, and variability over the short- and long-term. Degraded habitat generally returns to pre-treatment quality levels over a 20-year timeframe as the remaining trees grow larger and canopy levels reach and exceed 60% or higher and the mid- and understory continues to develop. These time estimates bar any events such as another epidemic insect or disease outbreak, or uncharacteristic stand replacing fire that can reset the seral stage in a stand, or part of a stand.

Twenty-seven acres of black oak release and 71 acres of radial thinning to protect and enhance predominant legacy pine in NSO and goshawk foraging habitat will downgrade habitat to dispersal function. This is due to canopy closure and cover being reduced to below 40% and the average basal area ranging from 60-120 sqft/ac on average. The effects of this treatment are expected to last for 10 to 30 years as follow-up underburning will incrementally reduce remaining under- and mid-story trees, and some down wood and snags, over the 30-year
timeframe for the three prescribed fire entries. While there will be patches of dense roosting/resting sites, oaks
that are not released, large and small trees, and snags and down wood in the post-treatment condition, these
conditions do not provide enough residual habitat to consider the 27-acre area as ‘foraging’ habitat for NSO or
NGO post-treatment.

The radial thinning around legacy predominant pine would downgrade foraging habitat function on 71 acres
to dispersal (based on the prescription of releasing up to two legacy trees per acre, as available). As this
treatment generally removes all smaller diameter trees within a 50-foot radius of the bole, except for other
predominant legacy trees of any species or large diameter snags, numerous 0.25-0.30 acre size gaps will be
spread across the treatment area where little to no understory or midstory vegetation remains. The effects
of this treatment are expected to last for 20 to 30 years and while the radial release treatment will also provide
residual foraging opportunities, the habitat condition in these patches will be considered dispersal in
combination with the other thinning and underburning treatments.

These combined treatments represent 7 to 9 percent of the foraging habitat available in the project area for
NSO and NGO respectively, and are not expected to result in a significant negative effect to individuals or
overall habitat function. This determination is based on the: 1) small scale of habitat affected, 2) position of
the treatment within the outer portion of the ST-215 home range and being outside the ST-205 territory, and 3)
the long-term benefit of increased stand and prey species diversity. It is considered a short-term and minor
adverse effect to critical habitat components of NSO foraging, with long term effects from follow-up
prescribed fire entries over the long term (PCE 3-discussed further below).

There will be no removal of suitable habitat function for NSO, northern goshawk or fisher.

Effects to Capable Habitat

The current dense and uniform stand conditions in older ponderosa pine plantations limit use by most wildlife
species and the stand variability created by thinning would facilitate access for foraging (fisher, goshawk).
Group selections would introduce a more diverse species and age class, particularly along plantation edges
adjacent to higher quality habitat. Long-term benefits would be realized through the increased species and
structural complexity, improved resilience to mixed severity fire, and eventual long-term development of
multi-aged, multi-species stands. The other treatments that improve capable habitat, such as young plantation
thinning and low-intensity fire, combined with older plantation treatments would occur on 329 acres for NSO,
and 608 acres for northern goshawk and fisher.

Prescribed Underburning

Three prescribed fire entries are proposed over an approximate 30-year timeframe following completion of
mechanical thinning activities. This treatment is intended to reintroduce a more frequent, natural fire regime
and to consume natural and activity-generated fuels or reduce small-diameter surface and ladder fuels. While
the entire project would not be burned in any one year, and burning entries would be incremental over the
30-year timeframe, effects to understory vegetation, down logs and snags are expected to be short-term. The
direct effects of prescribed fire on prey and suitable (and dispersal) habitat would primarily be limited to the
season or year of implementation. Underburns are intended to mimic low-intensity wildfires, and burn
prescriptions will be written and applied to minimize consumption of soil cover including duff, litter and
coarse woody debris in accordance with RPMs and Tables 21 and 22. Prescribed fire typically burns in a
patchy mosaic, coincident with the distribution of the fuelbed, leaving burned and unburned areas. Small
diameter-understory trees are typically killed and occasional flare-ups can occur and kill overstory trees.
Refer to the BA and the BE for additional effects analysis on prey base habitat elements.

Conclusions as they relate to the Purpose and Need

Based on the predicted effects of thinning and the stand modeling for tree size classes immediately post-
thinning and 20 years-post (see the Silviculture and Forest Health section) and the limitations of the modeling
results, the treatments under Alternative 1 facilitate the most acreage toward increased stand resilience and larger tree size classes in the LSR. This includes a corresponding reduced risk of habitat loss and increased connectivity for late-successional associated species.

In summary, 1,743 acres of habitat for NSO would be improved over the 20-year modeling period, representing 57 percent of the LSR; 1,997 acres of northern goshawk habitat would be improved, representing 65 percent of the LSR; and 2,018 acres would be improved for fisher, representing 66% of the LSR. Fire behavior modeling indicates that indirect effects of combined thinning and subsequent fuels treatment would reduce the potential for passive crown fire and promote surface fire (see the Fire and Fuels section).

In relation to the northern spotted owl, the project is consistent with six of the eight Recovery Plan’s dry forest restoration principles:89

- Conserving older stands that contain conditions to support NSO occupancy or high-value NSO habitat as described in Recovery Actions 10 and 32 (USDI-FWS 2011 pp. III–43, III–67). On Federal lands this recommendation applies to all land-use allocations;
- Emphasizing vegetation management treatments outside NSO territories or highly suitable habitat;
- Designing and implementing restoration treatments at the landscape level;
- Retaining and restoring key structural components, including large and old trees, large snags, and downed logs;
- Retaining and restoring heterogeneity within and among stands (USDI-FWS 2011 pp. III-34 to III-35).

Treatments that meet the above principles are expected to result in a variety of effects on NSO habitat in the short and long term. The proposed use of low-intensity fire in high quality habitat is expected to have an immediate beneficial effect. No mechanical treatments would occur in high value or highly suitable habitat. The proposed actions will not reduce nesting, roosting or foraging habitat in a home range with a reproductive NSO pair. Treatment types and locations have been prioritized within the unoccupied ST-215 core and home range, based on existing habitat levels, occupancy (or lack thereof), the current habitat levels that are <40% in the home range (currently at 37%) recommended values and the ability to effect meaningful structural change in a <30 year timeframe. Refer to Appendix E, ‘Effects to Home Ranges and Cores’ section.

The current ST-215 core and home range likely functions, or would function better over the short- and long-term, for a dispersing juvenile, subadult, or non-territorial (floater) NSO. However, over the long-term, the current ‘configuration’ of habitat types and overall suitability in the home range and core is not expected to support a reproductive pair, primarily due to 60% of the home range being within private industrial timberland production and 32% of the core in plantations. As NSO home ranges are typically analyzed at the circular scale, this analysis may be misleading in some cases. Over time, the project area could function to support a reproductive NSO pair as more dispersal and capable habitat transitions to suitable habitat. It is still likely that over the short and long term (20 to 30 years) that this area will primarily function as a temporary location for dispersing individuals moving from their natal sits to occupy other territories.

Project-wide, the variable density thinning treatments will maintain a range of basal areas ranging from 125-200+ sq. ft./acre (when combined with the roost and rest clump retention and unthinned patches), 40-60% or higher canopy cover, a patchy mosaic of burned and unburned areas, including unburned piles where fuels are

89 The remaining two principles, “Manage roads to address fire risk; and “Use wildfires to meet vegetation management objectives where appropriate.” are not directly applicable to the Proposed Action.
piled, and mid and understory layering. The group selection and small gap creation in white fir (2-acres in ponderosa pine plantations, to <0.25-acre openings in homogenous white fir) would result in increased vertical and horizontal heterogeneity from a younger age class and species diversity. These conditions are well within the range of foraging habitat conditions frequently used by NSO (Irwin, et al., 2007), (Irwin, et al., 2012), (Irwin, et al., 2015). Additionally, the retained species diversity, residual large trees, snags and down wood would contribute to habitat functioning as foraging post-treatment – providing prey base habitat and thermoregulation sites.

The treatments are considered consistent with the ecological forestry principles discussed in the Recovery Plan and 2012 Final Critical Habitat Rule where long-term NSO recovery will benefit, even if short-term impacts may occur (Franklin, et al., 2006). The treatments are proposed to improve the resiliency of the landscape in light of the threats to NSO habitat from the existing risk conditions in the project area that have been exacerbated by prolonged drought. The treatments are intended to promote spatial heterogeneity within patches, restore underrepresented species (oak, aspen, Douglas fir) and structural diversity. While some of these management actions may degrade habitat in in the short-term, they are considered beneficial in the long-term as they would reduce future losses of ecosystem structure or result in a higher resilience to future disturbance events (USDI-FWS, 2011 pp. III-14).

Effects relative to key issues

The effects of the variable density thinning and other restoration treatments designed to reduce the risk of losing, and accelerate development of, late-successional habitat summarized above relative to the purpose and need are addressed here, in terms of their expected influence on designated critical habitat for the NSO. There are 720 acres of critical habitat in the Elk Flat LSR and project area within Unit 8, Subunit 3 (East Cascades South [ECS-3]). All critical habitat in the project area is within the ST-215 home range. There are about 718 acres of vegetated area in critical habitat designation, the two acres being slivers or areas within the roadway.

Special management considerations or protection are required in this subunit to address threats to the essential physical or biological features from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls. The function of this subunit is to provide demographic support in this area of sparsely distributed high-quality habitat and Federal land, and to provide for population connectivity between subunits to the north and south. The FWS determined that all of the unoccupied (and likely occupied) areas in this subunit are essential for the conservation of the species to meet the recovery criterion in the Recovery Plan that calls for continued maintenance and recruitment of NSO habitat (USDI-FWS, 2011 p. ix). The increase and enhancement of NSO habitat in this subunit is especially important for providing essential connectivity between currently occupied areas to support successful dispersal of NSOs, and may also help to buffer northern spotted owls from competition with the barred owl (USDI-FWS, 2012 p. 71931).

The Final Rule describes that in the drier, more fire-prone regions of the NSOs range, habitat conditions will likely be more dynamic and active management may be required to reduce the risk to the essential physical or biological features from fire, insects, disease, and climate change, as well as to promote regeneration following disturbance. While the FWS recommends conservation of high quality and occupied NSO habitat, it asserts that long-term recovery could benefit from forest management where the basic goals are to restore or maintain ecological processes and resilience (p. 71908). Management actions should be considered to balance short-term adverse effects with long-term beneficial effects.

Suggestions regarding active forest management within critical habitat include:

1. Focusing active management in younger forest and lower quality owl habitat, or where ecological conditions are most departed from the natural or desired range of variability;
2. In dry forests, following the NWFP guidelines and focusing on lands in or outside reserves most “at-risk” of experiencing uncharacteristic disturbance, and where the landscape management goal is to restore more natural or resilient forest ecosystems;

3. Avoiding or minimize activities in active NSO territories (or high-quality habitat in these territories);

4. Ensuring transparency of process, so the public can see what is being done, where it is done, what the goal of the action is, and how well the action leads to the desired goal; and

5. Practicing active adaptive forest management by incorporating new information and learning into future actions to make them more effective, focusing on how these actions affect NSOs and their prey (pp. 71882-71883).

To ensure the treatments proposed in critical habitat are consistent with recommendations for management described in the Final Rule, several field reviews were conducted with the FWS and Forest Service personnel to the majority of natural stands designated as critical habitat, and some of the older plantation units in critical habitat. Refer to Appendix C of the BA (EIS Appendix E) for the detailed discussion of consultation to date. The specific treatments in unit 153 (oak release, radial thinning of pine, small gap creation), and other units proposed for thinning and prescribed fire were reviewed by both agencies and deemed consistent with management objectives within the East Cascades Province (p. 71907).

Effects to Critical Habitat

For the NSO, the Primary Constituent Elements (PCEs) of Critical Habitat are the specific characteristics that make areas suitable for nesting, roosting, foraging and dispersal habitat. PCEs are defined as:

1. Forest types that may be in early-, mid- or late-seral stages and that support the northern spotted owl across its geographical range (PCE 1);*

2. Nesting/roosting habitat (PCE 2);

3. Foraging habitat (PCE 3); and

4. Dispersal habitat (PCE 4).

*PCE 1 must occur with PCE 2, 3 or 4.

Under Alternative 1, approximately 629 acres of designated critical habitat would be treated (87% of the total in the project area). There would be short-term and minor adverse effects to elements of PCE 3 from variable density thinning, radial thinning around predominant legacy pine and black oak release. While these adverse effects would occur, this alternative meets the Final Rule’s recommendations for active forest management on the most acres in the project. The ST-215 core/home range is not considered active or occupied by a territorial pair, and as described in the Conclusions section above, treatment locations in the core and home range are prioritized in accordance with recommendations for Recovery Action 10. In addition, the project does not mechanically treat any high quality NSO habitat, in accordance with recommendations for Recovery Action 32 in the Recovery Plan.

At the project (and ST-215 home range) scale, 164 acres of capable habitat (PCE 1) would be moved toward stand conditions that support dispersal (PCE 4) over the short-term (~10 years) and foraging (PCE 3) over the longer term (20 to 30 years). The thinning and group selection treatments in 40+ year old plantations would affect 23% of the designated critical habitat in the home range and 100% percent of the core.
All of PCE 2 (nesting/roosting habitat; 120 acres) would be benefitted and maintained through low-intensity prescribed fire. This would reduce surface and ladder fuel loading and contribute toward understory diversity, as summarized above for general habitat effects (see also Appendix E). Prescribed fire in critical habitat may affect individual trees and could modify canopy cover through creation of gaps. However, due to the low-intensity burn objectives developed specifically with the FWS and the IDT fuels specialists (see Table 21 and Tables 8 and 9 in Appendix E), this treatment is not expected to appreciably reduce the function of nesting/roosting, or high quality foraging, habitat at the stand or sub-unit level. This treatment represents 17 percent of the critical habitat in the project area (ST-215 home range). About 60 acres of PCE 3 would also be benefitted and maintained through low-intensity prescribed fire (the higher quality foraging habitat). This treatment represents 36 percent of the PCE 3 in the core and 18% of the PCE 3 in the home range.

In PCE 3 (foraging), 46 acres would be downgraded to PCE 4 (dispersal) for an estimated 10 to 30 years. This treatment would not occur in the core, but in the outer portion of the home range, distant from nesting/roosting and higher quality habitat areas (southwestern portion of unit 153). This short-and long-term reduction in PCE 3 habitat quality and stand elements would occur on 14 percent of the PCE 3 in the home range, and 6 percent of the overall critical habitat in the project area. Short-term adverse effects to PCE 3 elements are expected from oak release (27 acres) and radial thinning around predominant legacy pine (19 acres) in this unit. There would be a short-term adverse effect to elements comprising PCE 3 regardless of resource protection measures as the combined treatments of variable density thinning with radial thinning or oak release would remove large and small conifer trees, and reduce habitat elements that comprise PCE 3 over a 10 to 30-year timeframe. With follow-up prescribed fire in these areas, small tree and shrub regeneration and snags/down logs may also be consumed during repeat burn entries, and these effects would occur over a one-season to 30-year timeframe, delaying development of essential physical or biological features. While the majority of the effects would be short term and immediately following the thinning and release treatments, the underburning within one season to five years of initial treatment would add to this effect, consuming small trees, regeneration and impacting down logs and prey base in these stands. With the longer-term prescribed fire entries and longer term increases in black oak canopy and tree size, the effects from prescribed fire are expected to transition towards being more beneficial, but similar, insignificant reductions in down wood and regeneration would occur during these second and third entries.

These treatments affect 14 percent of the PCE 3 in the project area.

Also in PCE 3, about 224 acres in the home range would be degraded (114 acres in the core) through variable density thinning treatments and follow-up underburning. Refer to the discussion above in the Purpose and Need effects section that describes degraded foraging habitat. While individual habitat elements will be reduced or variously affected, the reduction is not at a scale that would significantly reduce their value in critical habitat or the overall ability of the foraging habitat PCE to function and foraging habitat functionality post-treatment will be retained. However, there will still be some short-term and minor adverse effects to elements of critical habitat PCE 3, including prey base, as treatments result in reductions of canopy closure, basal area and habitat layering (vertical and horizontal structure); and reductions in snags and coarse wood, shrubs and forest floor vegetation from fuels treatments (USDI-FWS 2012 pp. 71939-71940).

These effects would occur in 68 percent of PCE 3 in the project area.

Combined with the short-term adverse effects of oak release and radial thinning around legacy pine, these treatments affect 82 percent of the PCE 3 in the project area. These effects, though beneficial, are not considered insignificant or discountable. Refer to Appendix E, Effects to Critical Habitat section, for further discussion.

Effects to PCE 4 (dispersal) include improvement of one acre in older plantation thinning treatment, and modification on 14 acres of natural stand within the home range, outside the core. The modification would primarily occur from thinning a ponderosa pine-white fir dominated stand where the thinning treatment would
Elk LSR Enhancement Project

reduce the average basal area to 100-125 sq. ft/ac to attempt maintaining and promoting the residual pine in this stand. Given the variable stand conditions in the stand (unit 169) and reductions in current canopy cover, which have been and continue to be decreased by mortality in the pine, it is not certain if the stand would continue to wholly function as dispersal habitat post-treatment. Given current stand conditions, the average canopy cover post-treatment is expected to range from 30-50%. This treatment would affect 93 percent of the PCE 4 in the home range and two percent of the overall critical habitat in the project area.

Based on the growth modeling, the amount of PCE 2/PCE 3 (suitable) projected in the project area critical habitat, over a 20-year period, is 456 acres. This is an increase over the current levels of suitable by only 6 acres and represents 63 percent of the total critical habitat being in “suitable” condition. This is due in part to habitat elements being maintained and benefitted through low-intensity prescribed fire; variable thinning treatments that maintain habitat function and increase individual tree vigor, growth and stand resilience over time; and an estimated recovery of the 27 acres of downgraded habitat in oak release toward improved suitable foraging conditions. While there would not be a significant change in the amount of suitable habitat over the 20-year timeframe, trees would be larger and more resilient and there would be an increase in vertical and horizontal heterogeneity in the stands (refer to the Silviculture and Forest Health section for a discussion of accelerated diameter growth 20 years after treatment).

There would be an increase of approximately 173 acres of PCE 4 (dispersal) in the project area over this same time span from the older plantation thinning treatments, residual dispersal habitat in areas where pine was radially thinned, and from capable stands that were burned transitioning toward stands that support dispersing NSOs. This is an increase over the current levels of dispersal habitat in the home range by 158 acres, and represents 24 percent of the total critical habitat being in conditions that support NSO dispersal. These treatments in PCE 4 are also not expected to significantly or appreciably reduce the function of dispersal habitat or habitat connectivity at the NSO action area, project area or ST-215 home range/core scales, or significantly affect the ability of NSO to disperse across the landscape. Conversely, they are an improvement over the long term from the existing condition.

As described in the 2012 Final Critical Habitat Rule, some management activities may have short-term adverse effects and long-term beneficial effects on physical or biological features of critical habitat. The Revised Recovery Plan recommends land managers actively manage portions of both moist and dry forests to improve stand conditions and forest resiliency, which should benefit the long-term recovery of the northern spotted owl (p. III–11). While a variable thinning treatment in a single-story, uniform forest stand is intended to promote development of multistory structure, it may also result in short-term adverse impacts to the habitat’s current capability to support owl dispersal and foraging, but have long-term beneficial effects of creating higher quality habitat that could better support territorial pairs. These types of activities would have less impact in areas where foraging and dispersal habitat is not limiting, and ideally could be conducted in a manner that minimizes the short-term negative impacts.

Some structural components of critical habitat PCE 3 would be reduced and removed by treatments, but when assessed at the stand scale, effects are not expected to change the actual function of NSO habitat, with the exception of the oak release and radial thinning of pine. The stands providing foraging habitat will continue to provide foraging opportunities for NSOs, should they occupy or disperse through the home range. The treatments will also facilitate a higher likelihood of use by NSO through increases in stand heterogeneity, larger trees over time and the reduction in density of small trees.

Over the 20 to 30-year timeframe, thinning and fuel reduction treatments are expected to enhance the function of the project area critical habitat by protecting existing nesting/roosting habitat, and improving long-term quality and resilience of additional roosting, foraging and dispersal habitats. The fire effects modeling for the Alternative 1 indicate that thinning and subsequent fuels treatment will generally reduce the potential for crown fire, or maintain a surface fire and significantly reduce predicted stand mortality in the event of a fire start. While thinned stands will be less dense, average tree diameters would increase and the basal area...
ranges and other habitat conditions (canopy closure, down logs, understory, large snags) would be retained well within the range of use by foraging NSOs (Irwin, et al., 2007), (Irwin, et al., 2012), (Irwin, et al., 2015).

The project will not remove PCEs of critical habitat or result in a measurable change in the ECS-3 subunit’s ability to provide the functions for which it was designated. PCE 1 would be transitioned toward PCE 4 and PCE 3 by thinning and group selection treatments; PCE 2 would be benefitted and maintained through low-intensity prescribed fire; and effects to PCE 3 and PCE 4 are described above. Effects to PCE 1, 2 and 3 are expected to be wholly beneficial, insignificant or discountable (refer to Appendix E for more discussion).

The Alternative 1 treatments affect less than one percent of the East Cascades South (ECS-3) Critical Habitat Subunit and the project actions do not significantly reduce the value of these primary constituent elements of critical habitat. There will some short-term and minor adverse effects on 224 acres of PCE 3 from thinning, with longer-term effects on 46 acres from oak release, radial thinning and repeated underburning entries that could prolong understory development in small patches due to burning in a mosaic pattern at different heat intensities. These treatments are considered to have a short-term and minor adverse effect on PCE 3 from initial release and radial thin treatments with underburning effects that are neutral to beneficial extending for about 20 to 30 years. While there would be short-term and minor adverse effects in 82 percent of the PCE 3 in the project area (ST-215 home range), the proposed treatments result in a greater assurance of long-term maintenance of suitable and dispersal habitat. They contribute positively to the overall function of the ECS-3 subunit, which is to provide demographic support in an area of sparsely distributed high-quality habitat and Federal land, and provide for population connectivity between subunits to the north and south.

Other resource effects
There are no other resource effects.

Compliance with Law, Regulation and Policy
The Elk Flat LSR Enhancement Project is in compliance with the Forest Plan standards and guidelines and management direction from the Forest Plan and NWFP and is consistent with objectives, recommendations and activity design criteria from the LSRA. Because some standards and guidelines between these documents differ, in all cases the more restrictive standard and guideline and/or the one most beneficial to TE&S wildlife species will be implemented. Chapter 2 includes the resource protection measures developed by the Interdisciplinary Team to reduce or eliminate impacts to listed, proposed, and sensitive species and their important breeding, feeding and sheltering habitats. The predicted effects for all action alternatives are based on the implementation of these RPMs.

The project is consistent with all other relevant laws, regulations, policies and plans as they relate to wildlife, including the Endangered Species Act of 1973 as amended, Forest Service Manual 2670.12 and 2672.42-2672.43 and the National Forest Management Act requirements to provide for a diversity of animal communities (16 USC 1604(g)(3)(B); also see 36 CFR 219.10(b).

Effects to Threatened, Endangered, Proposed and Forest Service sensitive species are analyzed in the wildlife BA and BE. Consultation is ongoing with the FWS with respect to effects to listed northern spotted owl and gray wolf. As described in the BA, the project is considered to be consistent with the Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS 2011), including recovery actions 10 and 32 that are most applicable at the project planning and implementation scale. This meets the intent of Forest Plan standard and guideline 25.h to “maintain and/or enhance habitat for TE&S species consistent with individual species recovery plans” (Forest Plan p. 4.30).
The variable treatments in each land allocation would maintain or enhance habitat for threatened, endangered and sensitive species consistent with individual species recovery plans (p. 4.30). The would manage habitat for sensitive plants and animals in a manner that prevents the species from becoming a candidate for threatened and endangered status (p. 4.5) and would continue to provide connecting travel corridors for wildlife, particularly late-successional dependent species (p. 4.14).

The project is consistent with Forest Plan management direction to protect each known northern goshawk nest site during planning and implementation and using limited operating periods adjacent to active nest sites until young have fledged (Forest Plan pp. 3.27, 4.30 and 4.44). The project is consistent with Forest Plan goals and direction for fisher (Forest Plan p. 3.27). This direction is primarily fulfilled through the Forest’s LSR and Riparian Reserve management direction and systems, and the project design that does not treat high value fisher habitat. Riparian areas provide important habitat for fisher because of the close proximity of water and structural diversity of the vegetation. Wilderness, roadless areas and wild and scenic rivers also contribute to habitat availability and maintaining species’ viability.

**Cumulative Effects – Alternative 1**

A review of ongoing and reasonably foreseeable future activities on federal and private lands in the NSO action area (and other wildlife cumulative effects analysis areas) was completed and is incorporated by reference (Jordan 2016b). There are no state-managed lands in the NSO action area. While there may be an overlap in two or more projects’ cumulative effects spatial or temporal bounds, where there are no direct or indirect effects that overlap in time and space on the resource considered (e.g., reproductive sites, suitable habitat), there are no cumulative effects.

Cumulative effects in the NSO, northern goshawk and fisher analysis areas are considered as the changes to the existing condition caused by ongoing or reasonably foreseeable future activities when added to the effects of the Elk LSR project actions. Currently, within the larger fisher analysis area that also addresses NSO and northern goshawk, there are no future foreseeable federal actions. There are at least three timber harvest plans in progress or submitted for approval on adjacent private lands. Other ongoing actions on NFS and private lands that can influence vegetation, create potential noise disturbance and influence wildlife behavior and habitat include, but are not limited to: fuelwood collection, dispersed recreation, implementation of Motorized Travel Management, Oversnow Vehicle Use associated with the Pilgrim Creek snowmobile park, and routine road and recreational site maintenance (including hazard tree felling). In addition, fire suppression activities, grazing on the Bartle Allotment and noxious weed monitoring are also ongoing. Project work authorized under previously completed NEPA includes the Pilgrim Vegetation Management project, road closures approved under previously completed NEPA, and Timber Stand Improvement work. Remaining activities under the Pilgrim project are limited to manual or mechanical release of reforested areas and small diameter (<14”) ponderosa pine tree thinning and these areas do not support suitable or dispersal habitat for the NSO, fisher or northern goshawk. Similarly, other TSI work does not include habitat for these species. Road closures do not typically affect habitat, but can result in beneficial effects to individuals from reduced human access and disturbance. Grazing is not predicted to negatively or significantly affect NSO, fisher or northern goshawk habitat if surface vegetation that mammalian or avian prey may use is not excessively removed. The other activities on NFS lands do not measurably or meaningfully influence wildlife breeding, feeding or sheltering behaviors and are not predicted to result in any detectable or meaningfully measurable effects to individuals. Therefore, cumulative effects from those activities are considered insignificant in combination with the project’s effects.

Activities on private land include commercial thinning, salvage, clearcutting and other forest stand treatments. Timber harvest plans (THPs) are subject to the California Forest Practice Rules (Sections 919.9
and 939.9) which create a process, that when implemented correctly by the State, avoids unauthorized ‘take’ of NSOs unless authorized by a federal Habitat Conservation Plan. The THP planning and review process incorporates survey results into THPs, comparing results with the State’s CNDDB NSO database and ensuring adequate amounts of habitat are retained around NSO activity centers. While the FWS does not review individual THPs in many cases, it has provided Technical Assistance when requested by CALFIRE or the California Department of Fish and Wildlife.\(^9\) Extensive hauling on roads and routes through the project area and in the analysis areas (to complete THPs) occurs near or through suitable habitat for NSO, northern goshawk and fisher. This is considered part of the ambient environment. Individuals (goshawk, fisher) occupying the project area, or larger analysis areas, are likely habituated to this noise and the disturbance associated with roads or harvest activities and may completely avoid these sources of disturbance. The project will cumulatively contributed to ongoing and predicted future road use, noise and other habitat disturbance by private land management in ~22 percent of the NSO and northern goshawk analysis area, and ~35% of the fisher analysis area during implementation. As noted above, individuals occupying the project area, or larger analysis areas, are likely habituated to haul noise in general and the disturbance associated with roads or harvest activities and may completely avoid these sources of disturbance. These impacts, should they occur, are not predicted to result in any significant cumulative effects to breeding individuals, provided the Project’s LOPs for noise-generating and habitat altering activities during the critical breeding period. The LOPs prescribed during the critical breeding period for the Elk LSR project would reduce, if not eliminate, the potential for direct, indirect or cumulative effects from project noise or habitat disturbance in combination with that from private activities (e.g. log haul on cost share roads).

None of the ongoing or submitted THPs are in designated critical habitat for the NSO, as critical habitat is not designated on private lands. Private lands in the analysis area currently contribute little toward maintaining the viability of the ST-215 NSO home range, or toward contiguous blocks of suitable goshawk or fisher habitat. The Elk LSR project will not remove or downgrade NSO habitat in the ST-215 core, or significantly downgrade suitable habitat in the home range. It will not degrade, downgrade or remove any suitable habitat from known northern goshawk territories, or fisher denning or resting habitat. Given that private lands in the analysis area contribute little to no habitat viability, the combined effects of the Elk LSR project and the ongoing and reasonably foreseeable intensive management of private lands will not result in effects that would be greater than the Elk LSR project alone. While future management actions on private lands may occur during the 20 to 30 year timeframe established for the Elk project, reasonable effects cannot be evaluated in the absence of a proposed THP that provides spatial and treatment data to assess potential effects to habitat and NSO, goshawk or fisher. While it is reasonable to base potential future actions on private lands on past actions and effects, the cumulative effects analysis under the ESA and the NEPA is completed based on the best available current information at the time of the analysis.

Modifications to suitable habitat from Alternative 1 are not expected to result in significant changes to stand structure or potential use by NSOs, northern goshawk or fisher. The effects to habitat from Alternative 1 represent about 34 percent of the suitable, and eight percent of the dispersal habitat in the NSO action area. Effects to suitable habitat will not occur in a currently occupied NSO core area, and nesting/roosting, and high quality foraging habitats will be benefitted through prescribed fire. The majority of the foraging habitat proposed for treatment is considered low to moderate value due to limited moisture,

\(^9\) Private timber harvest plans are reviewed under section 9 of the ESA for the possibilities of prohibited take and private take of threatened NSO is prohibited under California State law and prosecutable under both Federal and State law. The California Forest Practice Rules also contain requirements for NSO habitat retention.
species composition, stagnated growth or dense understory and midstory conditions, or a lack of structural diversity.

No suitable or dispersal habitat will be removed and the structural diversity of thinned stands is expected to be enhanced post-treatment. The effects on private lands, in combination with the ongoing and future foreseeable actions on Federal lands are not expected to remove NSO, northern goshawk or fisher habitat and therefore will not result in significant cumulative adverse effects to NSO in the action area under the ESA or NEPA. The project effects are not expected to significantly affect breeding, feeding or sheltering behaviors, or create barriers to dispersal; they are expected to retain and enhance habitat quality through the reintroduction of natural ecological processes.

**Alternative 2- No New Temporary Road Construction Other Than Those Required for Landing Access**

**Direct and Indirect Effects – Alternative 2**

Direct effects to NSO, northern goshawk and fisher are the same as described for Alternative 1 and the surveys, LOPs and all other RPMs would still apply. Sporax® application would occur on approximately 82 fewer acres under this alternative when compared to Alternative 1, due to reduced mechanical thinning treatments.

Compared to Alternative 1, this alternative foregoes mechanical thinning in four natural stands and one older plantation due to not constructing temporary roads. Approximately 22 fewer acres of suitable foraging habitat for NSO and northern goshawk, 27 acres of foraging habitat for fisher, 6 acres of dispersal habitat for NSO, and 9 acres of capable habitat for the NSO, goshawk and fisher would not be mechanically thinned. These changes do not occur in critical habitat, the ST-215 core or home range or the ST-205 territory (as there are no mechanical treatments in this goshawk territory). While tree size classes would not increase as quickly and these small stands would remain at higher risk of loss, low-intensity prescribed fire would still be utilized on all acres and is expected to benefit these areas by reducing surface and ladder fuels.

**Effects relative to Purpose and Need for Action**

Compared to Alternative 1, the reduced acreage of increased tree resilience and size classes from reduced thinning in small segments of these four natural stands and one older plantation are considered negligible in terms of meeting late-successional habitat needs for the NSO, northern goshawk and fisher. These stands would receive the same benefits from low-intensity prescribed fire as described for Alternative 1.

Compared to Alternative 1, this alternative transitions a similar amount of the habitat in the LSR toward increased resilience and larger tree size classes. In NSO habitat, approximately 13 fewer acres would be improved over 20 years from a combination of thinning and low-intensity fire; resulting in 56% of the LSR benefiting from this alternative for this species (compared to 57% under Alternative 1). In northern goshawk habitat, approximately three fewer acres would be improved and for fisher, eight fewer acres would be improved. Alternative 2 results in a similar amount of LSR benefit as Alternative 1 for the northern goshawk (61%) and for fisher, 65% of the LSR habitat would be improved (compared to 66% under Alternative 1). These differences are considered negligible to meeting the purpose and need.

**Effects relative to key issues**

The effects relative to key issues are the same as described for Alternative 1 as no temporary roads are proposed in critical habitat.

**Other resource effects**

There are no other resource effects.
Compliance with Law, Regulation and Policy
As described for Alternative 1.

Cumulative Effects – Alternative 2
As the differences in habitat benefit are so slight, the beneficial cumulative effects are considered the same as that described for Alternative 1, though slightly less beneficial for all species with only the return of low-intensity prescribed fire.

Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl

Direct and Indirect Effects – Alternative 3
Direct effects to NSO, northern goshawk and fisher are the same as described for Alternative 1 and the described surveys, LOPs and all other RPMs would still apply. Sporax® application would occur on approximately 270 fewer acres of natural stands under this alternative when compared to Alternative 1, due to eliminating mechanical thinning treatments in natural stands of designated critical habitat.

Compared to Alternative 1, this alternative foregoes the reintroduction of prescribed fire on 390 acres of suitable NSO habitat (nesting/roosting and high quality foraging), maintaining these acres in their current condition. There would be no increase in habitat diversity or risk reduction benefits from the reintroduction of low-intensity prescribed fire in these stands. This also results in reduced beneficial effects to fisher and northern goshawk habitat, though stands would remain in the current condition, at risk from the ongoing trends though likely functional for nesting/roosting, resting/denning or foraging at least in the short-term.

Mechanical thinning in 270 acres of suitable NSO, goshawk and fisher foraging habitat would not occur. Black oak would not be released on the planned 27 acres, and the 19 acres of radial thinning of legacy pine would not occur. Foraging habitat would not be degraded or downgraded, but as with the higher quality habitats above, would remain in its current condition and at risk to loss from the current trends. Black oaks would continue to be overtopped in this portion of the project area, and over time, reduced and potentially lost as a stand component. There would be no direct or indirect benefits to fisher denning, resting, or prey base habitat over time, though fisher (and other species) would be expected to still use this stand for foraging.

Effects relative to Purpose and Need for Action
Compared to Alternative 1, this alternative transitions the least amount of acreage toward increased resilience and larger tree size classes in the LSR, with a corresponding increase in the potential for continued habitat loss and reduced connectivity. In NSO habitat, approximately 1,346 acres would be improved over 20 years through thinning and low-intensity fire, resulting in benefits within 44% of the LSR for this species (compared to 57% under Alternative 1). In northern goshawk habitat, approximately 1,568 acres would be improved over 20 years through thinning and low-intensity fire, resulting in benefits within 48% of the LSR (compared to 62% under Alternative 1). In fisher habitat, approximately 1,568 acres would be improved over 20 years through thinning and low-intensity fire, resulting in benefits within 51% of the LSR (compared to 66% under Alternative 1).

Effects relative to key issues
Compared to Alternative 1, this alternative meets the active management recommendations described in the 2012 Final Critical Habitat Rule on 472 fewer acres. Mechanical thinning treatments would not occur in natural stands of critical habitat, and prescribed fire would not be utilized in critical habitat. The 120 acres of PCE 2 would not be underburned. The 224 acres of natural stands designated as PCE 3 would not be degraded, and the 46 acres of PCE 3 would not be downgraded. As there would be no treatments in PCE 3, there would be no short-term adverse effects within critical habitat. Conversely, long-term benefits from
increased foraging habitat diversity and prey base would not occur. Low-intensity prescribed fire would not be initiated or returned to critical habitat. Compared to Alternative 1, 12 fewer acres of PCE 1 (capable habitat in younger plantations) would be benefited and transitioned toward dispersal conditions, due to eliminating the use of low-intensity prescribed fire in those stands.

While the function of unthinned PCE 3 habitat will remain as foraging and elements would not be adversely affected, these stands would also remain at risk to loss from overstocking and inter-tree competition for light, water and nutrients, and insect attacks. The existing overstocked conditions and stands remaining stagnant in the understory (e.g., dense white fir with little to no diversity) will remain until gaps from mortality are likely created. Both PCE 2 and PCE 3 would be maintained at current condition levels and likely functional for nesting/roosting and foraging over the short-term. About 97 percent of the total PCE 3/PCE 2 in the core (and 100 percent in the project area / home range) would remain at risk to loss from ongoing density related-mortality, and the potential for high-severity uncharacteristic fire.

Other resource effects
There are no other resource effects.

Compliance with Law, Regulation and Policy
As described for Alternative 1.

Cumulative Effects – Alternative 3
Cumulative effects of Alternative 3 are similar to those described for Alternative 1 with the exception of critical habitat treatments. There will be no effect to nesting/roosting habitat (PCE2) under this alternative or to 325 acres of foraging (PCE3) under this alternative. Cumulative effects to suitable NSO habitat represent about 22 percent of the suitable in the NSO action area.

Alternative 4 - No Action
Under No Action, the proposed management activities would not be implemented. No direct, indirect, or cumulative effects are expected. While actions would not be undertaken with this alternative, the ongoing trends described in Chapter 1 would continue.

While there would not be project effects, the existing trends of declining forest health and increased risk of habitat loss described in Chapter 1 will continue until such time that natural events reset the seral stage, similar to what is occurring at present, or other management is approved and implemented. Any change in conditions would occur as the natural progression of vegetation and fuels change over time (see the Silviculture and Forest Health and Fire and Fuels sections for more detail).

Under no action, stands would continue to exceed recommended stocking levels, resulting in a continued loss of diameter growth and reduced resistance to insects and disease in ponderosa and sugar pine. The ability of trees to maintain vigor and survive during future drought conditions, especially drought sensitive species such as white fir, would decrease. Sugar and ponderosa pine would continue to decline within the mixed-conifer stands as they progress towards a higher density of shade tolerant species [white fir and cedar] in the absence of management activity.

Habitat conditions for NSO, northern goshawk and fisher are not expected to significantly change under Alternative 4 in the short term. The existing conditions in stands proposed for treatment are likely to sustain these species and their and prey over the short term. Increases in habitat suitability (i.e. development of larger trees, understory composition, heterogeneity and larger snags/logs) is expected to take longer than what is modeled under the action alternatives, and would result in fewer assurances of sustaining higher quality habitat for a longer time. While stand modeling is used to compare trends across Alternatives and through time, it is important to understand the modeling limitations when interpreting results. With continuation of the
current mortality trends, future stands would be characterized by a dense layer of smaller shade tolerant trees with fewer large diameter trees and areas of high concentrations of fuels conducive to high intensity fire. The increased risk of further stand loss from large, heavy fuel accumulation, slow growth of large trees due to high stand densities, and continued loss of large overstory pine from insects and disease do not meet the purpose and need of reducing risk, promoting stand resilience, or accelerating development of late-successional habitat characteristics in the Elk Flat LSR.

Dense stands will continue to remain at risk to loss from stocking pressure, drought, disease, insects or wildfire effects. Changes in stand structure are expected to result largely from individual tree mortality associated with inter-tree competition, blowdown or bark beetle activity. The amount and type of mortality would vary by stand type and species, with increased mortality expected to continue in all size classes of ponderosa pine. Because there will be no reduction in stand densities, the risk of insect-related mortality would also increase, contributing to fuel loading.

The fuels modeling shows surface, ladder and crown fuels would continue to accumulate in the absence of fire or mechanical treatment. With no modification of forest stand structure and fuels, fire behavior under normal, summer weather (90th percentile) conditions would be as described in Chapter 1 for the existing conditions. The standing dead trees will fall over the five to ten years, adding to the current surface fuel loading. Once the trees have fallen, surface fuel load is estimated to exceed 100 tons/acre, and are characterized as a fuel model 13 where “fire is generally carried by a continuous layer of slash. Large quantities of greater than 3 inches material are present. Fires spread quickly through the fine fuels and intensity builds up as the large fuels start burning. A wildfire in the mortality pockets with high fuel loading will be of high intensity. In the natural stands where mortality is not as extensive as in the ponderosa pine-dominated stands, some areas are expected to experience passive crown fire and flame lengths >4 feet.

FVS-FFE modeling of the No Action alternative indicates up to 40 percent mortality from a wildfire in the natural stands under 97th percentile weather conditions.

While research indicates spotted owls continue to occupy and may reproduce in burned areas, depending on burn severity (Bond, et al., 2002), (Bond, et al., 2009), (Lee, et al., 2012), (Clark, et al., 2011), (Clark, et al., 2013), these findings are strongly influenced by small sample sizes and the extent and spatial pattern of fire effects particular to each area studied. While it has been shown that California spotted owls show an apparent preference for foraging in burned areas of all severities (Bond et al. 2009) the author attributed the majority of these results to the likelihood that post-burn use by owls is associated with an ‘increased abundance or accessibility of prey.’ The Bond study also notes that while California spotted owls foraged in all burn severity areas (potentially preferring high-severity burn areas) they avoided high and moderate severity areas for roosting, and presumably nesting.

The NWFP’s 20-year monitoring report summary for the ‘Status and Trend of Late-successional and Old-growth Forests’ states that some portions of the NWFP area have been setback by decades from achieving those outcomes [expectations for older forest abundance, diversity, and connectivity] particularly resulting from large wildfires in the fire-prone portions of the NWFP area” (Davis et al. 2015). The 20-year monitoring report for the ‘Status and Trend of Northern Spotted Owl Habitat’ also states: “large wildfires continue to be the leading cause for loss of NSO habitats on federal lands. Most of these fire-related losses have occurred within the network of large reserves that were designed for the protection and restoration of habitat for long-term northern spotted owl conservation” (Davis et al. 2015). Range-wide, the nesting/roosting habitat lost from fire (505,800 acres) represents about 31 percent of the total habitat loss. The summary report further notes that the loss rates in fire prone portions of the NSOs range exceeded the expected 2.5% rate for the 20-year period at rates of 3.9 to 7.4% per decade, including the California Cascades area. Most large wildfires and resulting habitat losses have occurred in the federally reserved land use allocations [including LSRs] designed for NSO conservation (Davis et al. 2015). Climate change is also expected to expand the area of fire-prone landscapes and an increased frequency of large wildfires this century has already been observed.
Under no action, 50 percent of the project area will have the potential for flame lengths greater than 4 feet and passive crown fire. Though burn severity, extent and post-fire conditions would vary widely and be dependent on several factors, snags and CWD would likely be consumed and the existing structure and density of understory vegetation and ground fuels would allow for easy transition of fire from the ground into the forest canopy; making crown fire more likely and direct suppression less effective. As a result, the potential for high severity wildfire impacts to occur and a long-term loss of NSO habitat are increased under this alternative with no progress made toward initiating the restoration of ecological processes that promote a natural, low intensity, frequent fire regime.

**Cumulative Effects – Alternative 4**

As there are no direct or indirect effects under this alternative, there are no cumulative effects.

**Botany**

**Introduction**

This section analyzes effects to federally listed Endangered, Threatened, Proposed or Candidate, or Forest Service Pacific Southwest Regional Forester Sensitive Plant Species (TES species) and other botanical resources pertaining to the Purpose and Need for Action and Key Issues. A Biological Assessment and Evaluation for Botanical Species Report was completed and is incorporated by reference and information important to the decision is summarized here (Posey, 2016a). *Boletus* species and unique habitats were analyzed in the Compliance Report for Botanical Resources (Posey, 2016). Both reports are incorporated by reference. Information most relevant to the decision is summarized here.

**Purpose and Need Applicable to Botanical Resources**

The restoration of Elk Flat meadow is in part restoration of a unique botanical habitat and effectiveness of the Alternatives at meeting the Purpose and Need for Action #3- *Restore Meadow Habitat in Elk Flat*, and #4- *Retain Hardwoods as a Stand Component at Density Levels Commensurate with Developing Late- Successional Stands* are relevant to botanical resources. The Purpose and Need for Action is not applicable to TES plants.

**Issues Applicable to Botanical Resources**

No key issues were identified related to TES botanical species or unique botanical resources. Issue #4, mushroom collection in Elk Flat relates to special forest products; specifically the retention of *Boletus* habitat. Effects to the health and growth of *Boletus* mushrooms in Elk Flat are considered here.

**Methodology**

An official list of Threatened, Endangered and Candidate species was requested from the FWS website on January 5, 2016 for the Elk project area plus a 3.0-mile buffer. This document is included as Appendix 1 of the Botanical BA (Posey, 2015a). Four species were listed; however, none have the potential to occur in the project area. In accordance with the ESA and regulatory guidance, only those organisms and critical habitat

---

91 The 2013 FS R5 RF Species Sensitive Plant Species list is found here: [http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5434326.xlsx](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5434326.xlsx)

92 [https://ecos.fws.gov/ipac/project/IYL3DX7YG5D7LGGY54W4VBV5PU/regulatoryDocuments](https://ecos.fws.gov/ipac/project/IYL3DX7YG5D7LGGY54W4VBV5PU/regulatoryDocuments)

93 Document Nos. 140196950-13258, 140196950-1340, 140254377-13424 and 140196950-13448
listed on the official species list are considered, and only those species under the regulatory jurisdiction of the FWS.

Sensitive species habitat was evaluated through review of the GIS layers for known sites of sensitive plants for the Shasta-McCloud Management Unit of the Shasta-Trinity National Forest, district files; the National Resource Information Systems (NRIS) database, Soil Survey of Shasta-Trinity National Forest Area California; CalFlora; and the Consortium of California Herbaria and California Natural Diversity Data Base. All habitats in the project area were floristically surveyed; each plant encountered was identified to the degree necessary to determine if it was a species of concern. The sensitive species identified in the assessment process as potentially occurring in the project area were specifically targeted in the surveys.

Results of Surveys

No sensitive plants were known to occur in the project area prior to surveys and no new populations were found during surveys.

Indicators and Measures

**TES Species**

An indicator of effects to TES botanical species would be the presence of individuals or populations and the numbers of individuals or populations impacted by activities.

**Boletus Habitat at Elk Flat**

The indicator of effects for *Boletus* habitat in Elk Flat meadow is the number of acres of conifer removal within unit 402. For the purposes of this indicator, it is assumed that all conifer cover on Elk Flat is boletus habitat, although it is not known how much actually supports *Boletus*.

During implementation of the Pilgrim Project, 147 acres of boletus habitat in Unit 401 was degraded or destroyed. A second entry planned for Unit 401 will occur in the near future to complete the thinning prescription will further degrade boletus habitat if any is currently producing. The prescription for Unit 401 was to remove conifers to help restore Elk Flat’s meadow boundary. That it was boletus habitat was unknown at the time. This information came to the Forest Service in 2015 from the local mushroom gathering community. Other negative effects to mushroom habitat in Elk Flat and in general comes from the use of soil disturbing tools such as rakes and improper gathering techniques by mushroom gatherers. Some personal and commercial gatherers do not get the required permits so it is impossible to know how many people are gathering mushrooms and how many pounds they collected each season. The cumulative effects to boletus species from legal or illegal mushroom gathering is unknown. Cattle grazing may have a minor negative effect on mushroom habitat. They do graze, travel through and hang out in Elk Flat. They create trails that are compacted. These trails are devoid of vegetation and take many years to revegetate even if grazing is no longer occurring. They also eat mushrooms occasionally.

**Unique Habitats**

**Dry Meadow Ecosystem**

94 (USDA-FS, 2014b); (NRIS, 2014); (CalFlora, 2012); and (CDFW, 2015)

95 Sensitive plant surveys were done July 7, 8, 14 and 15, 2008 by a botany crew from the Shasta-McCloud Management Unit. Visits were also made to the project area in July and October of 2009, June 2012, July 16, 2012, November 5, 2012, April 29, 2013, June 13, 2013 and May 5, June 4, August 26 and September 24, 2014. Species of concern include TES, Survey & Manage, or Watch List species.
Acres of meadow restoration treatment provide the indicator and measure for restoration of the dry meadow ecosystem at Elk Flat. (Hydrologic function also influence meadow restoration and is included in the hydrology section starting on page 201.)

**Hardwoods**
Acres of oak release treatment and acres of aspen restoration indicate the effects related to hardwoods.

**Riparian Habitat**
Riparian habitat is also a unique habitat, but is covered in the hydrology section starting on page 201.

**Boundaries**
In accordance with 36 CFR § 220.4 (f), spatial and temporal boundaries set the limits for selecting those actions that are most likely to contribute to a cumulative effect. The effects of those actions must overlap in space and time for there to be potential cumulative effects. This is determined by how long, and how far reaching, direct and indirect effects of a project are felt on a given resource area.

**Spatial Bounding and Temporal Bounding**

**Threatened, Endangered and Sensitive Bounding**
The project area is the boundary for TES plants as that is the area where direct effects have potential to occur should individuals or populations be located. Any potential impacts to TES botanical species would be direct and occur during project implementation.

**Unique Habitats**
Unit 402 is the boundary for dry meadow habitat at Elk Flat. Any potential impacts to meadow habitat would be direct and occur during project implementation. The boundary for unique habitats of hardwoods is the project boundary, as that is the area where direct effects have potential to occur. Effects of release and restoration treatments are expected to last approximately 20 years as conifer ingrowth will begin to encroach again.

**Boletus Habitat**
The spatial boundary for Boletus habitat is those parts of Elk Flat with conifers; approximately 412 acres. The remaining areas of Elk Flat without adequate conifer cover, open areas and areas with widely scattered trees, are not habitat for ectomycorrhizal fungi such as Boletus species. Boletus species form mycorrhizal associations with many conifer species, hardwoods and other plants. In Elk Flat, associated conifer species include ponderosa pine, lodgepole pine, and white fir. Hardwoods include black oak. Boletes, commonly found throughout the Cascade Range (Desjardin, et al., 2015) including the McCloud Flats, are collected by both personal and commercial collecting permits. The Elk project area is a favorite collection area due to the amount of mushrooms present and its close proximity to the towns of McCloud and Mt. Shasta.

How long these effects will last after treatment depends on the treatment. The more aggressive the thinning and/or burning treatment the fewer mushrooms come back until that area is again providing habitat elements necessary for ectomycorrhizal fungi such as Boletus (Smith, et al., 2005). From the research, we can assume meadow restoration treatments using tree harvesting through mechanical methods that would create a pine/grassland savannah would result in a permanent loss of habitat conditions that support boletus species. Boletus habitat in unthinned patches would be underburned in a mosaic fashion leaving areas of Boletus refugia to recolonize the area. Depending on burn intensity, season of burning and the number of live trees killed by the burning, recovery could take anywhere from three to 20 years.
Affected Environment
Chapter 1 describes the general vegetative conditions in the project area including the existing condition of the unique botanical habitat of Elk Flat meadow and hardwood status in the project area.

Threatened, Endangered and Sensitive Plants
The only TES plant with potential to occur in the project area is *Cypripedium montanum*, or Mountain lady’s slipper, which is a Region 5 Forest Service sensitive species. Mountain lady’s slipper inhabits moist areas and dry slopes in mixed evergreen or coniferous forest between 760 and 7200 feet. There are no known occurrences in the project area.

Unique Habits

Dry Meadow
Dry meadow habitat includes unit 402 at Elk Flat at approximately 518 acres. The existing condition and affected environment of Elk Flat are described in more detail in Chapter 1 (starting on p. 30) Vegetation consists of sparse perennial forbs and perennial grasses and more densely covered areas by perennial bunch grasses with fewer perennial forbs. More developed soils support stands of older conifers. Conifer encroachment, as evidenced by the presence of very young conifer species is occurring throughout the meadow.

Hardwoods

Aspen
Aspen stands are important to species diversity both plant and animal. Aspen are an early successional species and shade intolerant. They need ample sunshine to grow and reproduce. Aspen habitat has declined at a rapid rate due to past management such as fire suppression, timber harvest and management practices that favored conifers, livestock grazing and site conversions. During the early days when the McCloud Lumber Company was harvesting timber and the early days of the Forest Service, aspen was considered a nuisance species and many stands across the flats were converted to pine trees. Livestock grazing was very intense until the mid-1940s and stands over-browsed. Livestock grazing declined greatly after WWII. Cattle still browse aspen as do deer and elk especially in late summer and fall when protein levels are higher in aspen than they are in grasses and forbs.

A few aspen stands throughout the McCloud Flats have been released from competing conifers in past projects with great results but many more are still in need of release. The Elk Salvage (2005-2005) and Elk Flat LSR Fuels Reduction (2007) Projects released small amounts of aspen within the boundary for this Project.

Aspen is known to occur in several units in small amounts totaling approximately 25 acres (24 of which are proposed for release treatment). The largest contiguous aspen stand is approximately 10 acres in unit 175.

Oak
Black oak is very important in terms of contributing to and maintaining species diversity, especially for late-successional wildlife species of concern such as the sensitive fisher and listed northern spotted owl. Oak habitats offer diverse resources to wildlife such as thermoregulation sites (shade in the summer, shelter in the winter), perching and resting sites, roost sites, nesting and denning cavities and food items for prey. Acorns are an obvious food source that is plentiful and rich in calories. Acorns are very important for maintaining the prey base for fisher, Pacific marten, NSOs and northern goshawks. Oak catkins, twig, leaves, buds, sap, and galls are eaten. Acorns are also an important food source for deer and bear during the fall months because of the high fat and protein content.
An estimated 30 acres of black oak occur scattered throughout the project area. Negative impacts to Black Oak from past activities are the same as for aspen. Encroachment and overtopping by surrounding conifers has decreased growth and the expansion of mixed conifer oak habitat. Most oaks are at the sapling stage and occur along roads in small openings. Portions of Unit 153 and 178 are an exception in that they have many adult oaks scattered throughout portions of the stands. Unit 153 has quite a few smaller and larger oaks (diameter classes range from 4 to 16 inches).

Habitat at Elk Flat

There are at least four species of edible Boletes known to occur on the Shasta-Trinity, the Klamath and the Modoc National Forests. These include the king bolete (Boletus edulis var. grandedulis), spring king bolete (B. rex-veris), queen bolete (B. regineus) and the butter bolete (B. aff. regius). These grow in soils under conifers and with oaks and other hardwoods. Only the spring king bolete is not known to occur with hardwoods. It grows in small clusters or groups buried in sandy soils under pines (ponderosa and lodgepole) and red fir. They fruit in the spring above 3,280 feet elevation in the Sierra Nevada and Cascade Range. All four boletus species are described as common.

Generally, any conifer area having trees over 30 years old and providing enough cover to maintain a cooler soil temperature could be habitat. Out of the 518 acres in unit 402, 379 acres will be harvested leaving approximately 60 square feet of basal area per acre or less. The unthinned patches provide approximately 33 acres of conifer with the remaining 106 acres in existing un-encroached dry meadow that does not provide boletus habitat. It is not known how much of the 412 acres of conifer currently provide habitat for Boletus species, but most if not all has the potential to eventually provide it in the absence of disturbance to reset the area to meadow habitat. Some specific areas identified by local boletus collectors as being good habitat were incorporated into the unthinned patches.

Environmental Consequences

Direct, Indirect Effects, and Cumulative - Alternatives 1, 2, 3

TES Plant Species

No sensitive plant species are known to occur within the project boundary. Standard operating procedures are in place to protect newly discovered populations (see Appendix C # 16, p. C-3). There would be no direct or indirect effects on TES botanical species and therefore no cumulative effects.

Determination of Effects to Threatened and Endangered Species

Adequate biological assessment/evaluation has been completed to determine the effects of this project on the plant species listed as threatened, endangered or proposed by the US Fish and Wildlife Service and sensitive by the USDA Forest Service Region 5. Based on the information summarized above, the project botanist has determined that implementation of the Elk Project will not negatively affect any plant species listed by FWS or Region 5 or their viability.

Unique Habitats

Dry Meadow

---

96 The butter boletes of California represent a complex of species closely related to the European Boletus appendiculatus and B. regius but are most likely undescribed species and in need of taxonomic clarification (Desjardin, et al., 2015 pp. 348, 349, 350, 354 and 356).
When combined with the hydrologic restorations, Alternatives 1 and 3 fully implement the meadow restoration treatments of meadow enhancement (conifer removal) and underburning. Alternative 2 drops the conifer removal on 25 acres, but does provide the underburning. All three action alternatives provide meadow restoration with Alternative 2 not meeting the Purpose and Need for Action to the same extent Alternatives 1 and 3 do. Beneficial effects are expected to be maintained by the periodic underburning with the early seral stage maintained for at least 30 years.

**Hardwoods**

*Aspen*

Effects of all action alternatives are the same for aspen because the changed acres in Alternatives 2 and 3 do not affect aspen stands. Most living conifers will be removed within 150 feet of tree and/or sprouts and conifers will not be replanted in the area. Aspen will be monitored to determine how project activities including burning may affect aspen. Photo points as well as some type of vegetation monitoring plan will be put into place prior to the start of any activities to have baseline information so the effects of logging activities and underburning can be determined over time. Browsing by livestock and wildlife will also be monitored to determine if fencing is needed. Aspen stand will be mapped annually as part of the monitoring to see if it is expanding each year. All three action alternatives are expected to benefit aspen and meet the Purpose and Need for Action. Monitoring and implementation of the adaptive management strategy for aspen restoration if needed (see p. A-28) will assure restoration, for beneficial direct, indirect and cumulative effects in the project area.

*Oak*

Thinning around oaks will reduce competition from conifers for sunlight, nutrients and water. As described and illustrated on page A-20, oak release removes conifers from within 30 feet of the dripline of healthy black oak that will benefit from a release, and increasing the removal out to 60 feet of the dripline within the southern aspects. Conifer adding desirable habitat contributions would be retained as described in Appendix A. The retained trees contribute to the late-successional habitat within the Elk Flat LSR, and are important roosting and foraging resources for northern spotted owl and their prey, as well as potential future nesting areas (large cavities or brooms that develop). Planting acorns in openings may also increase black oak over time. It is expected that after the oak release work is completed, the portions of stands 153 and 178, and others with oak release, will be a mixed conifer/oak stand.

All three action alternatives provide beneficial direct (release), indirect (underburning to help maintain oak in the stands), and cumulative effects, but vary in the degree of benefit. Alternative 1 would release approximately 30 acres of black oak occur scattered throughout the project area. Repeated underburning would help retain oak in in the stands for the next 20 to 30 years. Alternative 2 reduced thinning, and thus oak release where oak are encountered, by approximately 98 acres. However the majority of areas dropped do not provide substantial oak, and Alternative 2 results in very similar effects as Alternative 1. Alternative 3 drops units from thinning that provide greater percentages of oaks than is common throughout the project, resulting in approximately 9 acres of oak release. This will create a disproportionately lower response under Alternative 3 than the other two action alternatives and retaining oak as a stand component will not be achieved.

**Boletus Habitat at Elk Flat**

*Boletus spp.* are ectomycorrhizal mushrooms meaning they form symbiotic associations with the fine root systems of plants, growing out into the soil matrix. These fungi receive nutrients from the overstory associated tree species and in return, give nutrients back to these trees. Ectomycorrhizal fungi are very important in maintaining a healthy, resilient forest. These mushrooms are sensitive to activities that disrupt or destroy these fine root systems. They are also sensitive to changes in soil temperature from overstory removal.
and loss of associated species. According to research on the Willamette National Forest, the more aggressive the thinning the longer it takes mushroom habitat to rebound (Pilz, et al., 1999).

The unthinned patches providing current Boletus habitat would not be mechanically disturbed. Underburning may have a negative effect on most ectomycorrhizal mushroom species because it reduces the duff and organic layers which is where most of the mycorrhizae occur. The potential negative effects from underburning would be reduced through the retention of ground cover (duff and or fine woody debris less than 3 inches) across at least 50 percent of all activity areas to maintain soil productivity (see SOP 5 on p. C-1). Underburning would be implemented to create a mosaic pattern where burn intensities will range from areas not burned at all to areas burned low and at moderate intensely (p. 54, A-29). Burning in a mosaic pattern would retain areas of duff and down woody debris, preserving some habitat and reducing impact on the remaining habitat. Monitoring will occur once burning has been completed (p. 94).

It isn’t known how much of the 379 acres currently supports Boletus habitat or how much of it outside the UTPs would be eliminated; however, it is likely all 379 acres have the potential to eventually provided boletus habitat in the absence of disturbance needed to maintain the meadow habitat. Therefore, current or future Boletus habitat in Elk Flat meadow would be reduced by approximately 379 acres through maintenance of the meadow ecosystem with return of more natural disturbance regimes. The 33 acres of UTPs would continue to provide boletus habitat.

Treatments in Elk Flat are the same under Alternatives 1 and 3. Alternative 2 would treat 25 fewer acres than Alternatives 1 and 3. The effects on Boletus and their habitat in Elk Flat would be much the same for all action alternatives, with the possibility that Alternative 2 decreases the effects to boletus on the 25 acres dropped from the meadow enhancement treatment (but would still include underburning). If any areas are severely burned, mushrooms will likely be lost until favorable soil and duff conditions return to pre-burning conditions. Negative effects to habitat may last 20 years or longer. Habitat in Unit 402 outside of the UTPS would be substantially decreased or eliminated by the removal of thermal cover and associated species and ground disturbance. These areas will become habitat for grasses and forbs to restore the unique botanical habitat and maintained by repeated underburning activities.

Alternative 4 - No Action

Under No Action, the proposed management activities would not be implemented. No direct, indirect, or cumulative effects are expected. Current trends would continue. The unique habitats of dry meadow and hardwoods would continue to decline. Boletus habitat in Elk Flat would not be affected, however, natural disturbances such as fire or a mudflow event may alter habitat.

Summary and Conclusions

Surveys have identified no TES botanical species in the project area. Adequate procedures are in place to protect TES botanical species if newly discovered prior to or during implementation. There would be no direct, indirect, or cumulative effects to TES botanical species with any alternative considered in detail, and a determination has been made there would be no effect to botanical TES species.

Effects Relative to Purpose and Need for Action

All three action alternatives meet the Purpose and Need for action pertaining to dry meadow habitat at Elk Flat. Alternative 2 does not meet it as well as Alternatives 1 and 3 by providing 25 fewer acres of meadow enhancement treatment.

All three action alternatives meet the Purpose and Need for action for retaining hardwoods. There is no difference between the alternatives for aspen. Alternative 3 meets the Purpose and Need for Action on less than 1/3 of the available areas for oak when compared to Alternatives 1 and 2.
Effects Relative to Key Issues
All three action alternatives reduce boletus habitat at Elk Flat in favor of the unique habitat of dry meadow. All three action alternatives retain some boletus habitat at Elk Flat in the unthinned patches, although it may be reduced in value for 20 years through underburning. Alternative 2 removes conifer on 25 fewer acres. If those acres correspond to current or developing boletus habitat, it may have a slightly reduced negative effect when compared to Alternatives 1 and 3.

While the key issue is limited to the habitat at Elk Flat, it is worth noting that boletus are common species throughout the forested portions of the west. Elsewhere in the project area the design criteria to protect northern spotted owl (NSO) and goshawk habitat will also retain habitat for many fungi species including Boletus by retaining tree and shrub species, down woody debris, snags and overstory cover. Using the RPMs in place for survey and manage fungi and the Best Management Practices discussed in the project soil report will also help retain and improve fungi habitat by retaining 30% to 50% of the duff layer and down woody debris.

Compliance with Law, Regulation and Policy
The Elk Flat LSR Enhancement Project is in compliance with the Forest Plan (4.14,4.16), and other relevant laws, regulations, policies and plans including the Endangered Species Act of 1973 as amended, USDA Dept. Regulation 9500-4, Forest Service Manual 2670.12, 2670.22, 2670.32, 2671.1 and 2672.42.-2672.43.

TES species were analyzed in the BA/BE for this project. None were found during surveys and none were known to occur prior to surveys. No plant species including fungi species will be affected by the Elk project to the extent that they will need to be listed as a TES species at any time in the future.

The Forest Plan (p.4.81) directs the management of non-timbered areas of Elk Flat primarily for early seral stage species. NFMA directs us to manage for diversity of ecosystems across the landscape to provide a variety of habitats for numerous species of wildlife, plants and fish. Early seral stages such as grasslands and forb/grasslands are not well represented on the Shasta side of the Shasta-Trinity National Forest. Most are being affected by conifer or shrub encroachment.

Hydrology
A Hydrology Report (George, 2016) completed for this project is incorporated by reference. Information relevant to this decision is summarized here:

Introduction

Purpose and Need Applicable to Hydrology
Purpose and Need #5- Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries. Management opportunities identified from the Edson watershed analysis (USDA-FS, 2011a pp. 115-117), applies to hydrology. This also incorporates the portion of Purpose and Need #3-Restore Habitat in Elk Flat that is dependent on hydrologic function.

Issues Applicable to Hydrology
Issue #4 expressed concerns regarding the effects of machine piling on watershed health.
Methodology
Methods include qualitative analysis at multiple scales from data and information collected from field reconnaissance, monitoring and literature review, and quantitative analysis using ERA, within the cumulative effects watershed, sub-drainage and project area (George, 2015).

Incomplete and Unavailable Information
Analysis at the watershed scale incorporates reported past, present and foreseeable activities on public and non-public lands. Unreported actions are assumed to occur on non-public land and were not included in the analysis.

Indicators and Measures
Table 59 summarizes the indicators and measures used to analyze and disclose effects to hydrology, the relevant key issue, and the Purpose and Need for Action. A discussion follows the table providing rationale for each indicator and measure.

Table 59. Hydrologic Resource Indicators and Measures

<table>
<thead>
<tr>
<th>Resource Element</th>
<th>Indicator</th>
<th>Measure</th>
<th>Purpose &amp; need, Key issue, or Resource Effect</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality</td>
<td>Water quality necessary to support healthy riparian and aquatic ecosystems.</td>
<td>ACS Objectives (ACSO) - #4. Actions meet or Do Not Prevent Attainment of ACSO at project and watershed scales</td>
<td>Purpose and Need #5</td>
<td>Forest Plan pp. 4.53-54, (USDA-FS &amp; USDI-BLM, 2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range of Natural Variability (RNV) – Changes to turbidity and water temperature falls within the RNV</td>
<td></td>
<td>(USDA-FS, 2011 p. 30)</td>
</tr>
<tr>
<td>Riparian Area Processes and Functions</td>
<td>Riparian Vegetation - Plant species composition and structural diversity of plant communities</td>
<td>ACS Objective - #8. Actions meet or Do Not Prevent Attainment of ACSO at project and watershed scale</td>
<td>Purpose and Need #5, #3</td>
<td>Forest Plan pp. 4.53-54, (USDA USDI, 2007)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RNV - Changes to turbidity and water temperature falls within the RNV</td>
<td></td>
<td>(USDA-FS, 2011 pp. 121-124)</td>
</tr>
<tr>
<td>Floodplain and Meadow Processes and Functions</td>
<td>Timing, Variability, and Duration of Floodplain Inundation</td>
<td>ACS Objective - #7. Actions meet or Do Not Prevent Attainment of ACSO at project and watershed scale</td>
<td>Purpose and Need #5, #3</td>
<td>Forest Plan pp. 4.53-54, (USDA-FS &amp; USDI-BLM, 2007)</td>
</tr>
<tr>
<td></td>
<td>Water Table Elevation in Meadows and Wetlands</td>
<td>RNV - Changes to turbidity and water temperature falls within the RNV</td>
<td></td>
<td>(USDA-FS, 2011 pp. 30 and 121-124)</td>
</tr>
<tr>
<td>Riparian Habitat Connectivity</td>
<td>Riparian Corridor - Habitat Conditions in Naturally Appearing Riparian Corridors</td>
<td>ACS Objective - #9. Actions meet or Do Not Prevent Attainment of ACSO at project and watershed scale</td>
<td>Purpose and Need #5, #3</td>
<td>Forest Plan pp. 4.53-54, 4.81, (USDA USDI, 2007)</td>
</tr>
</tbody>
</table>

Key Issue Indicators

<table>
<thead>
<tr>
<th>Resource Element</th>
<th>Indicator</th>
<th>Measure</th>
<th>Resource Effect; Issue #5</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed Health</td>
<td>Sediment Transport and Erosion Rate</td>
<td>RNV - Changes in sediment transport and erosion rate fall within the RNV as evaluated by general disturbance level</td>
<td>(USDA-FS, 2011 pp. 31,84,85) BMPs</td>
<td>(USDA-FS, 2011 pp. 31,84,85) BMPs</td>
</tr>
</tbody>
</table>
## Resource Element

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Measure</th>
<th>Purpose &amp; need, Key issue, or Resource Effect</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Disturbance – at the Sub-Drainage Scale</td>
<td>Disturbance – Relative to existing condition</td>
<td>Resource Effect; Issue #5</td>
<td>Forest Plan, 1995 p. 4.25.</td>
</tr>
<tr>
<td>Ground Disturbance - Equivalent Road Acre (ERA)</td>
<td>ERA must fall below the Threshold of Concern (TOC) of 18% at the watershed scale</td>
<td>Resource Effect, Issue #5</td>
<td>Forest Plan TOC</td>
</tr>
</tbody>
</table>

### Discussion of Indicators and Measures

#### Water Quality

Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities. Attaining ACS objective #4 approximates water quality, because the processes that maintain water quality must be within their natural range of variability to be in a properly functioning condition. Turbidity and temperature are water quality parameters that describe current conditions and further characterize the natural range of variability.

**Turbidity**

Changes in turbidity can indicate the amount of suspended sediment in water introduced by disturbance and this can affect water quality. Discerning background from introduced suspended sediment input is difficult but by comparing runoff during a range of storm events, upstream and downstream of road crossings, turbidity can be used to estimate sources of suspended sediment. Turbidity measures the amount of light passing through water and indicates the presence of suspended particles, which interrupt the passage of light, sometimes recognized as cloudiness in water, as well as relatively clear water when fine particles cannot be actually recognized or seen.

**Water Temperature**

Water temperature variability reflects a variety of inputs such as ground water, runoff, amount of shade or sunlight near or well above the water surface in overstory canopy, as well as air temperature in adjacent stands or whole drainages (Gregory, et al., 1991).

#### Riparian Area Processes and Functions

**Riparian Vegetation**

Plant communities in riparian areas and wetlands must be maintained as indicated by ACS Objective #8 to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

#### Floodplain and Meadow Processes and Functions

**Floodplain Inundation**

Floodplain inundation indicates stream processes and floodplain interactions are maintained over a natural range of variability of runoff timing and duration. Attaining ACS Objective #7 indicates that channels are actively flooding onto the floodplain, spreading flow and releasing energy without excessive erosion or deposition.
**Water Table Elevation and Storage**

Increases in water table elevation and storage should result in extended flow duration as exhibited by comparing flow duration in the channel, as compared to before and after storms, with flow duration response after treatment. An increase in flow duration would indicate that infiltration and groundwater discharge is increasing water table elevation and water storage and indicate that ACS Objective #7 is being maintained.

Other evidence that ACS Objective #7 is maintained or improved would be active flooding on the floodplain, meadow saturation and the growth of upland sedges. Increased flooding, infiltration and sediment detention should result in the development of floodplain elevations consistent with existing meadow contours and establishment of meadow vegetation in areas adjacent to streams in Elk Flat meadow.

**Riparian Habitat Connectivity**

*Riparian Corridor – Habitat Conditions in Naturally Appearing Riparian Corridors*

Riparian Habitat Connectivity would increase with riparian vegetation extending along the channel and outward away from the channel with linkages from the aquatic to the terrestrial resources. Maintaining or improving Aquatic Conservation Objective #9 would be demonstrated by increased riparian habitat connectivity over the current condition.

**Key Issue - Watershed Health**

Watershed Health can indicate whether natural processes and functions are in equilibrium where background sediment transport and erosion rates fall within a range of natural variability resilient to temporary natural disturbance, such as dispersing erosive energy and detaining sediment during flooding.

**Sediment Transport and Erosion Rate**

Watershed drainage area receives precipitation and transports it as runoff according to the erosive and depositional processes functioning within the watershed. Where sediment transport and erosion rates fall outside their range of natural variability, these processes do not function as contributing towards Watershed Health and can be identified by excessive erosion on the landscape or sediment transport from landscape to streams. However, due to the naturally high background sediment transport rate in this watershed changes to sediment transport are masked, and direct measurements to detect changes are not measurable at a project scale or when evaluated on a watershed scale. Floodplain function and the presence of riparian vegetation is assumed to reduce both sediment transport and erosion rate along streams and in the watershed and indicate that active erosion and sediment transport in response to temporary natural disturbance falls within a range of natural variability. In addition because channel forms adjust through time to a range of runoff conditions, where erosive energy is dispersed while maintaining a stable channel form in relation to the ability to flood on the floodplain these channels are considered to erode and transport sediment within a range of natural variability resilient to temporary natural disturbance. Channels out of adjustment have altered forms such as entrenchment. The presence of entrenched channels that cannot flood are assumed to have high rates of sediment transport and erosion.

**Ground Disturbance at the Sub-Drainage Scale**

Monitoring results of past activities within the Sub-Drainages that intersect the project area are used to characterize the resilience to ground disturbance by activity and recovery potential (George, 2015). An increase in ground disturbance beyond the resilience of the soil to retain its structure, infiltration rate and capacity to recover from disturbance may increase erosion, sediment transport, peak flow and a loss of infiltration from compaction depending on soil characteristics (Rust, et al., 2015). Current recovery by the Sub-Drainages from past ground-disturbance is used to describe the resilience of the Sub-Drainages to ground disturbance and provide an estimate of the expected response to Sub-Drainage characteristics from future ground-disturbing activities. In addition, local observations of ground disturbing activities during monitoring
on public land and similar activities identified on non-public land are assigned a coefficient based on a given ground disturbance activity and acres reported to compare existing condition and future condition for each Sub-Drainage (for a complete description see narrative below and (George, 2015).

*Equivalent Road Area at the Watershed Scale*

The Ash Creek Watershed boundary identified from the Forest watershed GIS layer is used to analyze effects from the project and disturbance from past, present and future foreseeable activities, such as timber harvest, grazing, and roads, at a large watershed scale. A TOC was developed for 5th field Watersheds during the forest planning process and is the only scale used for comparison between existing and proposed activities. Equivalent Road Acre (ERA) is used as a surrogate for changes in runoff and any effects to peak flow discharge due to ground disturbance, (George, 2015).

ERA is a measure that compares the disturbance of a given area to that same area of a native road surface (Haskins, 1983). This method is used to evaluate effects from all activities that may cause disturbance known to occur in the watershed (George, 2015).

To determine relevant past, present, and foreseeable future projects, spatial and temporal boundaries must be defined (CFR § 220.4 (f)). For the effects analysis the direct and indirect effects of the Elk project relative to hydrology are conditions influencing runoff and sedimentation.

**Spatial Bounding**

Spatially, the conditions influencing runoff and sedimentation. (e.g. road construction and machine piling) in the project affect sedimentation in channels. As such, the spatial context is the project, sub-drainage and watershed scales:

1. Project Scale - As defined by the project boundary.
2. Sub-drainage Scale –As defined by 2nd to 3rd order watersheds that intersect the project boundary (Forest Plan, 1995). The 8th field hydrologic unit code (HUC) Sub-Drainages are used as a proxy for the 2nd to 3rd order watersheds as they are the smallest watershed-scale mapping unit available.
3. The Watershed Scale - The hydrology cumulative effects analysis area is the Ash Creek 5th field HUC watershed (Watershed). The TOC for the Ash Creek watershed encompassing the Elk Flat LSR project boundary is used to compare with the existing condition and the proposed action for cumulative effects analysis (Forest Plan).

These scales represent the area potentially influenced by effects from proposed treatment activities.

**Temporal Bounding**

The temporal context ranges with the type of activities from onset of the activity to a lifespan of decreasing disturbance with time, up to 30 years into the future; 30 years is approximately how long the most ground disturbing treatments would take to recover, decreasing in ERA and effects to runoff and sedimentation with time. Forest Transportation System Roads are considered permanent features and would therefore not recover.

In this analysis, the description of the existing condition includes the accumulation of past activities, which have influenced vegetation. In the effects discussion, “short-term” refers to effects over the 10-year period from the time the activity was accomplished. Beyond 10 years, effects are considered “long-term.” The current environmental conditions reflect the aggregate impact of all prior human actions and natural events.
that have affected the environment and might contribute to cumulative effects and are a proxy for the impacts of past actions.\textsuperscript{97}

**Affected Environment**

**Streamflow and Channel Condition**

- Banks are more susceptible to erosion in the project area in contrast to banks upstream where abundant riparian vegetation and in-stream bedload structure is functioning. Intermittent channels carry snowmelt or rainfall runoff with either intermittent duration, or as intermittent surface flow migrating across the landscape at a frequency controlled by flow volume and timing. Ephemeral channels refer to those channels that flow in response to rainfall events (going dry during protracted rainless periods when percolation depletes all flow (Linsley, 1982). All channels within the project area have intermittent streamflow and some are occasionally ephemeral. Along Ash Creek, channel condition varies from properly functioning condition where channels are able to flood in unconfined reaches, to where reaches are confined and flooding remains within the channel. Large woody debris is abundant along Ash Creek and is highly concentrated in some reaches. Woody debris enters the channel and floodplain along Ash Creek at a rate and volume that forms both desirable instream channel structure as well as at concentrations that exceed the channels ability to develop into instream structure. Large debris dams frequently force stream flow out of the channel and are responsible for increasing channel width.

- Along Swamp Creek, natural flooding has been disrupted by historical roads systems. Road drainage in the upper watershed diverting Swamp Creek, concentrating flow and eroding Swamp Creek into a gully, disconnecting it from spreading out over the meadow leaving Swamp Creek is not in a functioning condition. Ash Creek and Swamp Creek are intermittent channels that may flow during 100 year recurrence interval runoff events to the McCloud River, although downstream of the project area the channels are mostly dry during most years.

**Water Quality**

Water in the Ash Creek Watershed contains a naturally occurring high suspended sediment load from upstream glacial outwash, mudflows, volcanic ash, and other sediment sources recruited from stream bank erosion and flood events; these are responsible for the range of natural variability for a naturally high sediment load in streams in this watershed. Road surface runoff observed entering streams during larger rainfall and snowmelt events, adding fines to suspended sediment and streamflow, and comprise the sediment entering the stream outside the range of natural variability. Water temperature and turbidity has been measured at discrete locations in the Watershed during periods of base flow as well as before, during and after storm events give some indication of the existing condition and range of variability.

**Turbidity**

Turbidity was measured during and after storm events, as well as during periods when equipment was working in the channel, for culvert replacement or stream restoration. Turbidity measurements indicate the presence of suspended sediment is greatest during storm events and declines sharply to background levels soon afterwards. Turbidity increases and decreases rapidly with the onset and termination of disturbance in the channel such as from storms, culvert replacement or stream restoration. Due to the ashy volcanic soils and naturally high background sediment load in this area, this response characterizes the natural range of variability of turbidity as it responds to a range of events, some large, episodic, and random. Soils are

\textsuperscript{97} This approach is consistent with CFR § 220.4 (f) and the Council on Environmental Quality June 24, 2005 memorandum regarding analysis of past actions.
moderately high to highly resilient to disturbance (See Soils Report Appendix B.) In general, turbidity increases during periods of equipment activity and storms shows a recovery time to pre-disturbance as being very short-lived, the water typically clears from equipment-work within a few hours or from storm events in a few days in streams in the Ash Creek Watershed.

**Water Temperature**

Water temperature varies consistently with the seasons, warmer in the summer, cooler in the winter, but has considerable fluctuation in daily temperatures during the summer months. Near stream, water-surface shading from riparian vegetation, known to have the greatest effect on reducing and moderating water temperatures in comparison to over-story shading, is absent along Ash Creek. Over-story shading from conifer is the dominant shade source and also functions to shade-out riparian plants that would normally occur along the banks.

**Riparian Area Processes and Functions**

**Riparian Vegetation**

Sunlight is often limited within riparian areas where past harvest has occurred and natural regeneration of conifer species develops dense stands in the project area. Sunlight reaches through the conifer forest in only a few places between the uppermost reach of the project area and the crossing of Forest Road 19 upstream of the project area in the watershed. These few sunny sites contain the greatest riparian plant numbers and diversity with willow and alder forming dense pockets on large mid-stream gravel bars, and the channel has a lower width/depth ratio and much higher degree of sinuosity than the other channel reaches. Here, deeper water allows higher soil moisture and favorable conditions for riparian plant species.

The project area lies within the Bartle Grazing Allotment. The meadows and riparian areas attract livestock and receive livestock use. Trailing is evident along both sides of Ash Creek. Livestock congregate along Ash Creek near the junction of U41N96A and U41N97A where the area is trampled and bare of vegetation from livestock use. Cattle use patterns are managed through the grazing permit. Riparian, water and aquatic resources, are protected by administration of grazing permits and annual operating instructions (Appendix C BMP 8.2).

**Floodplain and Meadow Processes and Functions**

Floodplains and meadows are very limited within this watershed. They are characterized by finer sediment deposited by floods, glacial loess and ash deposits.

**Floodplain Inundation**

Floodplain inundation occurs in reaches where the channels are not entrenched and streams can reach the floodplain and overflow during large storms. Manmade features, such as old landings and unauthorized routes, restrict flooding and concentrate energy on floodplains and meadows (George, 2015). Past activity obliterated some intermittent and ephemeral channels, diverted flow and interrupted riparian and floodplain function. Along Ash Creek and within Elk Flat, these remnant features impede and confine flooding. Natural floodplain contours are altered and eroded by old landing activities and modify hydrologic processes associated with stream and floodplain interaction, such as retention of flood flow, groundwater storage and riparian plant community establishment.

**Water Table Elevation and Storage**

Water table elevation and storage supports intermittent stream flow for both Ash Creek and Swamp Creek, but manmade features reduce infiltration on the floodplain and meadows and increase runoff conditions that limit ground water storage and flow duration. Areas without channel incision have likely retained most of their original water table elevation and storage character within the meadow.
Riparian Habitat Connectivity

A 150-foot Riparian Reserve (RR) on each side of intermittent, non-fish-bearing Ash Creek and Swamp Creek is established (per Forest Plan guidance utilizing a RR width established by a site potential tree height of 150 feet) (Forest Plan, 1995). All other intermittent channels in the project treatment units are have a 100 foot buffer as they are characteristically inactive, responding only to 100 year flood events, but are recognized as important connective features needing protection. During high flows the contribution of nutrients, woody debris and sediment are assumed to be redistributed within the watershed as recognized as important functions of intermittent systems by Reid (Reid, 1994). High flows allow plant communities to expand in the downstream direction as seed and live plant material from upstream populations are redistributed downstream. Instream structure in Ash Creek consequently supports aquatic habitat limited to macro-invertebrates. Swamp Creek does not contain aquatic organisms due to its very short and infrequent flow duration. Channels without woody material lack structure to the bedform and often exhibit incision. Incision creates entrenched channels that cannot reach the floodplain to disperse floodwater, sediment and erosive energy. Aquatic organisms occur only in Ash Creek and are limited to macro-invertebrates. Terrestrial organisms supplied by the abundant riparian vegetation upstream of the project, and the limited riparian vegetation in the project area, are assumed to be a main food source to macro-invertebrates. Woody debris embedded in the channel also functions as important habitat for aquatic invertebrates.

Key Issue - Watershed Health

The Ash Creek Watershed lies within an area that exhibits a low occurrence of surface erosion and mass wasting with peak streamflow relatively low per unit area (Haskins, 1983). Topography varies dramatically in this watershed; slopes are steep along the highest elevations near the summit of Mount Shasta and surrounding volcanic outcrops, becoming intermediate to gentle around the alluvial fans where the Project is located. The volcanic soils, low gradient drainages lack of landslide potential and low peak flows indicate the Ash Creek Watershed has low sensitivity to disturbance (Haskins, 1983).

Sediment Transport and Erosion Rates

Ground disturbance from past silvicultural activities such as road-building, disking in plantations, windrow construction, site preparation for planting, is evident throughout the project area but monitoring results indicate little active erosion and sediment transport. In addition to forest system roads, unauthorized roads not designed or maintained for use add to road surface runoff. Many of these roads are hydrologically connected, capturing surface runoff that would otherwise infiltrate water into the ground, picking up fine sediment and eroding the surface. Elevated road prisms may control flow by intercepting or damming upslope runoff while low road prisms may pond water. All channels and ditches may activate during large events and flood road areas. Road damage from runoff events and poor drainage can be seen on some unauthorized roads. With inadequate road crossings and road alignment across fans, upstream of the project area, this has led to channel realignment and shortening, concentration of flow down roads capturing runoff and developing channels.

Road culverts are designed to pass a 100-year recurrence interval size runoff event.

The Sub-Drainage Scale

This 15,900 acre area is composed of Sub-Drainages that intersect the project boundary. This represents the acres from ongoing and past activities within the last 30 years within each Sub-Drainages. (George, 2015). The current condition of the Sub-Drainages at monitoring sites indicates little erosion, sediment transport or impediments to infiltration. Slopes are very low in activity areas and vegetation recovery is evident within several seasons (George, 2015).

The following table illustrates the current ERA results range from 5% to 27% for Sub-Drainages adjacent to or within the project area.
Table 60. ERA of Ongoing and Past Activities at the Sub-Drainage Scale

<table>
<thead>
<tr>
<th>Sub-Drainage Name</th>
<th>Current ERA</th>
<th>Total Sub-Drainage Acres</th>
<th>% from Project</th>
<th>% of Sub-Drainage in ERA</th>
</tr>
</thead>
<tbody>
<tr>
<td>180200401050301</td>
<td>193.7</td>
<td>3594.73</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>180200401050302</td>
<td>355.2</td>
<td>2295.25</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>180200401050303</td>
<td>416.2</td>
<td>1903.06</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>180200401060101</td>
<td>45.6</td>
<td>1930.55</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>180200401060102</td>
<td>386.7</td>
<td>1826.25</td>
<td>11</td>
<td>21</td>
</tr>
<tr>
<td>180200401060103</td>
<td>744.6</td>
<td>2712.60</td>
<td>11</td>
<td>27</td>
</tr>
<tr>
<td>180200401060104</td>
<td>395.7</td>
<td>1638.16</td>
<td>7</td>
<td>24</td>
</tr>
</tbody>
</table>

Equivalent Road Acre (ERA) at the Watershed Scale

From near the peak of Mount Shasta at 14,179 feet to about 4000 feet in elevation south of the McCloud River, encompassing over 10,000 feet of elevation change this watershed has a 113,867 acre drainage area where climate, topography and past and current management influence surface runoff and ground water.

Watershed and Sub-Drainage boundaries were identified from the Forest watershed GIS layer. A TOC was developed for the Ash Creek Watershed during the forest planning process and is only used for comparison between the existing and proposed activities at this scale.

The Ash Creek Watershed has been analyzed in the forest plan for sensitivity to disturbance and assigned a TOC of 18%, indicating a watershed with low sensitivity to disturbance (Forest Plan, 1995). Using the most readily available data for this watershed scale, the existing Ash Creek Watershed ERA is 8.3%, moderately lower than the TOC of 18 % (USDA, 2009; USDA-FS, 2014c).

Past activities in the Ash Creek Watershed include a range of activities on private and federal lands such as timber harvest (hazardous fuels reductions, green tree retention, salvage and thinning), road and landing construction, grazing and fuels. Road and stream interaction magnify runoff effects where several roads are in close proximity to one another resulting in a deleterious effect to water quality as the greater road runoff has more energy and picks up more sediment that is then delivered to the stream. Ash Creek interacts with road runoff inputs during moderate events such as at the intersection of the Military Pass road (FR 41N19X) with FR 41N09. Access along roads that intercept these channels may be disrupted and result in flood debris accumulating on roads. Such conditions could occur almost anywhere in the project area but especially in the following units and their associated roads: 171, 170, 150, 153, 154, 18, 155, 156-U, 346, 346-U, 224, 14, 218, 157, 347, 180, 107, 157, 162, 179, 401, 402, 110, 317 and 318.

Environmental Consequences

Alternative 1- Modified Proposed Action

Direct and Indirect Effects – Alternative 1

Water Quality

Turbidity

Water quality will benefit under this alternative from the elimination of a number of road interactions with channels that currently divert or capture runoff, decommissioning of roads in Riparian Reserves that will reduce sources of road water and sediment to channels and closing of roads that will be completed to standards. Little to no sediment transported into Ash Creek, or other intermittent channels, is expected from proposed activities, as ground disturbance will primarily occur on nearly flat slopes with a 20-foot buffer.
equipment exclusion zone from the edge of the inner gorge of all channels. However, due to the characteristically high natural background sediment load, changes in turbidity from these beneficial actions will not be measurable.

All activities follow BMPs and additional RPM’s designed to avoid water quality impacts and additional RPMs to ensure that water quality will remain falling within the range of natural variability for the area. Decommissioning, and at some locations, recontouring, user-created roads in Elk Flat and old landings in floodplains along Ash Creek will prevent future stream capture by roads.

**Temperature**

Riparian vegetative cover along the stream should increase by harvesting dense conifer and creating openings for sunlight needed for growth. Although riparian growth along the channel will increase stream surface shading, an overall negligible effect on water temperatures is expected due to the small scale of the treatment area relative to the size of the watershed upstream that carries the most influence to stream temperature.

**Riparian Area Processes and Functions**

**Riparian Vegetation**

Long-term stand health is expected to increase throughout the project area as the benefits from implementation are realized. Thinning forest stands in Riparian Reserves will have a short-term minor disturbance. Thinning will favor both forest and riparian vegetation as the change from shaded to open forest and openings will promote riparian growth with the increase in available sunlight. Thinning will also have a noticeable, but temporary effect on ground temperatures, until understory vegetation grows in. With the removal of over-story vegetation, the soil will be heated by direct solar exposure, but this effect will change to less solar exposure as the understory vegetation recovers.

The rate of woody debris input will change from the undesirable current state of whole tree failure, causing bank erosion and debris dams, to incremental input of woody debris as riparian vegetation stabilizes banks and forest stands increase in health and vigor.

Indirect effects expected in the riparian areas include a proliferation in riparian vegetation sprouting, a moderate increase in bank strength from riparian vegetation rooting, development of instream structure, such as point bars, an increase in sediment detention and bank construction and increased floodplain interaction with the channel. Collecting native seed, growing seed for out-planting and planting after disturbance from ground-disturbing activity will also serve multiple benefits: promoting riparian plant community development, stream bank strength, floodplain function, wildlife habitat and appearance of a natural corridor.

Because the area is in an active cattle allotment and livestock graze within the project area and Riparian Reserves, riparian plant community improvement will be influenced by livestock grazing as managed by the grazing permit.

Long-term beneficial effects are expected from an increase in floodplain interaction with streams, riparian vegetation and improved bank strength to the plant communities, summer and winter thermal regulation within the riparian reserve and nutrient filtering from properly functioning floodplains.

**Floodplain and Meadow Processes and Functions**

**Floodplain Inundation**

As natural contours are restored at old landings and meadows, near-stream flooding will resume and flood energy will be dissipated on floodplains and meadow areas. Reconnexion of floodplain to channels will improve timing, variability and duration of floodplain inundation, water table elevation and storage.
Water Table Elevation and Storage
Removing manmade features and restoring natural contours will increase infiltration and contributions to groundwater, raise water table elevation and increase water storage.

Riparian Habitat Connectivity
Recontouring old landings in riparian areas along Ash Creek will promote floodplain function and the interaction of the channel to carry and distribute nutrients, woody debris and sediment allowing plant communities to expand laterally and across the floodplain.

Key Issue - Watershed Health
Sediment Transport and Erosion Rates
Thinning and underburning that increase sunlight will favor the growth of riparian vegetation and sediment detention during flooding, and will reduce sediment transport and erosion rates leading to improved watershed health over the long term. Although these are incremental benefits, the increase in floodplain function allows sediment to be detained and erosive energy to dissipate and will optimize conditions for sediment detention processes. Increased riparian vegetation will increase stream bank stability leading to decreased sediment and erosion rates over time in the project area adding to watershed health. At a watershed scale, little measurable change to sediment transport rate from this project will result due to improvements to road drainage and reduced road mileage.

The Sub-Drainage Scale
The existing ERA for seven Sub-Drainages that intersect the project area varies from 5% to 27% ground disturbance (George, 2015). Results from the ERA analysis at the Sub-Drainage scale shows a general increase in disturbance for six of the seven Sub-Drainages from the project, one Sub-Drainage drops to 0% while the other Sub-Drainages increase up to nearly 40%. Results from field monitoring of nearby vegetation management projects, in the sub-drainages intersecting the Elk project, indicate that a 27% ERA demonstrates resilience to ground-disturbance in this geographic area. Sub-Drainages are expected to continue to be resilient to disturbance and respond with similar recovery as the other activity areas. The low slopes and past evidence of little erosion, sediment transport or impediments to infiltration from previous activities are used to determine that new activities, some designed to improve ground surface conditions and return areas to properly functioning conditions, that soil and vegetation will recover within several seasons (George, 2015).

Equivalent Road Area on a Watershed Scale
Existing Condition ERA for the watershed is 8.3%, Alternative 1 increases ERA by 0.7%, additional future planned activities modeled for the watershed on public and non-public lands raises ERA by 1.3% totaling 10.3% ERA for the Ash Creek Watershed.

Effects relative to Purpose and Need for Action
Alternative 1 meets the project purpose and need by restoring riparian vegetation and floodplains in the Riparian Reserves, and treating stands to improve resilience to disturbance. Timber harvest, vegetation treatment, prescribed burning and floodplain restoration are proposed to attain the ACS objectives (Forest Plan pp. 4.54, 4.56). Alternative 1 is expected to increase stand health, vigor and resilience to disturbance by treating forest stand density through responsive harvest prescriptions and by reducing fuels. A modest increase in acres of riparian plant communities is expected along Ash Creek, especially where vegetation treatments will open the dense canopy to sunlight and improve conditions for riparian growth. As sites vary along the stream and within the Riparian Reserve, other forest restoration activities will benefit stand densities for shade and thermal regulation on stream terraces. Units with greater harvest volume removed will require more harvest equipment, skidding and heavy equipment use and machine piling. Although more landings will
result in more ground disturbance, skidding patterns and distances to landings are designed to minimize equipment use. All landings used will be outside riparian reserves; machine piling in Riparian Reserves is limited to areas outside of equipment exclusion zones (EEZ) and fuels identified for piling within the EEZ will be hand-piled 20 feet away from the inner gorge in the Ash Creek RR. The proposed stand thinning within the Ash Creek Riparian Reserve will serve multiple purposes: creating openings, increasing sunlight, favoring diversity, health and vigor of both riparian vegetation and conifer stands, regulating the incremental input of woody debris to enhance instream aquatic bedform structure and promote near-stream thermal regulation from riparian plants and thermal regulation from conifer stands on terraces.

Effects relative to key issues

Effects to Watershed Health from activities to resource indicators listed in Table 59 are mostly short-term disturbance to water-holding properties from site-specific treatments with little if any effects outside of the treated units or project area as measured by the amount of equivalent road acre at the project, sub-drainage and watershed scales.

Overall, minor direct effects such as slight displacement of surface soils, and minimal ground disturbance, are expected to occur. No deleterious effects to resource indicators are expected from harvest activities. All acres in Alternative 1 could receive under-burning as described in Chapter 2. Underburning will produce a mosaic of fuel consumption on a relatively flat topography with little opportunity to influence stream runoff. Underburning is allowed within all Riparian Reserves with the restriction that only 5% of embedded large woody debris may experience burning over the project area. Evidence of prescribed fire and a mosaic of ash and charring of wood and organic debris are expected.

Cumulative Effects – Alternative 1

In some areas, effects from past activities continue to this day, interrupting and relocating surface and subsurface runoff, stream flow and floodplain interaction during large storm events. Incremental positive watershed effects from treatment will:

- increase floodplain and meadow function, infiltration and channel stability;
- increase sunlight to understory vegetation;
- reduce unauthorized route runoff and sedimentation to channels;
- restore infiltration within the project from decommissioning temporary and unauthorized routes;
- reduce the risk and increase resilience to disturbance from of high intensity fire and associated runoff and sedimentation to channels;
- return fire to the role of maintaining natural openings in Riparian Reserves and Elk Flat.

Effects vary by the number of entries; more entries will result in potentially more ground-disturbance than fewer entries, such as harvest followed by machine piling and burning. Equipment thinning, machine piling and burning are potentially high ground-disturbing activities due to multiple entries of heavy equipment followed by fuel treatments. Activities using tractors will result in initial low ground disturbance from mechanical harvest and moderate ground disturbance from additional machine piling. However, implementing BMPs and project resource protection measures will prevent water quality impacts and maintain soil and watershed resources. Short-term disturbance to water-holding properties from site specific treatment is expected, with little or no effects outside of the treated units or project area. An overall improvement to watershed function from increased vegetative species diversity and vigor and improved resilience to natural disturbance is expected to follow from this temporary disturbance.
In contrast to multiple entries for equipment activities, prescribed burning effects to surface conditions from multiple entries are less ground disturbing. Light thinning with less equipment and fuel reduction using under-burning are considered lower levels of ground disturbance where slight compaction or minor loss in infiltration is evident. Effects to resource indicators from prescribed fire are assumed to be minor because the prescription is designed and implemented to leave a surface condition similar to that of a low-severity burn, such as a protective duff layer over the mineral soil (Robichaud, 2000). Evidence of ground disturbing effects from prescribed fire diminishes rapidly with a return to pre-existing conditions within approximately 3 years. However, due to varying surface conditions, some high burn severity could occur with prescribed fire and result in soil hydrophobicity and associated loss in infiltration (Robichaud, 2000); this result is expected to be short-lived and minor based on BMP monitoring results for this area. Fire lines design avoids unnecessary ground disturbance by utilizing roads, trails or natural fire barriers where possible. Fire lines for prescribed fire are constructed where necessary and recover through time as they remove the duff layer down to mineral soil and push the material into a berm off to the side with slight ground disturbance. Fire control line would be approximately 2 feet in width where constructed by hand. Where constructed by machine, the finished fire line may be up to 8 ft. wide, the width of a dozer blade, but averages 6 ft. wide, as the blade is angled as it works the line. No trees are removed in line construction. After burning, usually within one year, the berm is pulled back over the fire line, replacing the bermed soil over the mineral soil. No measurable compaction is expected with this activity although some displacement of the soil and litter duff is expected. Because rapid recovery to pre-existing conditions is expected, 3 years, multiple entries at intervals designed to mimic the natural fire return interval for this area, 7 years, should result in a short-term disturbance and burn prescription effects that do not overlap in time although they may be in the same location.

Activities such as road maintenance and fuel treatments will improve watershed functions and processes over that of roads and drainages in poor condition and high risk of stand replacing fires.

The Ash Creek Watershed has a TOC value of 18% ERA. The Existing Condition ERA for the watershed (8.3%) is 46% of the TOC, Alternative 1 ERA (0.7%) is an additional 0.04% of the TOC, other future planned activities modeled for the watershed ERA (1.3 %) is 0.07% of TOC; the existing and future activities on public and non-public lands would be approximately 46.7% of TOC for the Ash Creek Watershed.

**Alternative 2- No New Temporary Road Construction Other Than Those Required for Landing Access**

Alternative 2 is the same as Alternative 1 except that it does not meet the purpose and need of the project as well as Alternative 1 by having slightly less benefits for some indicators: Water Quality, Water Table Elevation, Channel Bank Stability, Floodplain Restoration, Woody Debris and Riparian Corridor Habitat Conditions. Access to thinning units is necessary to meet ACS objectives and optimize stand objectives in all areas; this reduction in proposed thinning does not meet the stand health objectives as well as Alternative 1 would.

**Direct and Indirect Effects – Alternative 2**

Access to some stands will be limited under Alternative 2. With no temporary road construction, some portions of some units will not be treated and fewer landings would be needed. Less thinning and associated ground disturbance may appear to be less of an effect; however, Alternative 2 ultimately does not address the stand health issues that arise from not treating the stands and meeting the objectives identified in the project purpose and need.

Riparian Reserve benefits are reduced under this alternative compared to Alternative 1 because the existing access to Units 110 and 114 is insufficient, and would limit reaching 3.3 acres of Riparian Reserve treatment areas. Similarly, there is insufficient access to 4.3 acres in Units 346 and 347, where recontouring old landings in riparian areas to promote floodplain function and riparian habitat connectivity is proposed. Less treatment within Riparian Reserves reduces benefits from increased exposure to sunlight, riparian growth, bank
stability, stand health and woody debris recruitment; Riparian Reserve stand objectives would not be addressed without the use of a temporary road for these few acres.

**Effects relative to key issues**

Without temporary roads, access to some units will lower the total road disturbance, and will slightly increase ground disturbance over the unit area from increased skidding distance. However, because of the small unit area, the net outcome would be no measurable effect to any resource indicators at the Watershed scale.

**Cumulative Effects – Alternative 2**

There would be no measurable cumulative effect from reducing 1 mile of road construction to the measurement indicators from this alternative; therefore, this alternative would have approximately the same cumulative effects as Alternative 1. The ERA remains the same as Alternative 1.

**Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl**

Alternative 3 reduces the disturbed ground by 716 acres;\(^{98}\) however, it also does not meet the purpose and need for maintaining stand vigor and building resilience to disturbance through time as well as Alternative 1 in the LSR (see Chap. 3, Silviculture and Forest Health).

**Direct and Indirect Effects – Alternative 3**

No measurable direct or indirect effects are expected to resource indicators. Alternative 3 would reduce approximately 31 acres of prescribed fire within the Ash Creek Riparian Reserve (in Units 150 and 171.) Other Riparian Reserves (approximately 5 acres in Units 214 and 216) would also not receive prescribed fire.

**Cumulative Effects – Alternative 3**

Reducing the acreage of disturbed ground with Alternative 3 would result in no measureable difference in measurement indicators; therefore, this alternative would have approximately the same cumulative effects as Alternative 1.

**Alternative 4 - No Action**

With Alternative 4, the no action alternative, the proposed management activities would not be implemented. No direct, indirect, or cumulative effects are expected. Although there would be no actions undertaken with this alternative, ongoing trends would continue.

No action is expected to continue a trend towards high stand mortality and densities, even-aged stands, excessive fuels and associated risk of uncharacteristic fire. Therefore, Alternative 4 does not meet and prevents attainment of ACS objectives as restoration activity and unauthorized road decommissioning will not occur.

**Cumulative Effects**

Since there are no direct or indirect effects with Alternative 4, there would be no cumulative effects. However, current trends would continue. Any of these outcomes would be detrimental to meeting watershed and Riparian Reserve objectives from the loss of hydrologic processes and functions at all scales. Alternative 4 would continue the lack of floodplain function from old landings within floodplains, unauthorized roads and poor sunlight conditions for riparian plant growth.

---

\(^{98}\) This reduction is for underburning. Other ground-disturbing activities are reduced by lower amounts depending on the activity, as described in the Chapter 2 summary tables for Alternative 3.
Summary and Conclusions

No impacts to aquatic systems would occur with any of the action alternatives.

Although Alternatives 2 and 3 do not optimize Riparian Reserve objectives, they still meet and do not prevent attainment of ACS objectives. All alternatives except Alternative 4 meet and do not prevent attainment of ACS objectives.

Watershed Scale

The Existing Condition ERA for the Ash Creek Watershed is at moderate risk for exceeding threshold (8.3% of 18% ERA); Alternative 1, and other planned activities throughout the watershed on public and non-public land would add 2% ERA resulting in a slight addition to the moderate risk of exceeding TOC (10.3 % out of 18%) TOC (George, 2015 p. Appdx. B).

Project Scale

A modest increase in acres of riparian plant communities is expected from all action alternatives.

Table 61. Summary of Hydrologic Resource Elements and Indicators: The Expected Response by the Indicator from the Proposed Action, Alternatives and Effect to the Resource.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality</td>
<td>Benefits to water quality from elimination of road interactions with channels and road, landings and main skid trails, decommissioning and closures. Within RNV</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Current trends continue. ACS #4 not met</td>
</tr>
<tr>
<td>Riparian Area Processes and Functions</td>
<td>Increase in riparian vegetation, rate of woody debris input and bank stability with reduction of dense conifer canopy and improved floodplain function along the Riparian Reserve. Short-term minor ground disturbance and temperature.</td>
<td>Benefit from reduced road runoff would be offset by longer skid distances. Less sunlight and riparian growth than Alternative 1.</td>
<td>Fewer acres of riparian vegetation improvement. no measureable effect at Watershed scale</td>
<td>At risk for decline from a stand replacing fire, high rates of erosion, sedimentation and loss of Riparian Reserve function. would not meet ACS Objective # 7</td>
</tr>
<tr>
<td>Floodplain and Meadow Processes and Functions</td>
<td>Reconnection of floodplain to channels will incrementally improve timing, variability and duration of floodplain inundation, water table elevation and storage.</td>
<td>Reduced riparian treatment due to decreased access.</td>
<td>same as Alternative 1.</td>
<td>Continued decline in floodplain function and would not meet ACS Objective #8.</td>
</tr>
<tr>
<td>Riparian Habitat Connectivity</td>
<td>Habitat connectivity within the riparian area improves as riparian vegetation extends along stream reaches and from the stream to the floodplain from recontouring old landings to natural contours.</td>
<td>Natural flooding and interaction to promote riparian habitat connectivity would be reduced from Alternative 1 due to decreased access.</td>
<td>Slightly reduced benefits from Alternative 1.</td>
<td>Little connectivity of riparian habitat areas, would remain ineffective in meeting ACS Objective #9.</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Watershed Health (Alternative meets ACS objectives or does not prevent attainment of them)</td>
<td>Maintains or improves watershed function. From a watershed scale, the health of the watershed would not change.</td>
<td>Same as Alternative 1</td>
<td>Maintains or improves watershed function but not as well as Alternative 1. Approaches the benefits of Alternative 1.</td>
<td>Current trend would continue to not meet or prevent attainment of all 9 ACS objectives. Non-functioning conditions of sediment runoff would continue degrading the watershed and riparian areas.</td>
</tr>
</tbody>
</table>

**Effects relative to Purpose and Need for Action**

All action alternatives would meet Purpose and Need #5- Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries.

Alternative 2 does not meet the purpose and need of the project as well as Alternative 1 because although the presumed benefit from less road runoff is expected, it is a slight reduction. There would be slightly less benefit to the water table elevation, streamflow and vegetation as floodplain restoration of old landings would not occur, however, no measurable difference in floodplain inundation or water table elevation would be detected due to this small difference in lack of floodplain restoration. A slight reduction in the benefits to natural flooding and riparian habitat connectivity would also result, as some riparian treatments would not occur. The effects from reduction in temporary road would not be noticeable at the watershed scale.

There is little difference in effects from Alternative 3 compared to Alternative 1. However, Alternative 3 would limit the extent of prescribed burning as well as other treatments designed to improve vegetation conditions; reduced acres of prescribed fire within the Riparian Reserve LSR acres would reduce the benefit of removing excess fuel and lowering the risk of wildfire designed to promote resilient riparian vegetation conditions.

All action alternatives would meet Purpose and Need #3-Restore Meadow Habitat in Elk Flat as it applies to hydrologic function, to the same extent.

**Effects relative to key issues**

Machine piling for Alternative 1 would add 0.04% to the ERA existing condition, Alternative 2 and 3 ERA results are the same 0.04% shows no difference at a watershed scale. Effects on watershed health from machine piling under Alternative 1 compared to Alternative 2 or 3 are not detectable at a watershed scale.

**Compliance with Law, Regulation and Policy (includes Forest Plan under NFMA)**

All action alternatives (1, 2 and 3) meet and do not prevent attainment of the ACS objectives at the watershed and project scales. The degree to which the action alternatives meet all 9 ACS objectives varies with how well: a) Overstocked stands and fuels are reduced over the project area; b) How well treatment within riparian reserves improves openings for sunlight for riparian vegetation; and c) How well floodplain processes and functions are restored. See Appendix H (p. H-13) for a complete discussion of the project effects relative to ACS objectives.

Analyzing for effects at the 2nd and 3rd watershed scales (using Sub-Drainages as a proxy for analysis) found that all ground disturbance due to any of the action alternatives resulted in slightly ground disturbing effects.
Recovery would be at rates that would maintain properly functioning condition of the Sub-Drainage, and there would be no excessive cumulative impacts on stream channel condition and water quality, rather stream channel condition and water quality should improve above the existing condition.

Soils

A Soils Specialist Report (Rust et. al., 2016) was completed for this project and is incorporated by reference. Information relevant to this decision is summarized here.

Introduction

Purpose and Need Applicable to Soils

Soils are the basic resource that support or directly influence most, if not all, other resources. This support is through soil productivity (Forest Plan p. 3.75). As such, maintaining soil productivity would indirectly support purpose and need statements #1 to #4. Purpose and Need #2, “Accelerate Development of Late-Successional and Old Forest Characteristics”, particularly calls out an existing condition/desired condition departure for soils in the windrowed plantations (see Existing Condition section starting p. 29). The loss of soil productivity between the windrows directly affects site productivity and sustainability resulting in retarded stand development.

Issues Applicable to Soils

Issues #2 and #5 apply to effects on soils (see pp. 45, 47).

- Issue #2 – expresses the concern that road construction directly harms forest health and wildlife and results in long-term impacts to soil health and productivity, pertains to the soils resource. This issue applies to the Temporary roads that will be constructed to access landings, since no new FTS roads are proposed to be constructed for the project.

- Issue #5 – expresses the concern that machine piling has disproportionately harmful impacts on watershed and soil resources.

The Environmental Consequences section discusses temporary road construction and machine piling effects relative to the soils resource.

Methodology

Soils in the Elk project area were analyzed using several methods. Soils were reviewed using soil survey data, data in GIS, and field reconnaissance along with monitoring information and best available science regarding soils. Most of the units have been field reviewed by the soil scientist to verify mapping, identify areas where soil productivity may be affected by proposed actions, and examine current disturbance on site. The effects of each alternative on the soil resource have been assessed using the Region 5 Soil Quality Standards and the Forest Plan. Soil quality analysis standards provide threshold values that indicate when changes in soil properties and soil conditions would result in significant change or impairment of the productivity potential, hydrologic function, or buffering capacity of the soil. Management activities have potential to cause various types and degrees of disturbance. Soil disturbance is categorized into compaction, displacement, puddling, churning, severe burning, and erosion.

Initial field surveys were conducted by a soil scientist in July 2009. Subsequently, the National Soil Disturbance Monitoring Protocol (NSDMP) (Page-Dumroese, et al., 2009) level one analysis (visual soil disturbance indicators) and a level two analysis (validation sampling) using transects to measure erosion,
disturbance, compaction, displacement, and cover (Rust, 2011) were conducted. More information on NSDMP can be found in the soil specialist report.

Assumptions

The soils analysis assumes the following:

- **Nonproductive Area** - System roads, borrow pits, and utility corridors are a permanent commitment of resources and are not counted as detrimental soil disturbance as they are not part of the productive land base (Forest Plan pp. O-2).

- **Expected New Disturbance Levels from Silvicultural Treatments** - Anticipated new disturbance from ground based yarding, averages about 9% of an activity area; however, not all new disturbance exceeds thresholds for detrimental soil disturbances. The current level of detrimental disturbance is 9% for the project area. Appendix C of the Soils Specialist Report and Rust (2013a) describes further details on disturbance. Newer equipment, effective BMP’s and site specific resource protection measures would be utilized. New disturbance would generally overlap old disturbance adding only one to three percent cumulative detrimental soil compaction. Disturbance from tractor harvesting in winter conditions would be less due to logging on snow or frozen ground. Monitoring following winter harvest on the Shasta Trinity National Forest (Rust, 2013) showed a one to two percent decrease in porosity over pre-harvest levels of two to four percent. Mastication of biomass material accounts for an additional one percent.

- **Expected New Detrimental Levels from Fuels Treatments** - Detrimental soil disturbances from fuel treatments are estimated at an additional one percent for underburning; two percent for mechanical slash piling and burning, negligible for hand piling for each unit (Rust, 2013b).

- **Erosion Potential** - Erosion is predicted to remain low in all units and in all alternatives due to soils that are deep to very deep, well drained and gentle slopes. The steepest slopes in the project area were used in the erosion modeling.

- **Soil Recovery Rates** - The effect of management on soil recovery is dependent on soil type, climate, moisture, cover and time. By using the Universal Soil Loss Equation (USLE) typical recovery rates can be developed that show for erosion, soils with 50 to 70% cover; recovery is in 3 to 5 years versus. 15 to 30 years for full soil function recovery (litter, duff, and topsoil disturbance recovery) see Table 62.

<table>
<thead>
<tr>
<th>Soil Types and Conditions in Project Area</th>
<th>Erosion</th>
<th>Compaction</th>
<th>Fertility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>2-3 years</td>
<td>10-20 years</td>
<td>5-10 years</td>
</tr>
<tr>
<td>Shasta</td>
<td>2-5 years</td>
<td>5-10 years</td>
<td>5-15 years</td>
</tr>
<tr>
<td>Windrowed soil</td>
<td>2-5 years</td>
<td>5-10 years</td>
<td>20-30 years*</td>
</tr>
</tbody>
</table>

Source: (Rust, 2009) and (Foss, 2010)
* Windrow spreading can hasten recovery considerably.

Indicators and Measures

Table 63 lists resource and key issue indicators and measures used to evaluate effects to soils. All of the indicators indirectly affect attainment of meeting Purpose and Need #8 1 to 4. Discussion of the rationale for each indicator follows.
Table 63. Indicators and Measures of Effects for Soils

<table>
<thead>
<tr>
<th>Resource Element</th>
<th>Resource Indicator</th>
<th>Measure</th>
<th>P&amp;N, Key Issue, or Resource Effect</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion and Displacement</td>
<td>Soil Erosion Hazard Rating (EHR)</td>
<td>The calculated erosion risk based on soil texture, depth, infiltration, rock fragments, surface cover, slope, and climate is “low” unless mitigated. (see Soils Report Appendix A)</td>
<td>Resource</td>
<td>R-5 FSH 2505.22</td>
</tr>
<tr>
<td></td>
<td>Water Erosion Prediction Project (WEPP) Rating</td>
<td>Tons/acre of soil loss</td>
<td>USFS WEPP</td>
<td></td>
</tr>
<tr>
<td>Resiliency</td>
<td>Soil Resiliency Index Rating</td>
<td>The soil resiliency to erosion, compaction, displacement, burning, puddling, and whole-tree removal. The resiliency index is based on textures, permeability, depth, rock, slope, and cover after the disturbance and climate. (See Soils Report Appendix B). The measure ranges from slight to severe. Effects for elk pertain primarily to litter and duff removal.</td>
<td>Resource</td>
<td>Appendix B Soil Resiliency Index, (Rust, et al., 2015)</td>
</tr>
<tr>
<td>Organic Matter</td>
<td>Litter and Duff</td>
<td>Litter and duff occurs over 50% of activity area (where natural plant community is capable), or natural plant community will produce enough annually to cover 50% of activity area.</td>
<td>Resource, P&amp;N #2, and component of Key Issues #2 and #5 indicators</td>
<td>Forest Plan (Forest Plan pp. O-1). LSRA</td>
</tr>
<tr>
<td></td>
<td>Large Woody Material</td>
<td>Large woody material (in forested areas) – at least 6-10 logs per acre in decomposition classes 3-5 in LSR and at least 5 in Matrix and the Meadow Enhancement Unit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compaction</td>
<td>Soil Porosity</td>
<td>Percent of the natural porosity in undisturbed conditions is at least 90% of natural.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Issue Indicators**

<table>
<thead>
<tr>
<th>Issue #2, Soil Health and Productivity</th>
<th>Attainment of soil quality standards (SQS) post implementation</th>
<th>Acres in comparison to No Action</th>
<th>Issue #2 indicator “d”</th>
<th>see p. 46 (SQS in Appdx. O of Forest Plan)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attainment of SQS post-implementation</td>
<td></td>
<td>Issue #5 indicator “b”</td>
<td></td>
</tr>
</tbody>
</table>

**Discussion**

**Soil Productivity**

Soil productivity is described on page 4.25 and Appendix O of the Forest Plan. Surface organic matter and soil porosity are used as the indicators of soil productivity most likely to be influenced by the project.
Surface Organic Matter

- **Litter and Duff** – Litter and duff are the organic layers on top of mineral soil consisting of fallen vegetative matter in various stages of decomposition. Litter includes woody material up to 3 inches in diameter. The presence of living vegetation that could contribute significant annual litter fall to compensate for conditions when immediate post disturbance litter and duff coverage is too thin or less than 50 percent is counted in this assessment. Litter and duff are not measured in areas incapable of producing the required litter and duff.

- **Large Woody Material** – Residue left after advanced brown-rot decay is a brown, crumbly mass composed largely of lignin, an important component in western forests. Since brown rot typically affects only heart wood, large trees allowed to die and decompose naturally in the woods serve as an important lignin source. Soil wood possesses one key characteristic that makes it important: the ability to hold water. This high water-holding capacity provides: 1) Plant-available water, especially during the driest months; 2) Excellent underground habitat for all types of soil biological activity, and; 3) Appropriate conditions that cause a hub of mycorrhizal fungi activity. Wood decay fungi (mycorrhizae) contributes to: 1) Breaking down plant residues and recycling carbon to the soil or the atmosphere; 2) Releasing mineral nutrients from plant residues and making the nutrients available to living organisms, and; 3) Producing the physical character of the soil matrix. This decay by mycorrhizae helps promote soil water infiltration rates, soil water-holding capacity, cation exchange capacity, nutrient availability, nitrogen fixing activity, and other beneficial processes.

When in forested areas (in this project Elk Flat meadow would not be a forested area), desired large woody material (also referred to as coarse woody debris) consists of logs in contact with soil. The desired logs are at least 20 inches in diameter and at least 10 feet long in various stages of decomposition.

**Compaction – Soil Porosity**

Soil porosity refers to the amount and character of void space within the soil. In a “typical” soil, approximately 50 percent of the soil volume is void space. Pore space is lost primarily through mechanical compaction. Three fundamental processes are negatively impacted by compromised soil pore space: gas exchange, soil water infiltration rates, and water holding capacity. Soil oxygen is fundamental to all soil biologic activity. Roots, soil fauna, and fungi all respire, using oxygen while releasing carbon dioxide. When gas exchange is compromised, biologic activity is also compromised. Maintaining appropriate soil biologic activity is important when considering long-term forest vitality. Severely compacted soils do not allow appropriate water infiltration, leading to overland flow and associated erosion, sediment delivery, spring flooding, and low summer flows.

The Forest Plan standard calls for at least 90% of the total porosity found under undisturbed or natural conditions. Porosity is evaluated between 4 and 8 inches below the surface for soils with trees and shrub potential, and between 0 and 4 inches for soils with herbaceous potential (Forest Plan, Appendix O).

**Erosion and Displacement** –

- **Erosion Hazard Rating** - The Erosion Hazard Rating (EHR) was developed to assess the potential risk of a given soil to erode. The EHR system is designed to assess the relative risk of accelerated sheet and rill erosion. This rating system is based on soil texture, depth, infiltration, rock fragments, surface cover, slope, and climate. Erosion is generally low for the project area due to coarse soil textures and gentle slopes. Appendix A of the Soils Specialist Report describes further details on EHR calculations.
- **Water Erosion Prediction Project (WEPP) Rating** - The WEPP soil erosion model was developed by an interagency group of scientists including the USDA's Agricultural Research Service (ARS), Natural Resources Conservation Service, Forest Service, the Dept. of Interior’s Bureau of Land Management and US Geological Survey. Scientists from these agencies throughout the United States have been working since 1985 to develop this erosion prediction model to replace the Universal Soil Loss Equation (USLE) for various land management activities (timber harvesting, roads, grazing, fuel reduction, prescribed fire and wildfire).

**Soil Resiliency**

Soil resiliency is a soil’s ability to resist or recover a healthy state in response to destabilizing influences. The index rating calculations looked at erosion, compaction, displacement, degradation by fire, puddling/churning, and whole tree removal susceptibility. Appendix B of the Soils Specialist Report describes further details on soil resiliency. For the Elk Project, litter and duff removal and recover is the major diving factor of the index and how quickly the soils will recover.

**Key Issue Indicators**

**Soil Quality Standards**

Soil quality standard measure detrimental disturbance the acres pre and post project that would meet the SQS as described in Appendix O of the Forest Plan for soil productivity, soil hydrologic function, soil moisture regime and soil environmental health assess the projects impacts on soil health. Of these parameters, soil productivity measured through the indicators listed above, is the primary measure that has potential for effects. Natural processes such as climate, amount of rainfall, soil texture, geomorphology and time, influence soil hydrologic function and soil moisture regime. Acres meeting soil quality standards pre and post project will assess project effects on soil health.

**Machine Piling and Temporary Road Construction**

The acres and effects of machine piling and the pre and post piling effect on meeting soil quality standards, and a discussion of temporary road use and construction, will also indicate project effects relating to the key issues.

**Boundaries**

To determine relevant past, present, and foreseeable future projects, spatial and temporal boundaries must be defined (36 CFR § 220.4 (f)). Spatial and temporal boundaries set the limits for selecting the actions most likely to contribute to cumulative effects (FSH 1909.15, 15.2). The direct and indirect effects of the Elk project relative to soil productivity including erosion (surface cover), and resiliency and conditions influencing compaction [porosity], surface organic matter (litter and duff and large woody debris) (Forest Plan p. 4.25)

**Spatial Bounding**

Spatially, the conditions influencing soil productivity, resiliency and erosion in the project are potentially ground disturbing or soil modifying activities, such as mechanical tree cutting, skidding and piling, and prescribed burning.

**Temporal Bounding**

The temporal context being considered is activities 2-15 years into the future in non-windrowed areas and 2-30 years into the future for windrowed areas; 2-30 years is approximately how long proposed treatments would affect soil erosion, compaction, organic matter, LWD, and resiliency as discussed in the assumptions section).
The baseline year used for this analysis is the year 2015 as the existing condition. In this analysis, the description of the existing condition includes the accumulation of past activities, which have influenced vegetation. In the effects discussion, “short-term” refers to effects over the five year period from the time the activity was accomplished. Beyond five, effects are considered “long-term.” The current environmental conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment, might contribute to cumulative effects, and are a proxy for the impacts of past actions.99

Affected Environment

Existing Condition
The Elk Project is located in the Southern Cascades Ecological Section (M261Dg) of northern California. This section is dominated by Pliocene volcanic basalt flows buried by Quaternary alluvium. Mass wasting and fluvial erosion are the main geomorphic processes. This area is typified by nearly level glacial outwash terraces and lava flows. Surface water exists within the project area in Ash Creek and Swamp Creek, which flow intermittently throughout the year.

Soils within the project area have predominately formed in volcanic outwash terraces on timbered toe-slopes. Soils formed in volcanic outwash are generally deep to very deep (40 to 60 inches) sandy loams to loamy sands. Figure 17 shows the treatment units overlaid on general soil map units for the Elk Project indicating most treatment units are located on Shasta and Germany soils, which are well drained loamy sands and sandy loams. Germany family soils are deep volcanic sandy loam soil. Shasta family soils are a very deep volcanic loamy sand soil.

99 This approach is consistent with 36 CFR § 220.4 (f) and the Council on Environmental Quality June 24, 2005 memorandum regarding analysis of past actions.
Surface Organic Matter

Soil cover from organic matter is nearly continuous throughout the project area except old skid trails and landings.
Litter and Duff

Even where cover is naturally patchy, such as in woodland and shrub vegetation types, soil cover standards are met (well exceeding 50%). Average observed depth of litter is and duff is 6 centimeters with total organics ranging from 1 to 13 centimeters. The thinner litter and duff layers are located in the Elk Flat, this is likely due to the area having high natural disturbance from the geomorphology (i.e. debris flow, flooding, fire etc.). This area is predominately grasses and at this time is not capable of producing 50% litter and duff coverage, due to this although the units have 45% and 20% coverage of litter and duff, they still fall within standards. Most locations within the project area have a canopy cover of perennial, live vegetation, which serves as a relatively continuous source of replenishment for soil organic matter.

Germany and Shasta soils have good soil fertility due to their depth and available water-holding capacities. In general, most timber soils have low fertility and most nutrients are recycled from decomposing roots and surface duff that gets incorporated into the soil. Since most roots are in the upper one to two feet of soil, it is very important to protect topsoil from displacement and erosion.

Legacy monitoring (TEAMS 2009) indicate units 6, 12, 13, 14, 16, 110, and 208 (all plantations) have high levels of soil displacement and low LWD counts due to relic windrowing practices of converting brush fields to timber plantations. Additionally these plantations have truncated topsoil A horizons due to windrowing. Soil displacement windrowing monitoring (Rust, 2012) compared windrowed trees to inter-bay trees to see if surface duff and partial topsoil scalping from windrowing has affected soil productivity. In all cases when topsoil was scalped from windrowing, the windrow trees benefited (more nutrients, moisture, and space) from the topsoil and the inter-bay trees, suffered. These conditions occur on units 6 and 14. The loss of these processes, due to windrowing has direct effect on site productivity and sustainability.

Large Woody Material

The soil wood in the Elk Project area is generally adequate, but was generally more common in units without prior disturbance. Currently, LWD greater than 20 inches in diameter is sparse in plantations but for the rest of the project levels are adequate (Rust, et al., 2015 p. Appdx. C).

Compaction-Soil Porosity

Skid trails are the longest lasting detrimental disturbance, where many machines travel over the same route and compact the soil. Available water holding capacity is compromised as well by compaction since less water infiltrates to be held for plant growth on many soil types. Decreases in soil porosity from machine traffic may have some positive effect in that increasing the bulk density of these coarse textured soils (which results in increased water holding capacity), may provide water for plant growth longer into the growing season and promote increased tree growth (Gomez, et al., 2002). This has been observed in silvicultural site productivity surveys on McCloud Flats that shows no net decreases in site indexes for sandy soil in areas that were compacted (Fleming, 2010).

For the Elk Project, 51 percent is undisturbed (SD0), 34 percent is disturbed (SD1), and 15 percent is highly disturbed (SD2 & 3) as topsoil displaced or in skid-trails. Legacy porosity levels for disturbed areas, is 4 percent decrease in porosity and for skid-trails is six percent decrease in porosity. Units 162, 164, 166 and 206, are over soil quality standard thresholds at or greater than 15 percent of the area, which require measures to alleviate compaction in those areas.100 With resource protection measures that are planned with the alternatives operations will not be adding to legacy levels, in some cases soil productivity will be increased.

---

100 The Forest Plan allows 20% in uneven-aged systems (Forest Plan p. 4.25j); however, 15% is used here as a conservative approach.
Data from monitoring of soil compaction in projects on the McCloud Flats 2001 to 2013 shows on average across all soil types, current mechanical harvesting operations decrease porosity on skid-trails only by one to three percent from pre-harvest levels due to better equipment, effective BMPs, use of existing skid-trails, and site specific mitigations (Rust, 2013a). Total disturbance increased on an average of 12 to 15 percent using new harvest methods but this disturbance was not detrimental. New harvest equipment is lighter on the ground and has a bigger footprint. For volcanic soils on average, there is a three percent increase in detrimental compaction on skid-trails between pre- and post- harvest with a nine percent larger “footprint”.

**Erosion and Displacement - Soil Erosion Hazard Rating**

Table 64 summarizes the current composite EHR by soil type. Bare soil refers to soil without cover, current refers to current conditions before treatment, and treatment refers to soil cover after treatment. Soil cover is canopy (tree, forbes, grass), litter, duff, and rocks greater ¾ inches.

Table 64. Elk Flat LSR Enhancement Project Erosion Hazard Rating (EHR)

<table>
<thead>
<tr>
<th>Soil, Bare Soil by % Slopes, Current EHR, Post-Treatment EHR</th>
<th>EHR</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany 0-20% slope, bare soil</td>
<td>2.3</td>
<td>low</td>
</tr>
<tr>
<td>Current</td>
<td>0.5</td>
<td>low</td>
</tr>
<tr>
<td>Post treatment</td>
<td>0.9</td>
<td>low</td>
</tr>
<tr>
<td>Shasta 0-10% slope, bare soil</td>
<td>0.6</td>
<td>low</td>
</tr>
<tr>
<td>Current</td>
<td>0.1</td>
<td>low</td>
</tr>
<tr>
<td>Post treatment</td>
<td>0.2</td>
<td>low</td>
</tr>
<tr>
<td>10-30% slope, bare soil</td>
<td>4.7</td>
<td>moderate</td>
</tr>
<tr>
<td>Current</td>
<td>0.9</td>
<td>low</td>
</tr>
<tr>
<td>Post Treatment</td>
<td>1.9</td>
<td>low</td>
</tr>
</tbody>
</table>

Moderate ratings mean that accelerated erosion is likely to occur in most years and water quality impacts may occur, resource protection may be applied in certain cases. High to very high EHR ratings mean that accelerated erosion is likely to occur in most years and that erosion control measures should be evaluated.

**Soil Resiliency**

Table 65 summarizes the composite soil resiliency rating derived from Appendix B of the soil report. Germany soils have a high resiliency rating which means the soil can withstand many destabilizing impacts without decreasing its inherent productivity. Shasta soils have a moderate resiliency rating, which means some of its soil properties are more sensitive to destabilizing impacts, and treatments need to consider these factors with creation of soil protection measures to protect these soils from those impacts. The RPMS (see p. 85) and SOPs and BMPs (see pp. C-1, C-3) include soil resources protection for the project.

Table 65. Soil Resiliency Index Rating

<table>
<thead>
<tr>
<th>Soil</th>
<th>Resiliency</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>97</td>
<td>High</td>
</tr>
<tr>
<td>Shasta</td>
<td>115</td>
<td>moderate</td>
</tr>
</tbody>
</table>
Key Issue Indicator

Soil Quality Standards

Currently, 3,336 acres in the project area (about 95%) meet SQS. Estimated acres of machine piling needed based on fuel loading is approximately 944 acres. The maximum acreage, pending deadfall, approximates 1,461 acres. Of the acres to be machine piled 703 currently meet SQS. The acres that meet standards are throughout the machine-piling units; however, units 162, 164, 166, and 206 have pre-existing skid trails are increasing compaction and do not meet SQS on those compacted areas.

Unauthorized Routes

The existing condition relative to non FTS roads, or unauthorized routes, is described in detail in the Transportation section (starting on p. 234). Unauthorized routes are areas of disturbed soil from past vehicle use (and possibly current illegal motorized access).

Environmental Consequences

Alternative 1- Modified Proposed Action

Direct and Indirect Effects – Alternative 1

Surface Organic Matter

Surface organic matter may be influenced by the project. Biomass may be thinned through mastication. Depending on the market conditions at the time of implementation, biomass material may be treated with a combination of mechanical treatments (mastication), hand thinning or prescribed fire during the underburning operations. Masticated biomass chipped material would remain on site. Chipped material on the ground can decompose more rapidly. As decomposition increases, organic matter and nutrients are added more quickly to the soil. Soil temperature can increase from canopy reduction but soil moisture increases from the soil cover so decomposition rates will increase. With some soil incorporation of the masticated chips, decomposition will be accelerated along with the release of carbon dioxide. Important soils nutrients will be released faster (N, P, Ca, Mg, S etc.) and made for plant uptake and for increased microbial activity (Powers, 1983). Burning after mastication will further reduce fuels on the ground. There will be a short term N increase and nutrient release. Some wood may turn into char, which would increase water holding capacity. There will also be needle cast from surrounding trees to provide cover for the soil where fire does burn current litter and duff.

Prescribing burning in Elk Flat will burn off the dead vegetation, invasive encroaching conifers, and releases nutrients to the soil that are integral to plant growth which renews old decedent perennial grasses with negligible detrimental soil impacts. Meadow grasses are unaffected along with the soil by these low intensity fires as observed from the recent prescribed fire in Mud Creek Meadows in November 2013.

Underburning reduces surface slash and thins understory vegetation while releasing short-term nutrients for tree growth. Prescribed fires burn at low intensity and create a mosaic burn that is beneficial to soil fertility so long as they leave greater than 50% duff and fine litter. Moderate to high intensity underburns can destroy litter, duff, and intermediate trees reducing cover to less than 50%. When, underburning in large.

Recent prescribed fire effectiveness monitoring (Rust, 2013c) was conducted on Shasta Lake Northwood’s Community Protection Zone (CPZ) for prescribed fires of 2010, 2012, and 2013. Fuel treatments consisted of pile burning and broadcast burning in transition conifer/brush from the forest boundary along Packers Bay to O’Brien Mountain private homesteads. Northwood’s CPZ prescribed fires overall effect on the soil was minimal and after 1 year vegetative recovery was excellent compared to fall burned areas. Fall burned sites consumed most soil cover and duff, had loss of soil organic matter, and topsoil exposure was evident. Spring
burned sites had excellent cover, high levels of soil organic matter, and little loss of topsoil. In areas that burned low to moderately-low (prescribed fires in the spring), soils had excellent cover, intact topsoil, good organic matter, abundant seed source, adequate duff, and good structure showing how spring prescribed fire treatments reduce fuel loading and soil burning. This is due to soil being moist below the duff layer protecting critical soil organic matter and surface duff vs. fall burn when soil moisture conditions were dry (in spite of duff being moist).

Severely burned soils can reduce soil fertility and decreased biologic activity. Loss of organic matter through displacement decreases natural resiliency to disturbance, reduces nutrient cycling and availability, and all benefits associated with aggregation (tilth, porosity, bulk density, root penetration, etc.). Prescribed fire can increase available nitrogen for one to two years following fire (Choromanska, et al., 2002). Burning slash piles can create extremely high temperatures in concentrated areas, leading to volatilization of nitrogen, and loss of phosphorus and potassium (DeBano, 1991). If litter layers and organic matter are kept intact throughout the stand, nutrient losses are minimized from burning slash. Limitations on pile size in the machine piling units (see RPM 4 on p. 85) and low to moderate intensity prescribed fire resulting in a mosaic of burn intensities as prescribed (also see RPMS 19, 20, 24, 25, 26, 27, 29, 30), will minimize nutrient losses. Over all, with the protection measures in place and based on local observation for similar projects, surface organic matter will be preserved adequately to meet or exceed forest plan standards by maintaining a post implementation percent cover of litter and duff of approximately 60% and CWD of 5 to 35 tons per acre Forest Plan standards depending on the location. See also RPMs 11, 24, 26, 27, 40, 41, and 42 and SOPS 5 and 17 in Appendix C.

Compaction-Soil Porosity

Thinning will cause some soil disturbance of displacement, compaction, and rutting but levels of detrimental soil disturbance are generally low. Levels are moderate: less than 15% detrimental soil disturbance, 4 to 8% decrease in soil porosity, and a 14 to 17% increase in areal disturbance, not exceeding soil quality standard thresholds for erosion, compaction, churning, or displacement. For the adjacent Mudflow Project of 2012-3 soil disturbance was 42% undisturbed, 41% was light disturbance, and 17% was skid-trails with lightly disturbed areas having an average of 2.6% decrease in soil porosity (a 1 to 2 percent decrease in porosity over pre-harvest levels of 2 to 4 percent)and skid- trails having a 5.4% decrease in soil porosity. Given the above data it shows mechanical timber harvesting moderately compacts sandy soils (3 to 5% decrease in porosity) with a bigger footprint of soil disturbance (7 to 10% increase).

Research shows that moderate levels of compaction (less porosity) can be beneficial in sandy loam soils like McCloud Flats (Gomez, et al., 2002). They found that sandy loam soils have large macro-pores were compressed with moderate levels of compaction, available water holding capacity increased favoring tree growth.

Thinning around legacy trees where all vegetation will be 50 foot radial removed causing a slight increase in soil disturbance but still well below SQS thresholds. Similar impacts can be expected for aspen and oak release treatments. Compaction can decrease water infiltration rates, leading to increased overland flow and associated erosion causing sediment delivery to streams. Severe compaction decreases gas exchange, which in turn degrades sub-surface biological activity and above-ground forest vitality.

With the for-mentioned information, units 162, 164, 166, and 206 have detrimental disturbance levels above 10 percent mostly in existing landings and skid trails. These units with loamy soils (Germany) are more easily rutted and compacted especially during wet weather. The risk of exceeding standards are minimized by reusing existing skid trails, only operating during dry weather or frozen soil conditions, minimizing the sizes of landings, and rehabilitating sections of skid trails and landings. Mechanical harvesting operations only increase compaction by two to four percent due to better operations, equipment, and soil resource protection measures as shown by the Shasta-Trinity Monitoring. With the decompaction of units currently above
threshold, and the protection measures in place (SOPs for wet weather and following BMPs for soil protection) the entire project area is expected to meet the soil porosity standard of at least 90% of the natural porosity for the soil over at least 85% of the treatment unit.

(Soil effects specific to machine piling and temporary roads are discussed below in Effects Relative to Key Issues.)

**Soil Erosion and Displacement**

Units 6, 12, 13, 14, 16, 18, 110, and 208 are ponderosa pine plantations with varying degrees of windrowing or furrowing. Windrows will be redistributed in units 6 and 14 to increase soil productivity. Areas where windrow spacing was less than 60 feet (6, 12, 13, 14, 16, 110, and 208) tree height was less affected and DBH of trees showed little difference between interbay versus windrow trees.

Windrow respreading method has been used in several locations on the Shasta Trinity National Forest and the nearby Black Mountain Experimental Forest near the Elk Vegetation Management Project Area and has been found to be effective in restoring soil productivity.

Slopes in within the Elk project are gently sloping and with proposed treatments the likelihood of erosion occurring due to slopes are very low. The EHR post-implementation remains low. The WEPP model predicts soil losses of approximately 0.23 tons/acre. A No Action proposed treatment predicts a soil loss of approximately 0.12 tons/acre.

**Soil Resiliency**

Harvest and fuel operations that remove excessive biomass and site organic matter can affect nutrient cycling (see Table 65. Soil Resiliency Index Rating). Nutrients are lost during harvesting by removing the stored nutrients in trees, and additional nutrients are lost if the litter layer, duff, and woody debris is removed.

Whole-tree harvesting, as compared to conventional sawlog or thinning operations, extracts large amounts of biomass and nutrients, especially nutrient-rich foliage, from the site (see Table 65. Soil Resiliency Index Rating). The exact amount of nutrients lost from a particular site varies with forest types and particular site conditions (Grier, et al., 1989). The amount of nutrients present in the trees also varies with stand age and development of the humus layer (Grier, et al., 1989).

Data suggest that nutrient losses from whole-tree harvesting are greater when compared to conventional sawlog harvesting for all nutrients. Calcium losses are particularly large for whole-tree harvesting due to the high concentrations of calcium present in the wood fiber of twigs, branches, and boles (Adams, 1998) (Mann, et al., 1988). There is a general agreement of researchers that multiple bole only harvests would not deplete the soil of nutrients; however, multiple whole tree or biomass harvests have the potential to remove nutrients at a rate that has a high probability of leading to soil productivity decline within a few tree rotations (Wells, et al., 1979). The reduction in site nitrogen, phosphorous, potassium and calcium combined with short rotations (50-60 years) has a high probability of resulting in a measurable decline in site productivity (Miller, et al., 1989). Using longer rotations (such as 100 to 150 years) and less site biomass removed, such as thinning biomass prescriptions, the negative effects would be less.” Biomass thin “would remove approximately 2.9% of the sites nitrogen compared to 8.8% removed from a total biomass harvest (Miller, et al., 1989).

Indirect effects of soil nutrient loss on timber include reduced growth, yield, increased susceptibility to pathogens, such as root disease (Garrison, et al., 1998) (Garrison-Johnston, 2003) and insect infestation (Garrison-Johnston, 2003) (Garrison-Johnston, et al., 2004). Precipitation (Stark, 1979) and weathering of rocks would continue to make additional nutrients available on site, along with annual needle, leaf, and twig fall, forbs, and shrub mortality would continue to recycle nutrients as well in most units.

Since the majority of treatments are thinning, nutrient recruitment by litter-fall would mitigate most nutrient losses.
Effects relative to key issues

Soil Quality Standards

As noted above, operating when soils are dry or within the wet weather operations guidelines (see p. C-1), along with keeping piles free of soil and operating on residual slash will minimize impacts. As described above individually for organic matter, compaction, erosion and displacement, and resiliency, soil quality standards would be met on the entire project area. The units that are current over thresholds for SQS will have resource protection measures that will be followed in the Resource Protection Measure. In units currently over thresholds for porosity, skid trails 200 feet out from landings would be subsoiled; porosity should increase, improving soil productivity with progress towards meeting SQS (see RPM 14, p. 86). These resource protection measures will at a minimum sustain legacy levels and alleviate pre-existing conditions.

Machine Piling

Machine-piling slash in units when soils are dry (or frozen), following the wet weather operations guide (Appendix C SOPs), would not likely increase soil compaction in the meadow enhancement unit, but there is a risk of displacement. Machine piling may increase compaction to the extent described above under Compaction. Planned slash retention (5 to 35 tons/acre) would be in addition to duff and smaller surface organics that would remain in the unit.

Machine piling earned a reputation as a harmful practice on soils in the past, from the era where machine piling almost exclusively referred to site preparation for planting after a clearcut, and often occurring on moderately steep slopes. Impacts from tractor piling can be high if done improperly; it is estimated to add 2 percent detrimental soil disturbance as displacement to the activity units (Young, 2009). However, slash piling as practiced in the past no longer occurs on National Forest lands since the mid-1990s. Mechanical operations are limited to slopes less than 35%. Much smaller tractors equipped with a brush rake on the blade are used, which result is little to no topsoil displacement or compaction that would be of any detrimental degree.102 Piles are to be “clean” (without soil), which helps them burn properly. Tractor piling often takes place in thinned stands, so there is much less slash generated when compared to regenerated stands. Combined with whole tree yarding, the overall results are much less slash material being moved into piles, and much less equipment traffic on the soils compared to past practices.

Forest monitoring found machine pile and burning overall effects on the soil were minimal due to clean piles that lacked displaced soil (Rust, 2013b). Fall burning consumed most of the slash, and had minimal loss of soil organic matter and topsoil. Soil heating was 2 to 4 inches deep had high levels of soil organic matter, roots, low to moderate levels of compaction. The areal extent of tractor piling is limited to slash concentrations in much if not most of the areas that include machine piling. Some soil displacement may occur associated with equipment operations but this should be limited in extent due to flat topography and the spatially patchy distribution of activity generated slash. Slash (LWD) and litter/duff remaining on site will provide for soil cover, erosion control, and provides a source of nutrient supply over time. If done properly, machine piling is expected to meet soil quality standards.

---

101 Heavy slash accumulations were “straight-bladed” into piles, often also piling large amounts of topsoil into the piles (sometimes purposely, to reduce re-growth of sprouting species as competition for planted trees). This practice was eventually widely recognized as harmful to soil productivity, and one of a few practices that directly led to topsoil displacement standards incorporated in national and regional soil management direction from 1991 to 1995.

102 The Forest has a long track record of working directly with equipment operators to achieve minimal soil displacement or other soil impacts historically associated with this practice.
**Temporary Road and Landing Actions**

All developed roads (residence access, recreation, and vegetation management) built in the past have a lasting effect on soil productivity due to compaction and displacement however, FTS roads are not part of the soil resource.

Decommissioning approximately 6.4 miles of existing routes after use as temporary roads would improve previously impacted road beds. Although rehabilitation through decompression and/or recontouring cannot restore the roadbed to natural conditions, rehabilitation efforts initiate a long-term recovery process. Anticipated results would include improvements in hydrologic function.

The estimated construction and use of 2.9 miles of new temporary roads and landings will have a short-term impact to the soil resource. The creation of the temporary roads and landing will slow infiltration rates and could slow water flow patterns.

Proposed road maintenance of 17.9 miles includes culvert installation, blading, and brushing; with improved drainage and decreases erosion from water channeling down the road surface. For detailed information on roads, please see the transportation section (starting p. 234. While roads are not part of the soil resource, in the short-term, road reconstruction may have a slight impact to soils, with increased sedimentation, displacement of soil, or decreases infiltration. However, in the long-term road reconstruction will improve drainage, decrease soil erosion, and improve water flow.

**Cumulative Effects – Alternative 1**

Silvicultural treatments in unit 401 from the Pilgrim Vegetation Management Project, combined with Elk project underburning could have cumulative effects on soil productivity. Some nutrient recruitment by litter-fall would address nutrient losses. Detrimental soil disturbances from underburning is estimated to add an additional one percent (Rust, 2013c), which will still be within the soil quality standards, therefore the cumulative effect will not result in detrimental soil disturbance.

The active Bartle allotment overlaps with the Elk Project. Impacts of grazing to soil are limited to areas where the animals bed, lounge, trail, or access water. These areas are generally small in areal extent. Impacts include compaction, removal of groundcover, and displacement. Grazing will continue in the foreseeable future on these allotments. Generally, these small compacted areas are limited to the grassland portions of the project.

**Alternative 2 – No New Temporary Road Construction Other Than Required for Landing Access**

**Direct and Indirect Effects – Alternative 2**

Under Alternative 2, there will be no temporary roads (other than to access landings) and therefore, slightly less thinning activities (103 fewer unit acres) implemented to accomplish project goals in comparison to Alternative 1. There would be a slight decrease in acreage of disturbance versus alternative 1 due to less temporary roads (1.3 fewer miles) and landings (8 fewer landings of which none are new landings) and a slight decrease in thinning of natural stands and plantations, and approximately 58 fewer acres of potential machine piling.

No new adverse effects above Alternative 1 would likely result from this action Soil productivity and hydrologic function would be maintained by incorporating soil protection measures.

Under this alternative, soil cover standards would likely continue to be met along with coarse woody debris levels. As a result, EHR would likely remain low and soil nutrient cycles would be maintained. The predicted WEPP would be 0.20 tons/acre
**Effects relative to key issues**

This alternative would machine pile and burn an estimated 900 acres, and tree mortality pending, up to about 1,384 acres. New temporary road construction would drop from 2.9 miles in Alternative 1 to 1.6 miles in Alternative 3. Effects would be similar to Alternative 1, except on fewer acres.

**Cumulative Effects – Alternative 2**

Cumulative effects will be similar to Alternative 1 and because of the lack of adverse effects; the forest is likely to continue meeting the Forest Plan soil quality standards. By meeting soil quality standards, it is expected that desired conditions pertaining to the soil resource would be achieved.

**Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl**

**Direct and Indirect Effects – Alternative 3**

Under Alternative 3, there will be no treatment in Critical Habitat for NSO (with the exception of the thinning/other mechanical treatments in plantation units 7, 12, 13, 14, 208, part of 15, and part of 6). Therefore, there will be fewer acres of silvicultural treatment (270 fewer acres) implemented to accomplish project goals. There would be a decrease in acreage of disturbance in comparison to alternative 1 due to decrease in thinning of natural stands and fewer landings.

No new adverse effects above Alternative 1 would likely result from this action. Soil productivity and hydrologic function would be maintained by incorporating soil protection measures.

Under this alternative, soil cover standards would likely continue to be met along with coarse woody debris levels. As a result, erosion hazards would remain low and soil nutrient cycles would be maintained.

**Effects relative to key issues**

This alternative would machine pile and burn an estimated 879 acres, and tree mortality pending, up to about 1,363 acres. New temporary road construction would decrease from 2.9 miles in Alternative 1 to 1.5 miles in Alternative 3. Effects would be similar to Alternative 1, except on fewer acres (and fewer acres than Alternative 2).

**Cumulative Effects – Alternative 3**

The treatment for unit 401 is the same as Alternative 1. Because of the lack of adverse effects, the forest is likely to continue meeting the Forest Plan soil quality standards. By meeting the soil quality standards, it is expected that desired conditions pertaining to the soil resource would be achieved.

**Alternative 4 - No Action**

Under No Action, the proposed management activities would not be implemented. No direct, indirect, or cumulative effects are expected. Although there would be no actions undertaken with this alternative, ongoing trends would continue.

Under the no-action alternative, no silvicultural or fuel reduction treatments would be implemented. There would be no new disturbance resulting from forest management activities, and existing disturbance would persist. No new addition of detrimental compaction would occur and old skid trails would continue to recover at natural rates. Freeze-thaw processes, weathering, and soil biota would work slowly to break up compaction over time and vegetation would continue to re-establish on the existing infrastructure of trails. No new adverse effects would likely result from this action but in some locations, productivity potential in the short term may not be as high under this alternative as compared to the action alternatives because historic
disturbance would not be alleviated. Hydrologic function, such as soil drainage, would be maintained at existing rates.

Under the no-action alternative, the forest canopy would not be altered and organic material covering the soil would not be disturbed by management. Soil cover standards would likely continue to be met and the litter/duff layer would likely continue to thicken and increase in continuity. Coarse woody debris levels would also likely continue to increase. As a result, erosion hazards would likely remain low and soil nutrient cycles would be maintained.

The probability of a high-severity fire within the project area during a given timeframe is unpredictable. However, when a fire breaks out, the chances for high-severity fire effects on soils can be much higher in untreated areas with excessively heavy fuel loads compared to those that have been treated, including post-harvest logging slash (Certini, 2005), (Cram, et al., 2006), (Gorman, 2003), (Keane, et al., 2002).

A high-intensity wildfire would increase the potential for impacts to soils and soil productivity in severely burned areas, especially since the risk of soil erosion increases proportionally with fire intensity (Megahan, 1990). Other effects would include the potential loss of organics, loss of nutrients, and reduced water infiltration (Wells et al. 1979). Fires that create very high soil surface temperatures, particularly when soil moisture content is low, almost completely destroy soil microbial populations, woody debris, and the protective duff and litter layer over mineral soil (Hungerford, et al., 1991; Neary, et al., 2005). Nutrients stored in the organic layer (such as potassium and nitrogen) can also be lost or reduced through volatilization and as fly ash (DeBano, 1991; Amaranthus, et al., 1989).

**Cumulative Effects**

Since there are no direct or indirect effects with No Action Alternative 4 would result in no cumulative effects. Because of the lack of adverse effects, the forest is likely to continue meeting, or making progress toward Forest Plan soil quality standards. Not treating the project area could result in unknown effects on soil productivity in the event of a wildfire.

**Summary and Conclusions**

Table 66 displays the differences among the alternatives in relation to soil productivity. Alternative 3 would have the least impacts on soils followed by alternatives 1 and 2. All action alternatives will meet soil quality standards in the Forest Plan.

**Table 66. Comparison of Alternatives for Soil Productivity**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Alt 1 (proposed)</th>
<th>Alt 2 (no new rds.)</th>
<th>Alt 3 (no treat. NSO CHU)</th>
<th>Alt 4 (no action)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion Hazard Rating</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>WEPP(tons/acre) Soil Loss</td>
<td>0.23</td>
<td>0.20</td>
<td>0.18</td>
<td>0.12</td>
</tr>
<tr>
<td>Soil cover -litter &amp; duff (%)</td>
<td>60</td>
<td>65</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Resiliency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Litter Fall Mitigates Losses on Thinning Acres</td>
<td>60</td>
<td>65</td>
<td>75</td>
<td>N/A</td>
</tr>
</tbody>
</table>

---
Final Environmental Impact Statement

Shasta-McCloud Management Unit

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Alt 1 (proposed)</th>
<th>Alt 2 (no new rds.)</th>
<th>Alt 3 (no treat. NSO CHU)</th>
<th>Alt 4 (no action)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWD (logs/acre) (minimum, however RPMs may require more in specific locations)</td>
<td>&gt;5 in Matrix and Elk Flat Mdw. 6-10 in LSR</td>
<td>&gt;5 in Matrix and Elk Flat Mdw. 6-10 in LSR</td>
<td>&gt;5 in Matrix and Elk Flat Mdw. 6-15 in LSR</td>
<td>&gt;15</td>
</tr>
<tr>
<td>Compaction-Porosity (% of undisturbed)</td>
<td>Meets 90% Standard</td>
<td>Meets 90% Standard</td>
<td>Meets 90% Standard</td>
<td>4 Units do Not meet</td>
</tr>
</tbody>
</table>

**Key Issue**

- **Meets Soil Quality Standards (Forest Plan Appdx. O)**
  - All Units Meet 90% Porosity Standard
  - All Units Meet 90% Porosity Standard
  - All Units Meet 90% Porosity Standard
  - 4 units do not meet standard

- **Machine Piling (acres)**
  - Up to 1,461
  - Up to 1,402
  - Up to 1,365
  - 0

- **New Temporary Road Construction (miles)**
  - 2.9
  - 1.6
  - 1.5
  - 0

**Purpose and Need for Action**

- **Decommissioned Existing UA Routes (miles)**
  - 6.4
  - 6.4
  - 6.4
  - 0

- **Windrow Respreading**
  - 2 units
  - 2 units
  - 2 units
  - 0 units

**Surface Organic Matter**

Retention of soil cover (litter and duff) is higher with Alternatives 2 and 3 over Alternative 1 due to less harvesting, or no underburning in the case of some units under Alternative 3. With less harvest for Alternatives 2 and 3, less soil displacement would occur.

Overall, the intensity of harvesting and fuel reduction activities for most units will minimize any adverse effects on soil cover or nutrient cycling. Some units will be near soil quality standard thresholds and will require the use of the resource protections to keep them below thresholds. The use of existing skid trails and landings minimizes areal effects in addition to these previously disturbed acres. As a result, cover and organic matter standards would be met. Soil protection standard operating procedures and RPMs and natural processes will also address current shortfalls in coarse woody debris in some plantations through development of increased large woody debris recruitment into the future through accelerated development.

**Compaction-Soil Porosity**

Reusing old skid trails, logging on dry soils or frozen soils in the meadow enhancement treatment unit, or elsewhere in compliance with the wet weather operations guide in remaining units, will serve the project goals of avoiding new detrimental disturbance and adverse cumulative effects. Decommissioning would focus on major skid trails and landings, especially in units with high amounts of old harvest routes that have resulted in relatively high levels of compaction. Less-traveled trails would be excluded since they are not expected to have detrimental levels of compaction. Where compaction is above porosity standards, sub-soiling will effectively relieve most of the compaction. Recommended sub-soiling would be 18 inches deep and only occur on high traffic skid trails and on landings in units that are over soil quality standard thresholds. Where skid trails would be sub-soiled there should be an adequate overstory that would encourage trees to seed in post-harvest. Where only low to moderate compaction exists, leaving soils intact is more desirable. The net effect is that the proposed management alternatives will not introduce any meaningful degree of new compaction such that soil productivity would not be significantly reduced under any action alternative.

**Soil Erosion and Displacement**

Erosion modeling (WEPP and EHR methods) for all alternatives show low levels of erosion due to flat landscapes and more than adequate soil cover remaining after treatment. Current levels of soil disturbance for the Elk project on the average across all units is 15% (topsoil displacement or skid-trails) with 6% decrease in
soil porosity (less than 10% detrimental compaction threshold). Anticipated increase in soil disturbance due to mechanical thinning is 10% with an additional 3% decrease in soil porosity.

Alternative 4 (no treatment) would keep erosion low with, no new compaction or soil disturbance, but canopy cover levels would increase to unhealthy levels that pose fire risks and increased outbreaks of diseases and insects. In the event of a high intensity wildfire under these conditions, soils would be more likely to be severely impacted than under the action alternatives.

**Soil Resiliency**

This area has a high level of productivity and recovery potential if soils are left intact. Soil resiliency index (Table 65 and (Rust, et al., 2015 p. App. B)) shows that Germany soils have a high resiliency index where Shasta soils have a moderately high resiliency index. These ratings show Elk project soils have the ability to resist degradation from disturbance. The indications are that the sites have a very high growth potential based on the field observations. The site potential, together with other soil indicators being met, leads to the conclusion that the sites have a very high resiliency to soil disturbance, and it is not expected that soil productivity would be adversely affected in the long-term.

**Machine Piling**

Anticipated increase in soil disturbance by mastication or underburning will be 1% and 2% and for machine pile and burning 2% to 3% (Rust, et al., 2015 p. App. C). Units that are over soil quality standard thresholds will be mitigated by subsoiling, windrow respreading, or woody debris retention. Alternative 3 has less thinning units (270 acres), less machine piling, less underburning, and less mastication versus Alternative 1. Alternative 2 also has slightly less thinning units, less machine piling, and less mastication than Alternative 1.

**Effects relative to Purpose and Need for Action**

By implementing the soil resource protection measures in chapter 2, and following standard operating procedures described in Appendix C, all action alternatives in the Elk project will meet or exceed the Forest Plan soil quality standards, maintaining soil productivity in support of healthy forests. In particular, soil productivity will be restored in the previously windrowed units that would be respreads, accelerating development of late-successional characteristics to help meet Purpose and Need #2 in those units. Unauthorized routes (6.4 miles) will be decommissioned allowing soil decompaction and return to a natural condition.

**Compliance with law, regulation and policy**

There will be less than 15 percent of any unit in a non-productive state, adequate cover shall minimize erosion, added slash and maintenance of the duff layer shall maintain soil biological process, soil fertility, and ultimately soil productivity. Impacts to soil productivity will stay below thresholds and will therefore meet provisions in the National Forest Management Act. Soil and slope will not be irreversibly damaged.

**Transportation**

**Introduction**

A transportation report (Bonivert, 2015) and a project travel analysis process (TAP) (Bonivert, 2015a) were completed for this project and are incorporated by reference. Portions of the road analysis process completed for the Pilgrim project overlap the Elk project area and that document is incorporated as well (Huhtala, 2005). Information relevant to this decision is summarized here.

In addition to effects on the FTS, this analysis incorporates transportation-related features that are not part of the FTS including the use of unauthorized routes as temporary roads and newly constructed temporary roads and landings. Chapter 1 introduces the existing and desired condition relating to transportation. Appendix A,
starting on page A-33, describes site specific road actions including actions pertaining to the unauthorized routes and newly constructed temporary roads. Table Appendix A-5 provides road actions by alternative and road number and Table Appendix A-6 provides estimated temporary road needs by treatment unit. Chapter 2 provides summaries by Alternative (see Table 10, Table 15, and Table 20 for Alternatives 1, 2, and 3) and in comparison form (see Table 25, p. 82).

Purpose and Need Applicable to Transportation

Purpose and Need #6, National Forest Transportation System (FTS) Management and Decommissioning of Unauthorized Routes pertains to transportation. A need exists to increase FTS efficiency and provide access to a dispersed recreation area in Elk Flat. The Transportation Analysis Process (TAP) completed for the project recommends an approximately 0.10 miles of existing unauthorized route that is currently utilized as public access to a dispersed recreation area in Elk Flat should be added to the FTS as an open level 2 road to provide legal motorized access (Bonivert, 2015a). A need exists to remove several unauthorized routes in the project area from the landscape for restoration to a more natural condition.

Issues Applicable to Transportation

Issue #2, expressing the concern that road construction directly harms forest health and wildlife and results in long-term impacts to soil health and productivity, pertains to transportation. This issue applies to the Temporary roads that will be constructed to access landings, since no new FTS roads are proposed to be constructed for the project.

Methodology

Effects to the transportation system are determined by the existing conditions, the occurrence of past travel management activities, the proposed actions and transportation specific assumptions. Effects to individual roads, the transportation system in the project area and to a limited extent the Forest transportation system are considered. Effects to individual roadways can vary depending on the maintenance level, site conditions, traffic volumes, weather and extraordinary events. Field verification is conducted to review the effects of comparable recent and past travel management activities to the activities of the proposed action.

Transportation Specific Assumptions

1. The roads used for the project will be maintained with the project. Road maintenance consists of grading, resurfacing, culvert cleaning, hazard tree removal, snow plowing, clearing roadside brush and slide removal.
2. Traffic volumes in the assessment area will largely remain the same, increase or decrease slightly to meet resource demands.
3. Roads scheduled for maintenance level 1 will be closed to vehicular traffic.
4. State law regulating motor vehicle drivers sets the standard of care for the safety of themselves and other users of the FTS.
5. Roads not shown on the Forest Motor Vehicle Use Map (MVUM) are closed to vehicular access regardless of field conditions.

Information Sources

The information used for this analysis was collected from 36 CFR 212, 36 CFR 220, FSM 7700, the Forest Plan, site reconnaissance, relevant roads analyses, and consultation with other resource specialists. All distance figures are approximate values based on the Forest Transportation atlas and INFRA database and are limited to the accuracy of those sources, which includes measurements from GIS, GPS, field instruments and...
aerial photography. Mileages have been updated throughout the planning process as better information has been made available and may change slightly with additional field verification and project implementation.

Incomplete and Unavailable Information
Road maintenance beyond project implementation is dependent on Forest funding and may not occur every year, however it is assumed that it will be conducted to a level and interval that a minimum will allow the continued use of roads designated to be open. Unauthorized route use, the occurrence of cross country travel and the purposes of these activities can only be speculated considering the evidence of a motorized vehicle and known uses of areas, based on season and specialist experience. Landing locations and temporary road alignments are determined by the implementation contractor with approval by the Forest Service, the approximate locations used for analysis were determined by the location of past landing locations, specialist consultation and specialist experience.

Indicators and Measures
Table 67summarizes the indicators and measures used to analyze and disclose effects to the Forest Transportation System (FTS), UA routes, temporary roads, as they pertain to the transportation system, the relevant key issue, and the Purpose and Need for Action A discussion follows the table providing rationale for each indicator and measure.

Table 67. Transportation Resource Indicators and Measures for Assessing Effects

<table>
<thead>
<tr>
<th>Resource Element</th>
<th>Indicator</th>
<th>Measure</th>
<th>P&amp;N, Key Issue, or Resource Effect</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Safety</td>
<td>Road Conditions</td>
<td>Miles of roads maintained to standard, or reconstructed to standard</td>
<td>Resource</td>
<td>Forest Plan (p.4.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Miles of UA routes decommissioned</td>
<td>Resource, Key Issue #2 &quot;c&quot;</td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>Open FTS Road Density</td>
<td>FTS open road density changes (mi./sq. mi.)</td>
<td>P&amp;N #6</td>
<td>Forest Plan (p.4.16)</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Changes to FTS</td>
<td>Total road density changes (mi./sq. mi.), Changes to road MTC levels</td>
<td>Resource, Key Issue #2 indicator &quot;b&quot;</td>
<td>Forest Plan (p.4.16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changes to maintenance costs</td>
<td>Resource</td>
<td></td>
</tr>
<tr>
<td>Public Issue</td>
<td>New Temporary Road</td>
<td>Miles of new temporary road construction</td>
<td>Key Issue #2 indicator &quot;a&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion of Indicators and Measures

Public Safety - Road Conditions

*Miles of Maintained Road and Miles of Reconstructed Road*

Road maintenance, reconstruction and closures may improve road user conditions and safety in the project area. Reconstruction will improve roads to current design and safety standards. Road maintenance will ensure roads stay in appropriately safe conditions. Closure is part of the maintenance regime for ML-1 roads. Closed roads are not maintained at a level suitable for safe motor vehicle travel. Open roads increase accessibility for emergency response and may decrease response times.
Miles of Unauthorized Routes

Unauthorized routes are existing roads on the forest that are not open to vehicular traffic or managed as part of the FTS. Prohibition of motorized travel of unauthorized routes and cross-country travel has been established by Federal Regulation under the Forest’s Motorized Travel Management (MTM) Record of Decision (ROD) (USDA-FS, 2010a). Unauthorized routes are not designated for vehicle travel on the MVUM but may appear to be an open road. Without a barrier, these routes can be used unintentionally by uninformed drivers. Unauthorized routes added to the system will be improved and/or maintained to FTS standards designed to address safety concerns. Decommissioning unauthorized routes protects other resources and prevents vehicles from leaving designated open roads and improves user conditions and safety in the project area.

General Accessibility - Changes to Open FTS Road Density

Changes to the FTS may increase or decrease the amount of NFS land readily accessible by motorized vehicle. Road access facilitates all activities on the forest to some degree, including roaded recreation, OHV use, dispersed camping, hiking, hunting, and fuel wood collection. These activities may be enhanced or reduced depending on the changes to the open road density.

Open road density only includes FTS roads that are open to vehicle use as designated on the Forest Motor Vehicle Use Map (MVUM). There is no standard threshold for acceptable road density on the Forest, but a road density of two to four miles per square mile is generally considered acceptable, with a preference for lower road densities in LSR.

FTS Efficiency – Changes to FTS

Changes to the FTS may increase or decrease the amount of NFS land readily accessible for management activities on the Forest. Road additions may increase management capabilities and maintenance costs.

Total FTS Road Density Changes (miles per square mile)

Total road density is a general measure of open and closed roads in the project area that are available for future management activities. Future management activities may be more or less feasible depending upon road access.

Changes to Road Maintenance Levels

Maintenance levels can indicate an approximate average cost of maintenance per mile in order to determine if future management costs may be higher or lower with changes to the FTS. Roads closures are typically included in a project for resource protection, cost-efficiency and to reduce open road density. Closed roads are considered to be in intermittent service, with lower annual maintenance costs, to be made available for resource management as needed and closed again. The Travel Management regulations at 36 CFR 212.54 provide for revision of designations as needed to meet changing conditions, including the potential to add new routes.

FTS Efficiency – Temporary Road Construction, Landings and Skid Trails

The use of temporary roads facilitates management access in place of permanent system roads where off road management access methods, such as log skidding, are limited. Temporary roads provide access to landings and allow the landings to be farther from the FTS road to meet .25-mile log skidding limitations. Landings are better suited away from the FTS roads and allow roads to remain open to the public during implementation. Skidding logs farther than .25 miles can create a skid trail that is more damaging than a temporary road and the farther a landing is from a FTS road, the more beneficial it is to have a temporary road. When comparing the effects of skidding logs along the ground to conveying logs on a rubber tired log truck along a temporary road, the use of a temporary road is preferred and required to meet Best Management Practices (listed starting
Another consideration is that one log truck can carry the equivalent of several skidding trips, reducing trips required for removal.

**Key Issue Indicators**

Key Issue #2 indicator “b” is addressed above in total road density, and “c” is addressed in unauthorized routes decommissioned.

**Miles of New Temporary Road Construction**

Temporary roads connect harvest areas and FTS roads to landings. Unauthorized routes are utilized when available and can be used to protect resources. Key Issue #2 indicator “a” - miles of new temporary road construction, compares alternatives in response to the Key Issue expressing concern for road construction. (The project does not propose new FTS road construction).

**Boundaries**

To determine relevant past, present, and foreseeable future projects, spatial and temporal boundaries must be defined (CFR § 220.4 (f)). For the effects analysis the direct and indirect effects of the Elk project relative to transportation are conditions influencing road conditions and management designation.

**Spatial Bounding**

Spatially, the conditions influencing roads and management designation (e.g. user accessibility, drainage functionality, road density) in the project affects the transportation system. As such, the spatial context being considered is the project boundary. This is because this represents the approximate area potentially influenced by effects from the proposed road actions and treatment activities.

**Temporal Bounding**

The temporal context being considered is activities five years into the future; five years is approximately how long it is expected that the project activities and related traffic would affect road conditions and how long proposed project related treatments would affect temporary road use.

The baseline year used for this analysis is 2014 for the existing condition. In this analysis, the description of the existing condition includes the accumulation of past activities, which have influenced road conditions and unauthorized routes. The current environmental conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and are a proxy for the impacts of past actions. Cumulative effects are discussed as changes in the existing condition due to present and future activities, including the effects of the alternative being discussed.

**Affected Environment**

**Existing Condition**

The project area has a long history of timber management, including the site of a historic mill. Evidence of past management activities include FTS Roads and unauthorized routes. Unauthorized routes are existing roads on the forest that are not open to vehicular traffic or managed as part of the FTS. The existing FTS provides access to old landing locations, plantations and adjacent private inholdings.

The FTS roads include approximately 4 miles of arterial roads and 11 miles of local roads that that receive regular traffic and use. The FTS was developed over time to meet a variety of needs in the area including timber management, fuel treatment, access to private inholdings, fire control, utility management, special uses

---

103 This approach is consistent with CFR § 220.4 (f) and the Council on Environmental Quality June 24, 2005 memorandum regarding analysis of past actions.
management, special forest products collection and recreation. Approximately eight miles of road in the project area are under cost share agreements. The Pilgrim Creek Road (FA13) and the Military Pass Road (FA19) provide the main access to and beyond the project area. Table 68 displays the existing FTS road system by maintenance level and functional class.

**Table 68. Existing FTS Roads by Maintenance Level and Functional Class**

<table>
<thead>
<tr>
<th>Maintenance Level</th>
<th>Existing Miles of FTS Road</th>
<th>Functional Class</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1</strong> - Intermittent service roads closed to vehicular traffic but open for non-motorized uses. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to facilitate future management activities. While being maintained at level 1, roads are closed to vehicular traffic.</td>
<td>3.69</td>
<td>Local (Closed)</td>
</tr>
<tr>
<td><strong>Level 2</strong> - Open for use by high-clearance vehicles.</td>
<td>10.63</td>
<td>Local (Open)</td>
</tr>
<tr>
<td><strong>Level 3</strong> - Open and maintained for travel by a prudent driver in a standard passenger car. Some roads may be fully surfaced with either native or processed material.</td>
<td>2.34</td>
<td>Arterial</td>
</tr>
<tr>
<td><strong>Level 4</strong> - Provide a moderate degree of user comfort and convenience at moderate travel speeds. Most are double lane and aggregate surfaced, some paved or dust abated.</td>
<td>1.98</td>
<td>Arterial</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18.64</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Public Safety - Road Conditions**

*Miles of Maintained Road*

Road conditions in the project area are generally good with some isolated deteriorating areas and naturally blocked segments. Past road maintenance activities in the project area have included project specific maintenance activities, utility access, and commercial use maintenance. Higher road maintenance levels (maintenance level-3 and -4) are in better condition, and require less annual maintenance, attributable to a more durable road surfacing, such as asphalt or rock. Maintenance Level-2 roads can vary widely in condition and surfacing and are intended only for high clearance vehicles. Typically, open FTS roads can be considered to be in useable condition and safe for the intended use by a prudent driver. Roads that pass through the Extensive Mortality Areas are considered unsafe to drive through although fallen trees on the roadway are likely to discourage most users.

*Miles of Unauthorized Routes*

There are approximately 6.5 miles of unauthorized routes in the project area. Most of these routes appear to have been created for management access at some point in the past or user created. Most of the unauthorized routes are near a suitable condition for project use as a temporary road.

**General Accessibility – Open FTS Road Density**

The project area contains approximately 15 miles of open FTS roads with an approximate open road density of 2.72 miles per square mile.

**FTS Efficiency - Total FTS Road Density**

The project area contains approximately 18.64 total miles of FTS roads with an approximate total road density of 3.39 miles per square mile.
FTS Road Maintenance Levels

Refer to the table below for current miles of roads by maintenance level.

Temporary roads, Landings and Skid Trails

Existing unauthorized routes may be used as temporary roads. Landings are not a part of the FTS, but are features needed to transfer harvested materials for hauling. Currently the project area has approximately 67 landing locations evident from past activities. Some of these would be available for use under the action alternatives; however, not all would be considered useable due to resource concerns or location. Size of landings varies typically between ¼ and ¾ acres. Skid trails are not part of the FTS but where a landing location is reused it is likely past skid trail locations may be discernable and reused.

Key Issue Indicators

Key Issue #2 indicator “b” is addressed in total road density in FTS efficiency above. Indicator “c” is addressed in Public Safety UA routes above.

Environmental Consequences

Alternative 1- Modified Proposed Action

Direct Effects

Public Safety - Road Conditions

Miles of Maintained Road and Miles of Reconstructed Road

Project generated road maintenance will improve road conditions and roads used for the project should be in optimal condition for their intended maintenance level. With approximately 18 miles of roads maintained over the life of the project and 0.27 miles of reconstruction road conditions would be improved compared to the existing condition.

Miles of Unauthorized Routes

Unauthorized routes, while previously closed via the MVUM only, would now be signed and/or physically blocked, providing an engineered solution to prevent unauthorized and unintentional access. Additionally, field conditions would more accurately reflect the MVUM, increasing MVUM reliability for navigation. Miles of inventoried UA routes in the project area would drop from 6.5 to 0.

General Accessibility - Changes to Open FTS Road Density

Open road density in the project area will increase slightly, from 2.72 to 2.74 miles per square mile, with the addition of 0.10 miles of road to the FTS within the Matrix allocation. A slight increase in road density reflects an increase in general accessibility. Open road density in the LSR would remain the same. Maintenance Level-1 roads needed for the project are currently closed. All 2.86 miles of currently closed ML-1 roads would be opened for the project, and then closed again at completion resulting in no additional closed FTS roads.

FTS Efficiency – Changes to FTS

Total FTS Road Density Changes (miles per square mile)

Total road density would increase, from 3.39 miles per square mile to 3.41 miles per square mile, due to the addition of 0.10 miles of road to the FTS in the matrix allocation. The density in LSR would remain the same.
Changes to Road Maintenance Levels

Maintenance Level 2 road mileage will increase from 10.63 to 10.73 miles in the project area. The change is from the addition of the 0.10-mile segment at Elk Flat in the matrix allocation. No other FTS roads change maintenance level. Cost efficiency will generally remain the same or increase insignificantly given the short distance of the road addition.

Temporary Roads, Landings and Skid Trails

Alternative 1 requires an estimated 2.9 miles of new temporary road construction. Temporary roads would be decommissioned at the close of the project and would not affect the FTS. As displayed in Table 10, Alternative 1 makes use of approximately 38 existing landings and requires construction of approximately 40 new landings. Landings for the Elk project would be up to approximately ¾-acre each. All landings would be decommissioned at the end of the project and do not affect the FTS.

Key Issue Indicators

Key Issue #2 indicator “a” is addressed in Temporary roads, landings and skid trails in FTS efficiency above. Indicator “b” is addressed in total road density in FTS efficiency above Indicator “c” is addressed in Public Safety UA routes above.

Indirect Effects

Public Safety - Road Conditions

Road conditions can change frequently with each season, especially when considering native surfaced roads. Any open roads can generally be considered to be in useable condition and safe for the intended use. Roads maintained for the project will be in good condition and can be considered to provide better conditions for safe use compared to a road that has not been recently maintained. Overall, road user risk will decrease with improved road conditions. Beyond road conditions, state law regulating motor vehicle drivers sets the standard of care for the safety of themselves and other users of the FTS.

Miles of Unauthorized Routes

With approximately 6.4 miles of unauthorized routes blocked and decommissioned, unmanaged access will be prevented over a large portion of the project area.

General Accessibility - Changes to Open FTS Road Density

The addition of .10 miles of road will increase access slightly. This may allow a slight increase of other activities, such as recreational use and dispersed camping; however, this road was already used regularly as an unauthorized route for these recreation activities.

FTS Efficiency – Changes to FTS

Total FTS Road Density Changes (miles per square mile)

The slight increase in total road density has the same indirect effects as the changes in open road density since the 0.10 mile increase is in a maintenance level 2 road.

Changes to Road Maintenance Levels

Annual maintenance costs will generally remain the same given the short distance of the road addition in maintenance level 2.
Temporary Roads, Landings and Skid Trails

The new temporary road construction is unlikely to cause an indirect effect because they would be decommissioned and blocked at the close of the project. Landings and skid trails would have no indirect effect on the transportation system and are not part of the FTS.

Key Issue Indicators

Key Issue #2 indicator “b” is addressed in total road density in FTS efficiency above. Indicator “c” is addressed in Public Safety UA routes above.

Cumulative Effects – Alternative 1

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

The Project cumulative effects worksheet was developed by ID Team inputs. Those projects relevant to transportation were included in the cumulative effects analysis.

The direct and indirect effects of the proposed action when combined with past, present and reasonably foreseeable activities will result in a more effective and better maintained transportation system throughout the entire project boundary.

Road maintenance from past project activities and cost share maintenance has resulted in many miles of roads that are currently in good condition. Ongoing and/or future activities that may influence transportation include road maintenance, hazard tree abatement, road closures and other actions associated with previously approved projects. Recently conducted transportation management actions in the project area include the implementation of 3.12 miles of road closures from the Pilgrim Vegetation and Fuels management Project, reducing open road density to the current condition. Approximately .22 miles of NFS roads were decommissioned in the project area from the Pilgrim Vegetation and Fuels management Project. Recreational use and transportation needs for the area may remain the same or increase slightly with population growth and economic conditions. Resource management use of the transportation system can be expected to continue. The Military Pass Road and Pilgrim Creek Road will remain an important arterial route to the Forest, the public and the timber industry.

There are no other actions currently occurring or planned within the analysis area that contribute to or appreciably contribute to the transportation system in the project area.

The direct and indirect effects of the proposed action when combined with past, present and reasonable foreseeable activities will not significantly impact the Forest Transportation System.

Alternative 2- No New Temporary Road Construction Other Than Those Required for Landing Access

Direct, Indirect, and Cumulative Effects

Direct and Indirect effects under Alternative 2 would be the same as Alternative 1 except for those effects of new temporary road construction and decommissioning, and landing construction. Alternative 2 would decrease new temporary road construction by 1.3 miles for a total of 1.6 miles of new temporary road, to serve as landing access from the FTS road system. Temporary roads mileages are reduced in units 402, 152-1, 154, 18 and 163 where the units were reduced. 6.4 miles of existing unauthorized routes would still be used as temporary roads and decommissioned at the close of the project. Nine fewer landings would be needed (eight fewer existing and one fewer new landing) than in Alternative 1. The effects would be the same but over this correspondingly smaller footprint. Cumulative effects would be the same as Alternative 1.
Alternative 3 - No Treatments of Natural Stands within Designated Critical Habitat for the Northern Spotted Owl

Direct, Indirect and Cumulative Effects

Direct and indirect effects under Alternative 3 would be the same as Alternative 1 except for those effects of new temporary road construction and decommissioning, landing construction, and 0.5 fewer miles of FTS road maintenance. Alternative 3 would decrease new temporary road construction by 1.4 miles for a total of 1.5 miles of new temporary road, to serve as landing access from the FTS road system. All of the decrease is in unit 402, meadow enhancement, because the units in NSO Critical Habitat, that drop out of this alternative, are accessed by existing Unauthorized Route in Alternative 1, not new temporary roads. One mile of existing unauthorized routes would still be used as temporary roads and decommissioned at the close of the project. Sixteen fewer landings would be needed (9 fewer existing and 7 fewer new landings) than in Alternative 1. The effects would be the same but over this correspondingly smaller footprint. Cumulative effects would be the same as Alternative 1 except the 0.5 fewer miles would decrease beneficial cumulative effects very slightly.

Alternative 4 - No Action

Under No Action, the proposed management activities would not be implemented. No direct, indirect, or cumulative effects are expected. Although there would be no actions undertaken with this alternative, ongoing trends would continue. The 44 landings currently in the project area would not be actively decommissioned. Current management and ongoing activities, as permitted under NEPA may include road maintenance, hazard tree felling, wood-cutting, and over-snow vehicle use associated with the Pilgrim Creek Snowmobile Park, dispersed recreation (e.g., sightseeing, hunting), forest products collection and other permitted special uses. No treatments or road actions would be implemented to accomplish the purpose and need and project resource objectives. Road maintenance would likely only occur as funding allowed or as needed by cost share partners.

Summary and Conclusions

Table 69 summarizes the effects by alternative and resource and key issue indicator. All action alternatives will include beneficial road management actions to meet purpose and need #6 and will not significantly impact the Forest Transportation System. All action alternatives contribute to improved road conditions. Alternative 1 involves the most new temporary road construction (2.9 miles compared to Alternatives 2 and 3, at 1.6 and 1.5 miles).

Table 69. Summary comparison of environmental effects

<table>
<thead>
<tr>
<th>Resource Indicator/Measure</th>
<th>Alt 1: Modified Proposed Action</th>
<th>Alt 2: No New Temp Road Construction</th>
<th>Alt 3: No Treatment of Natural Stands in CHU</th>
<th>Alt 4: No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Safety – Road Conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roads Maintained or Reconstructed to Standard (miles)</td>
<td>17.92 miles maintained/0.27 miles reconstructed</td>
<td>17.92 miles maintained/0.27 miles reconstructed</td>
<td>17.42 miles maintained/0.27 miles reconstructed</td>
<td>0</td>
</tr>
<tr>
<td>UA Routes Decommissioned* (miles)</td>
<td>6.4</td>
<td>6.4</td>
<td>6.4</td>
<td>0</td>
</tr>
<tr>
<td>General Accessibility – Open FTS Road Density</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open FTS Road Density (mi/ sq. mi.)</td>
<td>Increase from 2.72 to 2.74</td>
<td>Increase from 2.72 to 2.74</td>
<td>Increase from 2.72 to 2.74</td>
<td>2.72</td>
</tr>
<tr>
<td>FTS Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Elk LSR Enhancement Project

<table>
<thead>
<tr>
<th>Resource Indicator/Measure</th>
<th>Alt 1: Modified Proposed Action</th>
<th>Alt 2: No New Temp Road Construction</th>
<th>Alt 3: No Treatment of Natural Stands in CHU</th>
<th>Alt 4: No Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Road Density Changes* (mi./sq. mi.)</td>
<td>Increase from 3.39 to 3.41</td>
<td>Increase from 3.39 to 3.41</td>
<td>Increase from 3.39 to 3.41</td>
<td>No Change</td>
</tr>
<tr>
<td>Changes to Road MLS (miles)</td>
<td>Increase of ML 2 from 10.63 to 10.73</td>
<td>Increase of ML 2 from 10.63 to 10.73</td>
<td>Increase of ML 2 from 10.63 to 10.73</td>
<td>No Change</td>
</tr>
<tr>
<td>Changes to Maintenance Costs</td>
<td>0.10 miles added = slight increase</td>
<td>0.10 miles added = slight increase</td>
<td>0.10 miles added = slight increase</td>
<td>No Change</td>
</tr>
</tbody>
</table>

**Key Issue #2***

| Miles of New Temporary Road Construction* | 2.9 | 1.6 | 1.5 | 0 |

*Key Issue #2 indicators

**Effects relative to Purpose and Need for Action**

Under all action alternatives, the addition of the .10 mile road to access a dispersed recreation site near Elk Flat will provide motorized access for recreational use. The decommissioning of over 6 miles of unauthorized routes in the project area will inhibit unauthorized cross county travel and allow restoration to a more natural condition. All action alternatives meet Purpose and Need #6. No Action would leave the dispersed recreation site at Elk Flat without authorized access and leave 6.4 miles of unauthorized routes physically open.

**Effects relative to key issues**

Key Issue #2 indicators relative to transportation show the following by alternative:

- a. Miles of new temporary road construction –
  Alternative 1 has the most at 2.9 miles, followed by Alternatives 2 and 3 at 1.6 and 1.5 miles. The additional 0.2 miles in Alternative 1 is all located in unit 402, meadow enhancement. Unit 402 is partially in LSR and partially in Matrix.
- b. Total open road density post-implementation in comparison to No Action – Increases slightly in all alternatives due to addition of 0.1 miles in matrix area.
- c. Miles of existing route decommissioning – All action alternatives decommission 6.4 miles.

No new NFS roads are proposed to be constructed for the project. Temporary roads will be decommissioned and will have no effect on the FTS. Decommissioning will discourage unauthorized vehicular access, and the temporary roads would revegetate. Alternative 1 would have 0.2 additional miles of new temporary road construction and decommissioning over the other action alternatives; a difference that is limited to unit 402.

**Other resource effects**

All three action alternatives use existing and new landings. Alternative 1 uses the most, followed by Alternative 3, then Alternative 2. All landings in each action alternative would be decommissioned. The no action alternative would leave 44 existing landings.

**Compliance with law, regulation and policy (includes Forest Plan under NFMA)**

The transportation report provides a summary of the legal framework pertaining to transportation. The project complies with all requirements and meets Forest plans forest-wide goal #8 to manage the Forests Transportation system and goal #9 to provide and maintain administrative facilities (p.4.4) using applicable standards and guidelines in the Forest plan (p.4.16).
Cultural Resources

A Cultural Resources Report (Schmidt, 2016) was completed for this project and is incorporated by reference. Information relevant to this decision is summarized here.

Introduction

The purpose of the cultural resources analysis is to identify historic properties potentially affected by the proposed project, assess the effects of the project, and seek ways to avoid, minimize, or mitigate adverse effects. For the purpose of this analysis, the term “historic properties” includes historic properties as defined in 36CFR§800.16(l) as well as areas of Native American significance that may not otherwise meet the definition for “historic properties.” Archaeological sites that are not eligible to the National Register of Historic Places (NRHP) are not included as “historic properties.”

Purpose and Need Applicable to Cultural Resources

There are no Purpose and Needs identified specific to Cultural Resources.

Issues Applicable to Cultural Resources

There are no Key Issues relative to cultural resources.

Methodology

Identification of cultural resources was completed through background research, field survey, and Tribal consultation. The effects of the project on cultural resources was determined through site visits, Determinations of Eligibility, Tribal consultation, communication with other interested individuals and groups, consultation with the State Historic Preservation Office (SHPO), and the development of site-specific resource protection measures designed to avoid adverse effects on historic properties. This analysis summarizes the results.

Prior to the field survey, records and references were reviewed to determine the extent and quality of previous archaeological surveys in the vicinity and the locations of known archaeological sites and other cultural resources within or adjacent to the project boundary. Lidar imagery, historic maps, and other documentation were reviewed to ensure cultural resources were sufficiently identified. Field survey was then conducted to locate additional cultural resources that may not have been previously identified.

Once the cultural resources were identified, each site was visited to update the documentation, assess the current condition, and determine the resource protection measures necessary for each site. All cultural resources were visited to ensure documentation is updated and to complete Determinations of Eligibility to further refine the list of historic properties that are eligible to or unevaluated for the NRHP.

Indicators and Measures

The following indicators were used to assess effects to historic properties:

1. Is the proposed project the type of activity that could affect historic properties, if such properties were present?
2. Does this project have the potential to cause adverse effects on historic properties?
3. Can adverse direct or indirect effects to historic properties be avoided or minimized through Resource Protection Measures?
4. Provided the Resource Protection Measures are implemented, will this project result in “no historic properties affected;” “no adverse effect;” or an “adverse effect” to historic properties?
Boundaries
To determine relevant past, present, and foreseeable future projects, spatial and temporal boundaries must be defined (CFR § 220.4 (f)). This is determined by how long, and how far reaching direct and indirect effects of a project are felt on a given resource area.

Spatial Bounding
The cultural resources “Area of Potential Effects” (APE) is the geographic area within which the project may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The cultural resources APE for the Elk Flat LSR Enhancement project encompasses the locations of project activities including mechanical cutting and hand thinning units, landings, roads identified for maintenance, improvements, decommissioning, and closure, prescribed underburning and machine pile burning locations, hazard tree abatement areas, areas of traditional or ceremonial use by Native Americans, and other areas of Native American significance or concern. Historic properties adjacent to the project boundary are included in the APE when they could potentially be affected by nearby project activities— including effects from noise, smoke, dust, and setting changes.

Temporal Bounding
The temporal context being considered is the duration of project activities, which is projected to occur until 2021 for initial activities and every 5 to 10 years for two additional entries of underburning. The baseline year used for the existing condition of this analysis is 2015. In this analysis, the description of the existing condition includes the accumulation of past activities that may have affected historic properties, The current environmental conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and are a proxy for the impacts of past actions.104

Field Results
No previously unrecorded sites were located during the field survey. One historic site was evaluated for eligibility to the National Register of Historic Places (NRHP) and all six of the historic McCloud River Lumber Company (MRLC) railroad grades were assessed to determine whether they contribute to the integrity of the historic MRLC district. Resource protection measures are designed in consultation with, and during communication with Tribes and the SHPO to ensure that adverse effects to historic properties will be avoided.

Tribal Coordination
In accordance with 36 CFR § 800.3(f) and Section 106 of the National Historic Preservation Act, Native American consultation was conducted. A formal consultation letter was mailed to the Redding Rancheria on 2/22/2013. The Redding Rancheria did not respond. A formal consultation letter was mailed to the Pit River Tribe on 2/22/2013. Additional consultation occurred with the Pit River Tribe at quarterly council meetings, field trips, and other meetings with individual practitioners and cultural representatives (4/26/2005, 8/12/2009, 8/4/2010, 7/20/2012, 8/28/2012, 11/30/2011, 3/30/2012, 11/7/2012, 2/6/2013, 8/1/2013, 6/20/2014, 11/16/2015, 12/10/2015). A draft cultural resources report and effects analysis were sent to the Pit River Tribe for consideration on 12/3/2015. No response has been received. A scoping letter was mailed to the Winnemem Wintu Tribe on 2/22/2013. Additional correspondence took place with Winnemem cultural representatives in the field and through email communication (7/26/2012, 9/13/2012, 3/20/2013, 4/19/2013, 4/4/2014, 4/8/2014). A draft cultural resources report and effects analysis were sent to the Winnemem Wintu for consideration on 3/4/2015 and again on 6/10/2015. These documents were also sent via email on

104 This approach is consistent with CFR § 220.4 (f) and the Council on Environmental Quality June 24, 2005 memorandum regarding analysis of past actions.
6/29/2015. The Forest received a copy of the 2/29/2016 letter from the Winnemem Wintu Tribe addressed to the State Historic Preservation Officer (SHPO) and interpreted this letter as a comment on the project.

**Affected Environment**

**Historic Properties**

There are two documented historic archaeological sites within the APE. One site is an historic saw mill related to early railroad logging that is eligible for the National Register of Historic Places (NRHP) and is thus considered an historic property. One site might have been an early trapper’s cabin, but the cabin is reduced to a decomposing pile of boards and the entire site has deteriorated to a point that the time of construction, use, and function cannot be determined. This site is ineligible to the NRHP and therefore will not be considered an historic property.

In addition to the above sites, there is an historic road (the original Military Pass Road, which does not overlay the current road of the same name) extending through the APE that is eligible for the NRHP and thus is considered an historic property. The APE also encompasses remnants of five historic railroad logging grades utilized by the McCloud River Lumber Company (MRLC) that date to 1899-1905. The MRLC railroad logging system is eligible to the NRHP, however, these railroad spurs are non-contributing features because they don’t retain the physical evidence necessary to supplement the historic record during the period of significance (1896 to 1930). There is no remaining physical evidence of the other two MRLC railroad logging grades that historically extended through the APE. Non-contributing railroad features are not considered historic properties.

There are two prehistoric lithic reduction sites in the APE. These have not been evaluated for the NRHP and thus will be treated as historic properties.

**Environmental Consequences**

**Alternatives-Alternatives 1, 2, and 3**

**Direct and Indirect Effects**

An adverse direct or indirect effect would occur if the proposed project activities altered any of the characteristics of an historic property that would qualify it for inclusion in the NRHP in a way that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association (36 CFR § 800.5(a)(1)). Adverse effects to historic properties are outlined in 36 CFR § 800.5 and include physical destruction of the property, alteration that is inconsistent with the Secretary of the Interior’s Standard (36 CFR § 68), relocation of the property, changes in the character of the property’s use or physical features, the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property’s significant historic features, neglect resulting in deterioration, or the transfer, lease, or sale out of Federal ownership without adequate protections.

The proposed project consists of the types of treatment activities that have the potential to affect historic properties unless there are resource protection measures in place. Specifically, physical damage or destruction, changes in a property’s use or physical features, and visual, atmospheric, or audible intrusions might result from activities associated with mechanical thinning, reforestation, underburning, and/or the proposed road work. Design features consist of avoiding historic properties during treatment activities with the exception of possibly removing fuels by hand from the edges of site boundaries. Resource Protection Measures have been developed to provide site-specific protection from the range of proposed treatment activities. Due to the design features and Resource Protection Measures, there will be no adverse direct or indirect effects to historic properties.
Cumulative Effects Alternatives 1, 2, and 3

Although there may be other projects that spatially and temporally overlap the Area of Potential Effect for the Elk Flat LSR Enhancement project, the lack of adverse direct and indirect effects means that there are also no adverse cumulative effects to archaeological historic properties or areas of Native American cultural importance.

Compliance with Law, Regulation and Policy
The National Historic Preservation Act of 1966 and Executive Order 11593 of May 15, 1971 require stewardship, maintenance and preservation of cultural properties for future generations. The American Indian Religious Freedom Act of 1978 and Executive Order 13007 of May 24, 1996 require agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of sacred sites. In consideration of the management and protection measures identified for cultural resources located within the project APE, this project will have no adverse effect on historic properties and will be in compliance with the National Historic Preservation Act (and 36 CFR Part 800), Executive Order 11593, The American Indian Religious Freedom Act, and Executive Order 13007.

Forest Plan
As outlined in the Forest Land and Resource Management Plan, the identification, management and protection of archaeological, historical, and religious sites is addressed in Forest Standards and Guidelines and in Heritage Resource Management allocations (Prescription XI) where needed. This project complies with the Forest Plan. Cultural resources were inventoried and evaluated, resource protection measures were developed and adverse effects will be avoided during implementation.

36 CFR Part 800
As addressed in 36 CFR § 800.8, the Section 106 requirements of this project are being fulfilled in coordination with the NEPA process.

Region 5 Programmatic Agreement
Resource Protection Measures were developed using Appendix E of the Programmatic Agreement Among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic properties by the National Forests of the Pacific Southwest Region (R5 PA).

Alternative 4 - No Action

Direct and Indirect Effects
Under the No Action alternative, the proposed project activities would not be implemented. No direct or indirect effects to cultural resources would be expected. Although there would be no actions undertaken with this alternative, ongoing trends would continue.

Cumulative Effects
Since there are no direct or indirect effects expected with the No Action alternative, there would also be no cumulative effects. Trends described under no action for Silviculture and Forest Health and Fire and Fuels would continue.
Summary and Conclusions

Although the proposed project is comprised of the types of activities that have the potential to directly or indirectly affect historic properties, the effects will be avoided through project design and the specific resource protection measures described in Chapter 2 (“RPMs Common to All Action Alternatives”) and Appendix C (“Standard Operating Procedures and Best Management Practices”). Provided these measures are implemented, the project will result in no direct or indirect adverse effects to historic properties. (See RPMs 1and RPMs 2, and SOP numbers 3 and 4 pp.C-1-C-1). The Cultural Resources Report was submitted to the State Historic Preservation Office (SHPO) on 2/3/2016. Additional information was submitted per request on 3/22/2016. The SHPO concurred with the findings and determinations on 4/6/2016, including the finding that pursuant to 36 CFR § 800.5(b), through the use of standard protection measures, no adverse effects to historic properties will result from the project.

Socio-Economics

A Socio-Economics Report (Glubczynski, 2016) was completed for this project and is incorporated by reference. Information relevant to this decision is summarized here.

Introduction

This section provides an assessment of the economic implications of the Elk project. An analysis of the existing conditions provides a baseline for comparing the effects of the action alternatives. The Affected Environment section presents the demographic, social and economic variables that describe the current state of the economic and social environment. This is followed by the environmental consequences section which estimates the actual impacts to local economic and social conditions.

Purpose and Need Applicable to Socio-Economics

The purpose and need statement that is related in part to socio-economics is the need to manage the Forest Transportation System. Changes to the Forest Transportation System affect public access to Forest lands.

Methodology

Economic Effects Methodology

According to Forest Service Manual (FSM) 1970.62, the analysis should implement “techniques to develop the most efficient combination of activities for each decision unit within each alternative.” Given the information provided, financial efficiency measures are calculated in this analysis to provide a means of comparing the economic feasibility across alternatives. The alternatives are analyzed and compared using the Quicksilver program to estimate the Benefit-Cost ratios and the Present Net Values (PNVs). Quicksilver is a financial analysis tool developed by the USDA Forest Service to generate measures of financial efficiency. A 5-year planning horizon is used in this analysis; activities would begin in fiscal year 2017 and end in fiscal year 2021.

Economic Impact Analysis

Economic impact analysis looks at the effects of the project alternatives on employment and income in the study area. The relative size of the local economy plays an important role in the assessment of impacts on jobs and income. Broader and more diverse economies in larger communities are likely to be more resilient to changes in jobs and income than smaller, more rural communities. For example, a change of 10 jobs in the city of Redding (Shasta County, population ~91,000) would likely have very little impact on the overall health of the local economy. However, that same change in jobs could have a much larger impact on the small town of McCloud (Siskiyou County, population ~1,100).
Implementing a project can result in economic stimulus to a region, by changing the total level of jobs and income in the area (logging companies, sawmills, biomass generation plants), increased demand for related products and services, and indirectly affecting the spending habits from individual households due to increased income.

**Social Effects Methodology**

**Social Impact Analysis**
The social impact analysis looks at the effects of the project action alternatives on public activities on the Forest. The availability of the Forest for activities such as recreation, collecting forest products primarily for personal use, foraging for food resources, and socializing is important to the local community for maintaining residents’ lifestyles and honoring historic uses. The social impact analysis also looks at labor and employment opportunities generated by the action alternatives.

**Indicators and Measures**
The indicators used for comparing the economic effects of the action alternatives are:

**Present Net Value** - Present Net Value (PNV) is the standard criterion for deciding whether a project is economically justifiable (OMB Circular A-94). PNV is a way of comparing all monetarily valued costs and benefits. It is calculated by subtracting the discounted sum of total costs from the discounted sum of total benefits. Benefits and costs occurring in the future are discounted back to represent their current value. A Federally prescribed discount rate of 4% is used in this analysis (FSM 1971.21). A positive PNV means that the discounted sum of benefits is greater than the discounted sum of costs, and vice versa. Due to the uncertainty of future inflation, the inflation rate is left at zero for the analysis (OMB Circular A-4).

**Benefit/Cost Ratio** - The relationship between benefits and costs is further assessed with the benefit-cost ratios. Benefit-cost ratio is the discounted sum of benefits divided by the discounted sum of costs. A ratio greater than one suggests that the benefits associated with the project are greater than the costs. Benefit-cost ratios do not allow an assessment of the aggregate value of benefits associated with a project alternative. The alternative with the highest benefit-cost ratio has the highest value of benefits compared to the associated costs, but does not necessarily have the greatest value of benefits at the aggregate level. Benefit-cost ratios are often utilized in situations when a budget constraint is present (i.e. choose the alternative with the highest ratio up to a certain level of total costs). PNV provides a better measure of the overall level of benefits and costs since it reports the difference between benefits and costs at the aggregate level.

The indicator used for social effects is:

**Access and Safety** - Changes in Public Access and Relative Safety of the Access influences community use of the forest. Changes are assessed in miles of legal public access in the project area, along with specific locations accessed, and changes to current hazards along those access routes.

**Boundaries**

**Spatial Bounding**
The spatial area for analyzing the economic effects of the Elk project is the area encompassed by Siskiyou and Shasta Counties. Other than contributing to jobs and income in processing facilities that may receive materials from this project, the economic effects of the Elk project would be felt primarily in southern Siskiyou and northern Shasta Counties. The social effects of community use are limited to the project area.

**Temporal Bounding**
The temporal bounding for analysis is the 5-year implementation period, because it is during this period that the project would be affecting the local economy by providing jobs and income. Other present and reasonably foreseeable natural resource extraction and restoration projects in southern Siskiyou/northern Shasta Counties during this period will also provide jobs and income, and contribute to the local economy.

**Affected Environment**

Fundamental components of the economic and social environment for this analysis are population, demographics, jobs and income, and local community uses of the Forest. Understanding the conditions and trends of such variables allows for a more complete assessment of the social and economic dynamic as it pertains to National Forest use. Population, age and racial distributions of Siskiyou County are important socio-economic indicators for determining possible uses of forest resources by local residents.

This section highlights demographic trends in the analysis area. Population levels influence the use of natural resources, while rate of growth indicates whether there may be the potential for increased pressures on those resources in the future. Age distributions provide insights into the economic dynamic of the study area in terms of assessing the proportion of individuals in the working age group versus retirees and minors who typically have different use patterns on forests and utilize local services in different ways. Similarly, the racial composition of the study area may affect the cultural and heritage uses of public lands, as well as having implications for the Environmental Justice section below. Employment and income statistics describe the economic conditions of the analysis area, as well as aid in the identification of important sectors of the economy. The Elk project would likely affect various sectors in different ways. For example, increases in recreational use would affect businesses in the recreation and tourism sector differently than businesses in the logging sector.

**Population and Demographics**

Population is an important consideration in managing forest resources. In particular, population structure (size, composition, density, etc.) and population dynamics (how the structure changes over time) are “essential to describing the effects and consequences of forest management and planning on a social environment” (Seesholtz, et al., 2004). This section highlights population trends in the analysis area. Growth rates help predict what the population levels may be in the future. These numbers help to indicate whether there is the potential for increased pressures for uses and recreational opportunities on the project area. Population increases may lead to conflicts over forest uses, recreation activities, and values; these are conflicts that Forest Service managers have to contend with and attempt to balance when making resource management decisions.

The County has maintained a relatively stable population in recent years. The most noticeable change was negative growth between 2008 and 2010. Several factors can lead to a decrease in population, however most out-migrations occur due to a change in employment conditions.

Forest management may also influence population growth. Forests offer a wide range of recreational and subsistence opportunities. Access to those opportunities could be a deciding factor in where people choose to live. In addition, the production aspects of forest resources could draw labor to the area, and thus influence local populations.

People moving to an area due to an increase in the demand for labor is referred to as job-led growth, and has been common in areas where recent technological advancements have created more jobs than local unemployment rates can support. This has not been the case in Siskiyou County in recent years.

Likewise, natural amenities have attracted people to live near forest boundaries in order to have easy access for recreational purposes. Such changes in population are referred to as amenity lead growth, and have been common in communities located near National Forest System lands. In prior years, the study area experienced
amenity led growth in the form of retirees relocating from more metropolitan areas, and people searching for smaller communities in which to raise their families. However, that trend appears to have subsided due to national economic conditions. When conditions improve, it is likely that Siskiyou County will once again experience new population growth.

Age distributions also influence use of National Forests. Different age groups are likely to participate in different natural resource based activities. The median age in each county is higher than the median age of the state. This suggests that residents of the study area are older than residents in more metropolitan areas of California. This could be due to a possible lack of adequate higher educational and job opportunities in the area to draw a younger demographic.

Likewise, there may also be a greater influence from retirees. The economic structure of the communities must evolve to meet the demands of its residents. In areas with a large retiree influence, this may mean enhancing service based industries. However, given the current economic environment, it is unlikely that major changes to infrastructure and services will occur near the project area.

The vast majority of local residents are Caucasian (white, 87.1%). As a whole, California is much more ethnically diverse than Siskiyou County. California’s population is 59.8% Caucasian. Nearly 36% of California’s population comes from a Hispanic origin, whereas in Siskiyou County it is only 7.6%. In general, the Native American population has a much higher presence in the county than in the state as a whole; it is the second most populous race in Siskiyou County at 3.9%.

Employment and Income

Employment and income statistics are important indicators of economic health. In recent years, the study area has mirrored the national trend in higher unemployment following the 2008 financial crisis. Table 70 reports the percent change in employment levels from the previous year over the period 2002 to 2010.

<table>
<thead>
<tr>
<th>Location</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siskiyou County</td>
<td>-0.8%</td>
<td>-0.1%</td>
<td>-0.5%</td>
<td>-2.1%</td>
<td>2.0%</td>
<td>-0.6%</td>
<td>-3.1%</td>
<td>-4.0%</td>
<td>-3.3%</td>
</tr>
<tr>
<td>California</td>
<td>-1.0%</td>
<td>-0.2%</td>
<td>1.0%</td>
<td>1.9%</td>
<td>1.8%</td>
<td>0.9%</td>
<td>-3.2%</td>
<td>-5.2%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

Source: [www.bls.gov](http://www.bls.gov)

It is particularly important to consider the impact to employment in remote areas where jobs supported by the affected resources may consist of a large portion of total employment. Such areas may not be as resilient to a certain loss in jobs as a more metropolitan area. For example, a loss of 100 jobs in a certain sector in Siskiyou County is likely to have a more devastating effect on the local economy than the same loss of jobs in a more populated and economically diverse county, where the local economy is likely to be better positioned to absorb the loss in employment in one sector with job opportunities in other sectors.

Retail trade, health and social services, and government support the largest percentage of jobs in Siskiyou County. As the population continues to evolve there will likely be a transition in economic base. For example, as the population ages and if more retirees move into the area, there will likely be an expansion in health and social services. Overall natural resource based industries are not a major contributor to employment. Agriculture, forestry, fishing, and hunting account for 6.6% of total jobs in Siskiyou County. However retail, accommodation, food service and entertainment/recreation sectors total 23%. Retail, accommodation, food service and entertainment/recreation are assumed to include National Forest related recreation and tourism at least in part.
Another important indicator of economic health is the unemployment rate. Siskiyou County has consistently maintained an unemployment rate near or greater than the state average in recent years. In the period 2002 through 2012, Siskiyou County has had a high presence of unemployment, consistently experiencing rates above 8% since 2002. As jobs are created in a region, labor comes from two primary sources: local unemployment and in-migration of households. With the higher unemployment rates in the analysis area, it is likely that any new demands for labor would be supplied from the local labor market; assuming that qualified individuals reside there. Thus, any additional jobs created by the Elk project would likely not affect household migration patterns, and may serve to reduce unemployment rates.

Household income is another indicator of economic health. Income available to local residents directly impacts their ability to purchase goods and services, including those related to activities taking place on National Forests. Per capita personal income is $26,874 in Siskiyou County. Labor income remains the primary source of income. Half of the total income in Siskiyou County is generated by transfer payments and investments. Siskiyou County also has a high poverty rate, and it is likely that a high proportion of income is derived from public assistance sources.

Local Community Use of the Forest
The Elk project area is approximately nine miles from the community of McCloud. Public comments and anecdotal evidence indicate that local residents have a relationship with the National Forest that includes recreational activities (dispersed camping, hiking, horseback riding, mountain biking, Off Highway Vehicle (OHV and OSV) riding), use of forest products such as edible mushrooms (including boletes, morels and chanterelles), edible plants (including strawberries, currents and gooseberries), game hunting, and fuelwood gathering. The Bartle range cattle allotment overlays the project with about 10% of the allotment area within the project area. The local Native American community also has a special relationship with certain areas within and near the project area. Native American use of the project area is discussed in the Environmental Justice section.

Over 200 commercial and personal mushroom collection permits (maximum limit of 20 pounds for personal and up to 150 pounds for commercial permits) were issued out of the McCloud and Mt. Shasta Ranger Station offices in 2015. These permits included mushroom hunting areas throughout the McCloud Flats from Highway 89 and Pilgrim Creek Road to Medicine Lake, including areas outside the project area.

The existing Forest Transportation System roads and provide access to adjacent private inholdings, recreational activities, and forest products. The project area contains approximately 19 miles of open Forest Transportation System roads, including approximately 4 miles of arterial roads and 15 miles of local roads that receive regular traffic and use. The Pilgrim Creek Snowmobile Park is just outside the project area on the Pilgrim Creek Road, and groomed snowmobile trails pass through the project area. The area also contains numerous unauthorized (user-created, not part of the Forest Transportation System) routes. While the routes may be physically accessible by motor vehicle, they are not included on the motor vehicle use map and therefore illegal for motorized use. Currently legal access to a dispersed recreation site on the edge of Elk Flat is not provided on the MVUM, despite a long term use unauthorized route extending 1/10th of a mile to the site. Additionally, many of the areas accessed by the transportation system are experiencing high levels of mortality, creating higher than typical risk from falling snags. The roads most affected are mapped in the Hazard Reduction treatment areas on the Alternative 1 map. The extensive mortality area in the vicinity of 206 has experienced extremely high mortality with corresponding increased hazard.

Environmental Consequences

Alternatives 1, 2, and 3 – Action Alternatives

Direct and Indirect Effects
### Project Costs and Benefits/Contributions to the Local Economy

Table 71 presents the costs and benefits derived from implementing any of the three action alternatives.

#### Table 71. Cost Benefit Matrix Cost Description

| Activity | Unit Cost (2010$) | Alternative 1 | | Alternative 2 | | Alternative 3 | | Est. FY |
|----------|------------------|---------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Planning/Prep/Admin (CCF) | $30 | 43,900 | $1,317,000 | 41,600 | $1,248,000 | 37,600 | $1,128,000 | 2016 |
| Stump to Truck (Saw-Timber and Biomass Harvest (CCF)) | $75 | 43,900 | $3,292,500 | 41,600 | $3,120,000 | 37,600 | $2,820,000 | 2017, 18, 19 |
| Sawlog Haul Costs (Assume 45 Miles to Mill) (CCF) | $50 | 43,900 | $2,195,000 | 41,600 | $2,080,000 | 37,600 | $1,880,000 | 2017, 18, 19 |
| Landing Plus Skid Trail Subsoiling (Per Landing, ¾ acre ea.) | $157 | 14 | $2,198 | 14 | $2,198 | 14 | $2,198 | 2021 |
| Site Prep-Mechanical | $350 | 269 | $94,150 | 266 | $93,100 | 269 | $94,150 | 2020 |
| Reforestation Planting (includes seedlings) (acres) | #400 | 313 | $125,200 | 309 | $123,600 | 304 | $121,600 | 2020 |
| Reforestation Survival Exam (1st Year) (acres) | $17 | 313 | $5,321 | 309 | $5,253 | 304 | $5,168 | 2021 |
| Reforestation Survival Exam (3rd Year) (acres) | $19 | 313 | $5,947 | 309 | $5,871 | 304 | $5,776 | 2023 |
| Reforestation Survival Exam (5th Year) (acres) | $21 | 313 | $6,573 | 309 | $6,489 | 304 | $6,384 | 2025 |
| Post Planting Hand Release (acres) | $375 | 313 | $117,375 | 309 | $115,875 | 304 | $114,000 | 2023 |
| Unauthorized Routes Decommissioned (miles) | $5,000 | 6.4 | $32,000 | 6.4 | $32,000 | 6.4 | $32,000 | 2021 |
| New Temporary Roads Decommissioned (miles) | $5,000 | 2.9 | $14,500 | 1.6 | $8,000 | 1.5 | $7,500 | 2021 |
| NFS Road Closures – Berms (miles) | $1,000 | 2.9 | $2,900 | 2.9 | $2,900 | 2.9 | $2,900 | 2021 |
| New Temporary Road Construction (miles) | $5,000 | 2.9 | $14,500 | 1.6 | $8,000 | 1.5 | $7,500 | 2017 |
| NFS Road Reconstruction (miles) | $5,000 | 0.3 | $1,500 | 0.3 | $1,500 | 0.3 | $1,500 | 2017 |
| Maintain System Roads (miles) | $2,000 | 17.6 | $35,200 | 17.6 | $35,200 | 16.9 | $33,800 | 2017 |
| Fuels Treatment-Machine Pile (acres) | $260 | 1,461 | $379,860 | 1,402 | $364,520 | 1,365 | $354,900 | 2020 |
| Fuels Treatment-Burn Piles/Burn Landings (acres) | $150 | 1,541 | $231,150 | 1,453 | $217,950 | 1,434 | $215,100 | 2020 |
| Fuels Treatment – Underburning (acres) | $350 | 3,482 | $1,218,700 | 3,482 | $1,218,700 | 2,961 | $1,036,350 | 2020 |
| Fire Line Construction (miles) | $100 | 9.3 | $930 | 9.3 | $930 | 10.1 | $1,010 | 2020 |
| **Total Project Costs** | | | | | | | | **$9,088,504** | **$8,684,086** | **$7,874,836** |
| **Estimated Project Revenue (Log Delivered Price)** | | | | | | | **$160** | **43,900** | **$7,024,000** | **41,600** | **$6,656,000** | **37,600** | **$6,016,000** | 2017, 18, 19 |
The action alternatives would involve a combination of commercial thinning and ecosystem restoration to meet the purpose and need of the project. These activities would impact economic conditions in a variety of ways. Direct and indirect effects on the economic environment are addressed through a quantitative assessment of the financial and industrial components of the alternative. Financial efficiency and economic impact analyses provide the basis for estimating the PNV of monetizable benefits and costs, and levels of jobs and income contributed to the local economy.

The PNVs and benefit-cost ratios of the action alternatives are listed in Table 72. When discounted back to today's dollars, the monetary costs of the project for all the action alternatives are much greater than the monetary benefits. Of the 3 action alternatives, Alternative 2 has the highest PNV, at -$1,956,841. Alternative 3 has the lowest PNV at -$2,057,097. Benefit/cost ratios are all less than one (0.71 to 0.75), confirming that the monetary costs associated with the project are greater than the monetary benefits.

Table 72 displays the Present Net Value and the benefit/Cost ratios of the action alternatives.

**Table 72. Present Net Values and Benefit/Cost Ratios of Action Alternatives**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>PNV</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
<td>-$1,999,896</td>
<td>0.75</td>
</tr>
<tr>
<td>Alternative 2</td>
<td>-$1,956,841</td>
<td>0.74</td>
</tr>
<tr>
<td>Alternative 3</td>
<td>-$2,057,097</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Note that the PNVs and benefit/cost ratios only take into account benefits from the commercial timber harvest element of the project. They do not take into account funding to accomplish the project that may come from sources other than commercial timber harvest.

Only monetary benefits and costs are accounted for in the financial efficiency analysis. Values that are not included are those that cannot be accurately measured through currency. Estimating the value of benefits and costs not accounted for in the market place is outside the scope of this analysis. But these non-market benefits may include improved ecosystem health, increase in wildlife, and reduced threat of wildfire, etc.; and the costs may include reduced recreational values and scenic quality. Thus, the financial measures reported in this document should be considered along with any other social and ecological impacts resulting from the management activities.

**Social Effects to Local Communities/Forest Use, Employment**

**Employment**

In addition to the financial implications of these alternatives, management activities would require human labor to be completed. This would affect the level of jobs and income in the study area. Jobs and income would be generated directly from the industries performing the tasks, as well as indirectly from the inter-industry purchasing habits and household expenditure patterns of the directly affected industries and employees. All of the action alternatives would introduce new employment and income to the study area that would not occur under the no-action alternative.

**Forest Use**

Decommissioning will reduce the number of miles unauthorized routes physically available for vehicular use in the project area, and will reduce vehicular access to some areas used for recreational activities, forest products/food collection, and hunting. However, it should be noted that the routes being decommissioned are unauthorized routes that are not on the Forest MVUM. These roads are not legally open to vehicles, even if
they are physically accessible. While closing roads and routes will reduce the number of miles physically accessible by vehicles, decommissioning unauthorized routes would not affect the number of miles of FTS roads available for vehicular use. Maintenance level 1 FTS roads are currently closed consistent with the storage management for ML-1 roads, will be reopened for the project, then closed once the project implementation is complete. Closed roads would still be accessible for non-vehicular uses but not for vehicular use. The addition of 0.10 miles of road in Matrix to the Forest Transportation System as a maintenance level-2 road will ensure access to a portion of the project area to public users by vehicle; non-vehicular access would not be affected. The hazard reduction treatment along key roads as well as the extensive mortality treatment will reduce, but not eliminate, risk from falling trees. These effects will be the same across action alternatives, as the alternatives all propose the same number of miles of decommissioning of unauthorized routes, and addition to the Forest Transportation System.

Portions of the project area will not be available for public use during implementation activities, for public safety reasons, but will be available again once implementation is complete. Forest stand treatments may temporarily affect habitat for edible mushrooms and other edible plants, and so could affect mushroom and plant availability. However, with Resource Protection Measures in place to protect and/or improve habitat, mushroom and plant availability and harvesting is not likely to be affected, long-term. Snowmobile trails may be temporarily reduced to one lane if winter hauling is necessary.

Mushroom hunting outside the project area will not be affected by project implementation. Access to portions of the Elk project area for mushroom hunting may be temporarily limited during project implementation activities. However, since project activities are typically done in specific areas in stages, it is unlikely that access to the entire project area would be limited all at one time. Where boletus habitat is treated in Elk Flat, some impacts are expected. Elsewhere where there is limited or light duff and soil disturbance and inter-tree competition is reduced, residual trees are expected to increase in growth resulting in benefits to ectomycorrhizal fungi as more sugars and other nutrients are made available. An increase in boletus habitat is expected with improved gathering opportunities. Morels are another important mushroom gathered in the spring. Thinning and underburning will improve habitat for morel mushrooms and increase gathering opportunities.

The availability of game for hunting in the project area may be reduced during implementation activities due to noise and other disturbances, as game is likely to move out of the area temporarily. Game for hunting would still be available outside the areas undergoing treatment/disturbance, and would be expected return to those areas after activities are complete.

The project would not interfere with management of the range allotment (Wenham, 2015). A marginal increase in forage would be expected for 10 to 20 years. The nearest water trough is 2.5 miles from the project area so the marginal increase in forage would constitute a slight increase in transitory forage, with range condition and use remaining substantially the same in no action versus the action alternatives.

Effects relative to Purpose and Need for Action

There are no elements in the project purpose and need that are related to the economic or social environments, other than the need to manage the National Forest Transportation System (addition of a portion of an unauthorized route to the system to access a known dispersed camping area). All three action alternatives will have the same effect of providing legal access for the dispersed recreation area.

Cumulative Effects

A “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7).
Cumulative effects include the total change in economic conditions that would result from any of these alternatives in conjunction with the direct and indirect effects of other present and reasonably foreseeable natural resource related activities. Estimates of the impacts associated with other projects are not readily available; however, on the margin, it is expected that they will support additional jobs and income in a similar fashion to the Elk Project. In general, the cumulative effects area has low population density, a large proportion of the population is in the working age group, and unemployment rates are higher than state averages. Thus, new jobs would likely be filled by unemployed residents. This should contribute to reduced unemployment rates and increased resident incomes. Cumulative effects should continue to positively influence employment and income. Due to the higher unemployment rates, it is not expected that those effects will change household migration patterns; therefore the population base should remain unaffected.

Other present, or foreseeable future projects on either Forest or private land are unlikely to affect public access to the Elk project area. They will not affect habitat or the presence of mushrooms or edible plants in the project area, although if other projects adversely affect the presence of mushrooms or edible plants or habitat in their areas, it could have the cumulative effect of resulting in heavier foraging in the Elk project area. Additionally other projects, while active, could increase the presence of game species of wildlife within the Elk project area as game would be moving temporarily out of areas of disturbance.

Alternative 4 - No Action

Under this alternative no project activities would be carried out in the Elk project area. This alternative provides a baseline by which all action alternatives are analyzed for environmental effects.

Direct and Indirect Effects

There would be no direct or indirect effects on the economic or social environments if no actions were to take place. Any change in conditions would occur as a natural progression of social and economic activities and would occur regardless of this decision.

Cumulative Effects

Given that there are no measurable direct and indirect effects that would occur under the no action alternative, there would also be no measurable cumulative effects.

Summary and Conclusions

All three action alternatives will have negative PNVs and benefit/cost ratios less than one. It is expected that the monetary costs associated with the project will be greater than the monetary benefits. The project will produce jobs and income for local residents, regardless of the action alternative. There may be minor temporary effects to public access for recreation, forest products and food gathering, hunting, and social activities. Treatments would reduce hazardous conditions along key roads in the project area. Legal access to the dispersed recreation area on Elk Flat would be gained. Long term effects would be minimal or none.

Effects relative to Purpose and Need for Action

There are no elements in the project purpose and need that are related to the economic or social environments, other than the need to manage the National Forest Transportation System (addition of a portion of an unauthorized route to the system to access a known dispersed camping area). All three action alternatives will have the same effect of providing legal access to the dispersed recreation site at Elk Flat.
Other Required Disclosures

**Short-term Uses and Long-term Productivity**

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Under the Multiple-Use Sustained Yield Act and the National Forest Management Action, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting of timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if long-term soil productivity is maintained through application of resource protection measures described in chapter 2 and the Standard Operating Procedures and Best Management Practices in Appendix C.

Short-term use (two to five years during treatment operations) for the Elk Flat LSR Enhancement Project would remove forest products and generate revenue for the Federal and State government. Treatment activities and resulting forest products would directly support jobs in the forest products and management industry. Existing roads would be used to access the treatment units during the timeframe for treatments. When treatments have been completed road use would return to the status quo on most roads.

There would be a short-term loss of soil productivity on areas dedicated to landings (up to approximately 58 acres for Alternative 1, 53 acres for Alternative 2, and 47 acres for Alternative 3). Of these estimates, some of these needs are provided by existing landings in the project area. Currently approximately 50 acres in landings exist in the project area, some of which would be used in the action alternatives. Soil in all treatment units in all action alternatives would meet Forest Plan soil quality standards with implementation, and less than 15 percent of any unit would be in a non-productive state. Soil productivity would be restored in the previously windrowed units, and improved by decommissioning roads with residual soil compaction Decommissioned roads would return to forest or grassland.

**Unavoidable Adverse Effects**

Implementation of this project may result in some negative effects that are necessary to obtain the benefits of reducing the risk of large-scale habitat loss from natural disturbances and stressors such as insects, disease, wildfire and drought in the Elk Flat Late-Successional Reserve and accelerating development of late-successional and old-growth habitat characteristics in project area stands. Implementation of any of the alternatives, or no action, could cause adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse impacts often result from managing the land for one resource at the expense or condition of other resources. Some adverse effects are short-term and necessary to achieve long-term beneficial effects. The application of Forest Plan standards and guidelines, RPMs, SOPs, and BMPs are intended to limit the extent, severity and duration of potential impacts.

While adverse effects of the action alternatives fall within Forest Plan standards and comply with the regulatory framework, some may view these losses as an adverse impact to the environment. Adverse effects are discussed in detail by resource throughout Chapter 3. Conversely, taking no action at this time would leave stands susceptible to continued large-scale disturbance that could threaten existing and developing late-successional habitat. Under no action, forest stands are less likely to develop into desirable late-successional habitat conditions, due to overcrowding and increasing areas of root disease and insect activity.
Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irreversible commitments of resources are permanent losses of non-renewable resources.

Irretrievable commitments of resources are temporary losses of renewable resources. Irretrievable commitments are those that are lost for a period, such as the temporary loss of timber productivity in forested areas that are kept clear for use as power line rights-of-way or road access.

With implementation of this project, there are no irreversible commitments of forest resources. The irretrievable commitment of resources for the action alternatives include:

- The temporary loss of productive forest lands from creation of landings (Alternatives 1, approximately 58 acres; Alternative 2, 53 acres; Alternative 3, 47 acres), skid trails, and temporary road uses (of existing unauthorized routes) or construction (Alternatives 1, approximately 8.6 miles; Alternative 2, 8.3 miles; Alternative 3, 6.2 miles), constitutes an irretrievable commitment of resources for the action alternatives. Productivity is expected to return upon decommissioning and revegetation.

- *Boletus* habitat in Elk Flat meadow will be reduced in favor of returning natural processes that produce and maintain the unique dry meadow habitat.

- A temporary reduction in the quantity and quality of northern spotted owl foraging habitat designated as critical habitat (PCE 3) will occur under Alternatives 1 and 2 and is an irretrievable commitment of resources. There will be no reduction of NSO nesting/roosting habitat under any action alternative, and no treatments or effects will occur within suitable NSO habitat designated as NSO critical habitat under Alternative 3.

PCE 3 will be degraded (habitat quality reduced) on approximately 224 acres, and will be downgraded to dispersal habitat (PCE 4) on approximately 46 acres under Alternative 1. Under Alternative 2, these same effects will occur. While individual elements of PCE 1, PCE 2, PCE 3 and PCE 4 will be removed or affected by project treatments, the overall habitat function in affected stands will not be removed. Treatments will affect less than one percent of the ECS-3 Critical Habitat Subunit and are considered discountable in terms of reducing the intended function of this Critical Habitat Subunit.

**Degraded Habitat** - The temporary change in the quality but not function, of PCE 3 would last for approximately 5 to 20 years, depending on treatment location and type. Degraded foraging habitat still functions at the pre-treatment habitat level since primary habitat elements are retained in the post-treatment condition. This includes, but is not limited to, at least 40% or higher canopy closure or cover; a range of tree basal areas and appropriate tree species to support foraging NSOs (or other species or their prey); abundant down logs and large snags; multi-layering; and vertical and horizontal structure. Other important habitat elements that contribute to maintaining foraging habitat function include roosting structure, thermal refugia, shrubs and openings for dusky-footed wood rat and other prey base. Degraded habitat generally returns to its pre-treatment quality over a 20-year timeframe as remaining trees grow larger and canopy levels reach and exceed 60% or higher, and the mid- and understory continues to develop. These are estimated timeframes, barring any events such as epidemic insect or disease outbreaks, or uncharacteristic stand replacing fire, that can reset the seral stage in a stand or part of a stand.

**Downgraded Habitat** – The temporary reduction in the quality of PCE 3 would last for approximately 10 to 30 years. Downgraded foraging habitat is generally considered dispersal habitat post-treatment
due to the reduction of overall canopy closure; or removal or significant reductions in understory and midstory layering when combined with a significant removal or loss of large snags or large down wood. Downgraded habitat usually returns to pre-treatment levels within 10 to 30 years, and the timespan for recovery is usually dependent on the treatment causing the downgrade. Where 27 acres of foraging habitat (PCE 3) are downgraded to dispersal habitat (PCE 4) through variable density thinning and California black oak release, the stand is expected to continue to provide some foraging opportunities for NSO. Canopy closure and cover will be below the 40% level and the average basal area will range from 60-120 sqft/ac, on average. Follow-up underburning will incrementally reduce the remaining under- and mid-story trees, and some down wood and snags, over the timespan for the three prescribed fire entries. While there will be patches of dense roosting sites, oaks that are not released, large and small trees, and snags and down wood in the post-treatment condition, these conditions do not provide adequate residual habitat to consider the 27-acre area as ‘foraging’ habitat post-treatment. In this case, while the short- and long-term benefits of providing an increase in hardwood diversity, improved hardwood condition and increased prey base are all considered beneficial, the treatment is a ‘temporary’ loss of foraging habitat function and quality and PCE 3 elements on these 27 acres. Radial thinning around predominant pine may also downgrade PCE 3 to PCE 4 on 19 acres scattered across an approximate 37-acre treatment area (based on the prescription of releasing up to two legacy pine per acre, as available). As this treatment generally removes all smaller diameter trees within a 50-foot radius of the bole, except for other predominant legacy trees of any species or large diameter snags, numerous 0.25-0.30 acre size gaps will be spread across the treatment area where little to no understory or midstory vegetation remains. The effects of this treatment are expected to last for 20 to 30 years and while the radial release treatment will also provide residual foraging opportunities, the habitat condition in these patches will be considered dispersal in combination with the other thinning and underburning treatments.

- A potential loss of habitat elements from new landing construction, existing landing enlargement or temporary road construction for the landings will occur on approximately 4.5 and 8.25 acres of PCE 1 and PCE 3, respectively, under all action Alternatives. No other temporary roads are proposed in critical habitat, but landing driveways may be needed on up to 0.35 miles. This constitutes an irretreivable commitment of resources. The loss and reduction of habitat would be distributed throughout the portion of the project area in critical habitat both spatially and temporally (i.e., not all landings/driveways would be constructed and used at the same time). The project’s design and applicable resource protection measures will assure that existing landings in the project area are used to the extent feasible.

### Energy and Natural or Depletable Resource Requirements and Conservation Potential

Consumption of fossil fuels would occur with the action alternatives during treatment activities and timber hauling as well as road and fuel treatment actions. There are no unusual energy requirements associated with the action alternatives nor is it the type of proposal that provides an opportunity to conserve energy at a large scale. Wood is a renewable resource. With the proper application of Forest Plan standards and guidelines and resource protection measures described in Chapter 2 for soils, water, wildlife, forest vegetation and other resources, the project would conserve resources.

### Urban quality, historic and cultural resources and the built environment

Historic and cultural resources will be protected (flagged and avoided), as described in chapter 3, Cultural Resources and in the RPMs and SOPs (Appendix C). There would be no changes to urban quality or the built environment with this project.
Incomplete or Unavailable Information
Incomplete or unavailable information is discussed in the methodology section of each resource report in the project record incorporated by reference, or described elsewhere in this document if pertinent to the individual effects analyses. In general, much of the Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to analyze this data. GIS data is available in tabular (numerical) format and as plots displaying data in map format. Knowledge about many of the relationships and conditions of wildlife, hydrology, forests, jobs and communities is evolving as research continues. The ecology, inventory, and management of a large forest area is a complex and ever-developing science. However, the basic data and central relationships are sufficiently established in the respective sciences in order for the deciding official to make a reasoned decision to select an alternative and to adequately assess and disclose the possible adverse environmental consequences. Given the uncertainty of any modeling exercise, the results are best used to compare the relative effects of the alternatives, rather than as an indicator of absolute effects.

Compliance and Consistency
Appendix H – Compliance and Consistency, provides detail discussion of compliance and consistency under law, regulation, executive order, agreement, and key policies (The legal and policy framework). Forest Plan consistency not previously provided is detailed under the National Forest Management Act (NFMA) starting on page H-13. The Project is consistent with the Forest Plan and all applicable legal and policy framework.
Chapter 4 –Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and other organization and individuals during the development of this environmental impact statement:

Interdisciplinary Team Members

**Anna Courtney**: Project soil scientist - 5 years of experience mapping soil, collecting data, field work, and participating on interdisciplinary teams. BS in Soil and Land Management and Geology: Earth Materials, University of Wisconsin Stevens Point.

**Emelia Barnum**: District Environmental Coordinator - 16 years of experience in environmental planning and project development, NEPA environmental analysis documentation and team leading. BS in Zoology.

**Dustin Bonivert**: Project transportation planner - 13 years of experience in civil engineering design, review and inspection.

**Cindy Diaz**: Team Leader, natural resource planner – 20 years of experience forestry, recreation, and planning. BS in Forest Resource Management, Humboldt State University, 1984.

**Heidi George**: Project hydrologist - 25 years Forest Service, two years Calif. Dept. of Water Resources. MS in Watershed Science, Utah State University, BS in Geology, Chico State and Humboldt State Universities.

**Ann Glubczynski**: Project socio-economics and climate change specialist, natural resource planner – 16 years of environmental analysis, permitting, and project planning with Federal, State, and local government. BS and MS in Forestry, University of Illinois.

**Leslie Johnson**: Project archaeologist - 11 years working as a field archaeologist. B.A. in Anthropology and Archaeology, 2002 and MA, 2009.

**Christine Jordan**: Management Unit Wildlife Biologist - 15 years of experience as a wildlife and fisheries biologist in County, State and Federal natural resources capacity, specifically for wildlife and fisheries conservation. BS in Wildlife, Humboldt State University, 2000.

**Stephanie Joyce**: Forest Landscape Architect - 19 years of experience in scenery analysis, recreation planning and design. BS in Landscape Architecture, Cal Poly San Luis Obispo.

**Heather McRae**: Project prescribed fire and fuels specialist - 15 years of fire, prescribed fire, fuels management experience. BS in Forestry, Northern Arizona University, MS in Natural Resources Management, Utah State University.

**Annette Navarre**: Project GIS Specialist - 19 years of experience in Geographic Information Systems and 8 years of experience in timber sale preparation. BS in Forestry, U.C. Berkeley, 1984.

**Lauren Payne**: Project silviculturist, VMS Enterprise Unit - 26 years in the Forest Service with experience in fire suppression, wildlife, reforestation and silviculture. BS in Natural Resource Management, Humboldt State University, graduate work in hydrology at Chico State University and completion of the Pacific Southwest Region's Natural Resource Institute resulting in Silviculture Certification.

**Rhonda Posey**: Project Botanist - 23 years of experience working on the Shasta-Trinity National Forest. BS from California State University, Chico, CA, in Agriculture with
Elk LSR Enhancement Project

264  Shasta-Trinity National Forest

an emphasis in Range Management and Soil Science.


Reviewers and Other Contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anguin, Pete</td>
<td>Plant Pathologist</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Bachmann, Steve</td>
<td>Hydrologist</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Cassidy, Julie</td>
<td>Heritage Program Manager</td>
<td>Shasta-McCloud Management Unit, Retired</td>
</tr>
<tr>
<td>Chase, Gary</td>
<td>Web Manager</td>
<td>Shasta-Trinity National Forest, Retired</td>
</tr>
<tr>
<td>Clark, Steve</td>
<td>District Fuels Officer</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>delaFuente, Juan</td>
<td>Zone Geologist</td>
<td>Klamath National Forest</td>
</tr>
<tr>
<td>Domanski, Ed</td>
<td>Timber Management Officer</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Dow, Robert</td>
<td>Program Analyst</td>
<td>Geospatial Service and Tech. Center, WO</td>
</tr>
<tr>
<td>Dushey, Daniel</td>
<td>Former, Prep. Forester</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Gelb, Justin</td>
<td>Forester</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Graham, Lara</td>
<td>Fuels Planner</td>
<td>Trinity River Management Unit</td>
</tr>
<tr>
<td>Ham, Robin</td>
<td>Business Management Assistant</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Hamilton, Todd</td>
<td>Forester</td>
<td>Shasta-Lake Ranger District</td>
</tr>
<tr>
<td>Horton, Jim</td>
<td>Support Services Specialist</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Johnson, Patricia</td>
<td>Wildlife Biologist</td>
<td>Shasta-McCloud Management Unit, Enterprise Team</td>
</tr>
<tr>
<td>Losi, Chris</td>
<td>Environmental Coordinator</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Mai, Christine</td>
<td>Hydrologist</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Mapula, Justin</td>
<td>Wildlife Biologist</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>McBath, Alex</td>
<td>Fuels Program Manager</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Montagne,</td>
<td>Biological Technician</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Brenna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muroff, Roman</td>
<td>Sale Preparation/Contract Forester</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Nelson, Julie</td>
<td>Forest Botanist</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Redman, Jennifer</td>
<td>Natural Resource Specialist</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Roche, Kathy</td>
<td>Ecosystems Staff Officer</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Sewell, Craig</td>
<td>District Silviculturist</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Simons, Lee</td>
<td>Forest Biologist</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Snyder, Cynthia</td>
<td>Entomologist</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Suing, Judy</td>
<td>NEPA Planner</td>
<td>Geospatial Service and Tech. Center, WO</td>
</tr>
<tr>
<td>Tierney, Marilyn</td>
<td>District Biologist</td>
<td>Yuba River Ranger District, Tahoe National Forest</td>
</tr>
<tr>
<td>VanHees, Nisha</td>
<td>Timber Stand Improvement Mgr.</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Vardanega, Eve</td>
<td>Forestry Technician</td>
<td>Shasta-McCloud Management Unit</td>
</tr>
<tr>
<td>Wenhamm, Hide</td>
<td>Former, Range Program Manager</td>
<td>Shasta-Trinity National Forest</td>
</tr>
<tr>
<td>Wilmot, Susan</td>
<td>Private Contractor</td>
<td></td>
</tr>
<tr>
<td>Young, Dave</td>
<td>Zone Soil Scientist</td>
<td>Shasta-Trinity National Forest</td>
</tr>
</tbody>
</table>

Consultation and Coordination

Consultation

Section 7 of the ESA

The species list for the Biological Assessment for the Elk Project, using the legal requirements set forth under Section 7 of the Endangered Species Act and Forest Service Manual direction (FSM 2672.42), was obtained from the FWS Information for Planning and Conservation (IPaC) website on December 22, 2015. Between August 2009 and present, the Forest has been intermittently consulting with the FWS on this project. Streamlined consultation was initiated in December 2011 and Jordan and FWS wildlife biologists David Topolewski, Katherine Fitzgerald and Chad Anderson have consulted on the project’s preferred alternative and anticipated effects since that time. Jordan presented a draft Project Initiation Form to the FWS, Yreka Office on December 1, 2011, and a final Project Initiation Form was presented on March 21, 2013. On January 18, 2016, the Shasta-McCloud Management Unit submitted the draft Biological Assessment to the FWS and the Final on April 4, 2016. A formal request for consultation was made on April 4, 2016 (received by FWS on April 5) with an attached Forest Service and FWS...
mutually agreed-to final Biological Assessment (Myers, 2016). This is in accordance with the streamlined consultation procedures.

**Section 106 of the NHPA**

In accordance with 36 CFR § 800.3(f) and Section 106 of the National Historic Preservation Act, Native American consultation was conducted. A formal consultation letter was mailed to the Redding Rancheria on 2/22/2013. The Redding Rancheria did not respond. A formal consultation letter was mailed to the Pit River Tribe on 2/22/2013. Additional consultation occurred with the Pit River Tribe at quarterly council meetings, field trips, and other meetings with individual practitioners and cultural representatives (4/26/2005, 8/12/2009, 8/4/2010, 7/20/2012, 8/28/2012, 11/30/2011, 3/30/2012, 11/7/2012, 2/6/2013, 8/1/2013, 6/20/2014, 11/16/2015, 12/10/2015). A draft cultural resources report and effects analysis were sent to the Pit River Tribe for consideration on 12/3/2015. No response has been received.

The Cultural Resources Report was submitted to the State Historic Preservation Office (SHPO) on 2/3/2016. Additional information was submitted per request on 3/22/2016. The SHPO concurred with the findings and determinations on 4/6/2016, including the finding that pursuant to 36 CFR § 800.5(b), through the use of standard protection measures, no adverse effects to historic properties will result from the project (Polanco, 2016).

**Coordination**

The Forest Service coordinated with the following individuals, Federal, State and local agencies, tribes and non-Forest Service persons during the development of this environmental impact statement.

**Federal, State, and Local Agencies**
- Siskiyou County
- California Department of Fish and Wildlife
- Central Valley Regional Water Quality Board
- Shasta Valley Resource Conservation District, Elk Stewardship Working Group

**Native American Tribal Organizations**
- Winnemem Wintu Tribe

**Individuals**
- Jerry Hoertling (local historian)

**Distribution of the Environmental Impact Statement**

As per FSH 1909.15 (Chapter 20), the following is a list of agencies, organizations, and persons who have requested and will receive a copy of the FEIS. Other agencies, organizations and individuals that submitted comments will be notified of the online availability of the FEIS via letter or email.

**Federal Agencies**
- U.S. Fish and Wildlife Service, Yreka Office
- National Agricultural Library Head, Acquisitions & Serials Branch
- EIS Review Coordinator, U.S. Environmental Protection Agency Region 9
- Director, Office of Environmental Policy and Compliance, U.S. Department of the Interior
- Director of NEPA Policy and Compliance, U.S. Department of Energy

**Organizations**
- Conservation Congress
- Klamath-Siskiyou Wildland Center
- Environmental Protection Information Center
- Klamath Forest Alliance
- American Forest Resource Council
**Glossary of Acronyms and Terms**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive Management</td>
<td>Adaptive management promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Adaptive management identifies in advance precisely how, when, and why adaptive management plans will be altered.</td>
</tr>
<tr>
<td>Aquatic Conservation Strategy Objectives (ACS)</td>
<td>Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. It employs several tactics to approach the goal of maintaining the “natural” disturbance regime (NWFP pp. B-10). Aquatic Conservation Strategy Objectives are nine objectives to meet the standards and guidelines in the Northwest Forest Plan Record of Decision to manage the riparian dependent resources to maintain the existing condition or implement actions to restore conditions (NWFP pp. B-11).</td>
</tr>
<tr>
<td>Area of Potential Effect (APE)</td>
<td>The area of potential effects (APE) means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. 36 CFR § 800.16(d). In defining the APE, the potential direct, indirect, and cumulative effects to historic properties and all aspects of integrity, including their associated settings as applicable is considered.</td>
</tr>
<tr>
<td>Basal Area (BA)</td>
<td>The cross-sectional area of all stems of a species or all stems in a stand measured at breast height (4.5 feet above the ground on the uphill side) and expressed per unit of land area (Society of American Foresters, 2008).</td>
</tr>
<tr>
<td>Biological Assessment (BA)</td>
<td>Biological Assessment refers to the information prepared by or under the direction of the Federal agency concerning listed and proposed species and designated and proposed critical habitat that may be present in the action area and the evaluation potential effects of the action on such species and habitat (50 CFR §402.02)</td>
</tr>
<tr>
<td>Biological Evaluation (BE)</td>
<td>A Biological Evaluation analyzes and discloses the potential effects of a project on sensitive species known or assumed to occur within the project area. The Forest Service defines sensitive species as those plant and animal species identified by the Regional Forester for which population viability is a concern.</td>
</tr>
<tr>
<td>Biological Opinion (BO)</td>
<td>A Biological Opinion is the document that states the opinion of the Service as to whether or not the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (50 CFR §402.02).</td>
</tr>
<tr>
<td>Black Stain</td>
<td>Black stain is a wilt-like disease of conifers caused by the native, insect-vectored, fungal pathogen <em>Leptographium wageneri</em>. Disease centers appear as small groups of dead and symptomatic trees but can sometimes be much larger, especially in ponderosa pine stands. Susceptible stands are usually densely stocked and consist of either pure or predominantly ponderosa pine. Black stain predisposes trees to bark beetle infestation. Vigorous trees with adequate spacing are more resistant. Open stands have warmer soils that inhibits the fungus with fewer root contacts between susceptible trees.</td>
</tr>
<tr>
<td>Communities at Risk (CAR)</td>
<td>Communities at Risk in designated Wildland-Urban Interface (WUI) (USDA &amp; USDI, 2001). To help protect people and their property from potential catastrophic wildfire, the National Fire Plan directs funding to be provided for projects designed to reduce the fire risks to communities. To achieve this goal communities that are at high risk of damage from wildfire were identified. These high risk communities identified within the wildland-urban interface, the area where homes and wildlands intermix, were published in the Federal Register in 2001. (<a href="http://osfm.fire.ca.gov/fireplan/fireplanning_communities_at_risk">http://osfm.fire.ca.gov/fireplan/fireplanning_communities_at_risk</a>)</td>
</tr>
<tr>
<td>Coarse Woody Debris (CWD)</td>
<td>Piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses, on the ground in forest stands or in streams —synonyms are large organic debris (LOD),</td>
</tr>
</tbody>
</table>
large woody debris (LWD) (Forest Plan, Appendix O), down woody debris (DWD) (Society of American Foresters, 2008). CWD is often described in size classes by diameter.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-dominant</td>
<td>A tree whose crown helps to form the general level of the main canopy and receiving full sunlight from above and comparatively little sunlight from the sides (Society of American Foresters, 2008).</td>
</tr>
<tr>
<td>Critical Habitat (CH), Critical Habitat Unit (CHU)</td>
<td>Designated critical habitat and critical habitat unit for Northern spotted owl (USDI-FWS, 2012)</td>
</tr>
<tr>
<td>Crown Fire</td>
<td>Fire spread through the tree canopy</td>
</tr>
<tr>
<td>CVRWQCB</td>
<td>Central Valley Regional Water Quality Control Board</td>
</tr>
<tr>
<td>Diameter Breast Height (DBH)</td>
<td>The diameter of the stem of a tree measured at breast height (4.5 ft. or 1.37 m) from the ground. On sloping ground the measure is taken from the uphill side. DBH usually implies diameter outside bark (DOB) but can be measured as inside bark (DIB) (Society of American Foresters, 2008).</td>
</tr>
<tr>
<td>Dominant</td>
<td>That component of a community, typically a species, exerting the greatest influence on its character because of its life form or great abundance or an individual or species of the upper layer of the canopy (Society of American Foresters, 2008). Most commonly used in this analysis as A tree whose crown extends above the crowns of the tree's immediate neighbors and receiving full sunlight from above and complete to partial sunlight from the sides.</td>
</tr>
<tr>
<td>Early-Seral/Early-Successional</td>
<td>Potential natural community species are absent or in very low numbers. typically 6-12 inch dbh with &gt;40% canopy closure comprised of both natural stands and older plantations (LSRA, 1999 p. 22)</td>
</tr>
<tr>
<td>EIS, DEIS, FEIS</td>
<td>Environmental Impact Statement, Draft Environmental Impact Statement, Final Environmental Impact Statement</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>Fire behavior potential based on fuels and weather (USDA-FS, 2015 p. 49).</td>
</tr>
<tr>
<td>Fire Regime</td>
<td>A generalized description of the role that fire plays in an ecosystem; the pattern and variability of fire occurrence and its effect on vegetation by description of fire frequency, predictability, intensity, seasonality and size characteristics of fire in a particular ecosystem (Agee, 1993).</td>
</tr>
<tr>
<td>Fire Regime Condition Class</td>
<td>A fire regime condition class is a classification of the amount of departure from the natural regime. Condition class can be utilized to describe the degree of departure (low, moderate or high) from historical conditions. The condition class 3 (high departure) is defined as “fire regimes have been substantially altered from their natural (historic) range. The risk of losing key ecosystem components is high. Fire frequencies have departed from natural frequencies by multiple return intervals. Dramatic changes occur to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been substantially altered from their natural (historic) range (NWCG, 2003 p. 1).</td>
</tr>
<tr>
<td>Fire Return Interval (FRI)</td>
<td>The number of years between two successive fires documented in a designated area (USDA-FS, 2015 p. 49).</td>
</tr>
<tr>
<td>Fire Return Interval Departure (FRID)</td>
<td>A measure of how departed from the natural average fire return interval (USDA-FS, 2012a).</td>
</tr>
<tr>
<td>Fire Risk</td>
<td>The probability of a fire occurring in a given area based on historical fire occurrence (USDA-FS, 2015 p. 49).</td>
</tr>
<tr>
<td>Fire Severity</td>
<td>The effect of a fire on ecosystem properties, usually defined by the degree of soil heating or mortality of vegetation (Agee, 2007). The severity of a fire depends on the fire intensity and the degree to which ecosystem properties are fire resistant. Therefore, fire severity is, in part, a function of the ecosystem being burned and is not simply indexed from fireline intensity. If a fire has a long residence time, fire severity will usually increase.</td>
</tr>
<tr>
<td>Forest</td>
<td>The Shasta-Trinity National Forest</td>
</tr>
<tr>
<td><strong>Forest Plan</strong></td>
<td>Shasta-Trinity National Forest Land and Resource Management Plan (Forest Plan, 1995)</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Forest Transportation System (FTS)</strong></td>
<td>The designated road and trail network managed by the Shasta-Trinity National Forest by maintenance levels (ML) 1, 2 and 3. The FTS does not include unauthorized routes. Forest Service Handbook 7709.59 (62.32) described maintenance levels (also see Bonivert, 2015a). Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria.</td>
</tr>
<tr>
<td><strong>Fuel Model (FM)</strong></td>
<td>Fuel models are tools to help land managers estimate fire behavior and are described in terms of both expected fire behavior and associated vegetation. Thirteen fuel models for fire behavior are utilized for the severe period of the fire season.</td>
</tr>
<tr>
<td><strong>Geographic Information System (GIS)</strong></td>
<td>A geographic information system (GIS) is a system for managing spatial data and associated attributes. In the strictest sense, it is a computer system capable of integrating, storing, editing, analyzing, and displaying geographically-referenced information.</td>
</tr>
<tr>
<td><strong>Heterobasidion Root Disease</strong></td>
<td>A fungus that attacks the root system increasing susceptibility to bark beetles and causing mortality. It spreads from root contact and can infect fresh cut stumps, and survives in living or dead as well as rotting tree stumps, and can persist long term. The fungus spreads via root-to-root contact to adjacent live trees and may survive for many years. Infection centers may enlarge until they reach barriers, such as openings in the stand or groups of resistant plants. Young conifers established near infected stumps often die shortly after roots contact infected roots in the soil.</td>
</tr>
<tr>
<td><strong>Historic Properties</strong></td>
<td>Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or native Hawaiian organization and that meet the National Register criteria* 36 CFR § 800.16(l)(1).</td>
</tr>
<tr>
<td><strong>Hydrologic Unit Code (HUC)</strong></td>
<td>Watersheds in the United States and the Caribbean are delineated by the U.S. Geological Survey using a national standard hierarchical system based on surface hydrologic features and are classified into six types of hydrologic units: first-field (region), second-field (sub-region), third-field (accounting unit), fourth-field (cataloguing unit), fifth-field (watershed) and sixth-field (sub-watershed). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification (<a href="http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1042207.pdf">http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1042207.pdf</a>).</td>
</tr>
<tr>
<td><strong>Intermediate</strong></td>
<td>A tree whose crown extends into the lower portion of the main canopy, but that is shorter in height than the co dominants and receiving little direct sunlight from above and none from the sides (Society of American Foresters, 2008).</td>
</tr>
<tr>
<td><strong>Ladder Fuels</strong></td>
<td>Fuels which provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning. (NWCG, 2014).</td>
</tr>
<tr>
<td><strong>Late Successional Characteristics</strong></td>
<td>Trees with distinct traits common to older overmature trees including large, decadent boles and limbs, cavities and forked, broken or flattened tops, sometimes called “woify” trees. These trees provide unique wildlife habitat not common in most overstory trees. Unless stated within a stand specific prescription, trees with these late seral characteristics should be retained except where they serve as a public or operational safety hazard.</td>
</tr>
<tr>
<td><strong>Late Successional Reserve, (LSR)</strong></td>
<td>Late-Successional Reserve is a land allocation managed to protect and enhance old-growth forest conditions (NWFP p. 8). LSRs are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem (Forest Plan p. 4.37).</td>
</tr>
</tbody>
</table>
| **Late-Seral/Late-Successional** | Potential natural community species are dominant, but seral species still persist. Typically greater than 25 inches in diameter with greater than 40% canopy closure. Many of these stands tend to be multi-storied. The large overstory trees are spaced
Elk LSR Enhancement Project

Late-Successional Old Growth (LSOG) Forest or stands consisting of trees and structural attributes and supporting biological communities and processes associated with old-growth and/or mature forests (FEMAT 1993, p. IX-19).

Limited Operating Period (LOP) Restricted time of operations for resource protection

Live Crown Ratio The portion of the tree which is occupied by live healthy crown. Live crown ratio is expressed as a percent of the total height of the tree, e.g. 30% live crown ratio means a 100-foot tall tree has 30 feet of live crown.

LSRA Forest-wide Late-Successional Reserve Assessment (LSRA, 1999)

Maintenance Level-1 (ML-1) Roads that have been placed in storage (e.g. "closed") between intermittent uses. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs (Forest Plan p. Appdx. K).


Maintenance Level-4 (ML-4) Roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced, but may be one lane (Forest Plan p. Appdx. K).

Mature Trees or stands pertaining to a tree or even-aged stand that is capable of sexual reproduction (other than precocious reproduction), has attained most of its potential height growth, or has reached merchantability standards —note within uneven-aged stands, individual trees may become mature but the stand itself consists of trees of diverse ages and stages of development (Society of American Foresters, 2008).

Mid-Seral/Mid-Successional Potential natural community species are increasing and colonizing the site. Typically 13-24 inches in dbh with greater than 40% canopy closure. Most of these stands are even-aged and relatively dense, due to the encroachment of shade tolerant species. Hardwoods generally make up a minor component within most mid-seral stands. Suppressed and intermediate trees are beginning to die out of the stands as competition for growing space becomes a factor (LSRA, 1999 p. 22).


Northern Spotted Owl (NSO) The northern spotted owl is a medium-sized, dark brown owl with a barred tail, white spots on the head and breast, and dark brown eyes surrounded by prominent facial disks. Males and females have similar plumage, but females typically weigh 10 to 20 percent more than males. The northern spotted owl is Federally listed under the Endangered Species Act as a threatened species in Washington, Oregon and California (http://www.fws.gov/arcata/es/birds/NSO/ns_owl.html).

Northwest Forest Plan (NWFP) The mission of the Northwest Forest Plan is to adopt coordinated management direction for the lands administered by the USDA Forest Service and the USDI Bureau of Land Management and to adopt complimentary approaches by other Federal agencies within the range of the northern spotted owl (NWFP, 1994) (http://www.fs.usda.gov/detail/r6/landmanagement/planning/?cid=fsbdev2_026990).
<table>
<thead>
<tr>
<th><strong>Notice of Intent (NOI)</strong></th>
<th>Federal Register Notice of Intent to Prepare and Environmental Impact Statement (USDA-FS, 2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Old Growth Forest</strong></td>
<td>Forest ecosystem that has developed over a long period essentially free of catastrophic (including humans) disturbance. In the Pacific Northwest, an old-growth forest generally ranges in age from 200 to 750 years or more and contains the following structural features: 1) large, live old-growth trees, 2) snags, and 3) large logs on the forest floor and in streams (LSRA, 1999).</td>
</tr>
<tr>
<td><strong>Predominant (Remnant, Legacy)</strong></td>
<td>Predominant trees are above the general level of the upper canopy trees. Remnant - Trees that remain from a previous management activity or catastrophic event. The tree is significantly older than the surrounding vegetation. Remnant trees do not form a canopy layer and are usually isolated individuals or small clumps (USDA-FS, 2010). Legacy tree - a tree, usually mature or old-growth, that is retained on a site after harvesting or natural disturbance to provide a biological legacy (Society of American Foresters, 2008).</td>
</tr>
<tr>
<td><strong>Project Area</strong></td>
<td>Project assessment area or project boundary. The boundary within which physical implementation will take place.</td>
</tr>
<tr>
<td><strong>Project, or project</strong></td>
<td>Elk Late-Successional Reserve Enhancement Project</td>
</tr>
<tr>
<td><strong>Record of Decision, (ROD)</strong></td>
<td>The document that records the decision for the EIS.</td>
</tr>
<tr>
<td><strong>Recovery Plan</strong></td>
<td>Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS, 2012)</td>
</tr>
<tr>
<td><strong>Regional Ecosystem Office, (REO)</strong></td>
<td>The Regional Ecosystem Office is tasked with facilitating decision-making and prompting interagency issue resolution during the implementation of the Northwest Forest Plan (<a href="http://reo.gov/">http://reo.gov/</a>).</td>
</tr>
<tr>
<td><strong>Resilience</strong></td>
<td>Resilience refers to the capacity of an ecosystem to not only accommodate gradual changes but to return toward a prior condition after disturbances including fire, extreme weather events, and climate change. Ecologically healthy and resilient landscapes, rich in biodiversity, will have greater capacity to adapt and thrive in the face of natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions such as those driven by climate change and increasing human use (USDA-FS, 2014 p. 12)</td>
</tr>
<tr>
<td><strong>Riparian Reserve (RR)</strong></td>
<td>Forest Plan management prescription for riparian areas (Forest Plan p. 4.53).</td>
</tr>
<tr>
<td><strong>Roost/Rest Clumps</strong></td>
<td>distinct groups of tightly spaced overstory trees/snags, often with late seral characteristics and with smaller (&lt;10-inch size class) shade tolerant trees growing underneath. These clumps can range from a tight group of 3 to 6 trees/snags to an area less than 1/10 acre. In all natural stands, and as available, retain rest/roost clumps throughout the stands. As they are available, ideally retain approximately 4 smaller clumps and 2 larger clumps per acre.</td>
</tr>
<tr>
<td><strong>Running Crown Fire</strong></td>
<td>Crown fire that jumps from tree to tree</td>
</tr>
<tr>
<td><strong>SDI</strong></td>
<td>Stand Density Index – A widely used measure developed by (Reineke, 1933) that expresses relative stand density in terms of the relationship of a number of trees to stand quadratic mean diameter. Any index that expresses relative stand density based on a comparison of measured stand values with some standard condition (Society of American Foresters, 2008)</td>
</tr>
<tr>
<td><strong>Seral Stage/Succesional State.</strong></td>
<td>A stage of ecological process of progressive change in a plant community after disturbance leading to a relatively stable potential natural community under existing environmental conditions. Succession may be retrogressive after disturbance to a less stable plant community. (Hall, et al., 1995).</td>
</tr>
<tr>
<td><strong>Silviculture</strong></td>
<td>The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis (Society of American Foresters, 2008).</td>
</tr>
<tr>
<td><strong>Site Index</strong></td>
<td>Site index is a measure of a forest’s potential productivity. Site index is usually defined as the height of the dominant or codominant trees at a specified age in a</td>
</tr>
</tbody>
</table>
Elk LSR Enhancement Project

stand. It is calculated in an equation that uses the tree's height and age. Site index equations differ by tree species and region (Hanson, et al., 2002).

**Stand**

A recognizable area of the forest that is relatively homogeneous and can be managed as a single unit.

**Suppressed (overtopped):**

A tree whose crown is completely overtopped by the crowns of one or more neighboring trees — note the vigor of overtopped (suppressed) trees varies from high to low depending on individual circumstances (Society of American Foresters, 2008).

**Surface Fire**

Fire that burns loose debris on the surface, which include dead branches, leaves, and low vegetation. Burns only in the surface fuel bed.

**The National Register of Historic Places (NRHP)**

The National Register of Historic Places is the official list of the Nation's historic places worthy of preservation. Authorized by the National Historic Preservation Act of 1966, the National Park Service's National Register of Historic Places is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources.

**Timber Type Classification**


**Torching**

(Passive Crown Fire)

Fire that consumes single or small groups of trees or bushes.

**Tree Well**

An area free of snow around the base of the trees created by lower snow accumulation directly below the crown of the tree and more rapid melting due to radiant heating from the bole.

**Unauthorized Routes**

Existing roads that are not open to vehicular traffic or managed as part of the FTS.

**Uncharacteristic Wildfire**

A fire that does not closely resemble the expected historical natural fire regime in terms of fire frequency and effects. The greater the departure from historical natural fire regime, the more uncharacteristic is the fire. Typically used when describing fires with more extreme behavior resulting in greater effects than what occurred historically.

**Underburning**

Prescribed burning with a low fireline intensity fire under a timber canopy.

**Variable Density Thinning**

Variable-density thinning is a silvicultural technique intended to promote biological diversity and structural heterogeneity (biocomplexity) characteristic of old-growth forests, by inducing fine-scale variation in homogeneous second-growth forest canopies (Carey, et al., 1995; Muir, et al., 2002). Variable-density thinning consists of thinning a forest stand at different intensities in patches at a scale of approximately 0.1 to 0.5 ha, mimicking the scale of patchiness found in old growth (Carey, et al., 1999) and creating a mosaic of overstory tree densities.

**Western Pine Beetle**

A small black bark beetle that creates egg galleries are winding and packed with frass and frequently introduces fungal infections such as blue stain. Western pine beetle most commonly attacks trees of reduced vigor. While older, larger trees are generally preferred, younger trees can also be infested, especially when they occur in dense stands, are infected by pathogens, or are damaged by fire. During periods of drought, the western pine beetle can overcome apparently healthy trees as well Western pine beetle most commonly attacks trees of reduced vigor. While older, larger trees are generally preferred, younger trees can also be infested, especially when they occur in dense stands, are infected by pathogens, or are damaged by fire. During periods of drought, the western pine beetle can overcome apparently healthy trees. Groups of trees are sometimes killed, especially when growing under crowded conditions. Since larger trees are generally preferred, the western pine beetle can dramatically alter the character of a forest that comes under attack. (Snyder, 2012)

**Wildland Urban Interface (WUI)**

The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels. (Guidance for Implementation of Federal Wildland Fire Management Policy)
Works Cited


Franklin, J. 2013. Personal communication between Dr. Jerry Franklin and the Elk interdisciplinary team. July 2013.


Elk LSR Enhancement Project


Wenham, H. 2015. Memo Regarding the Bartle Range Allotment and the Elk LSR Enhancement Project. s.l.:
Unpublished internal correspondence from Hide Wenham to Carolyn Napper regarding the effects of the Elk
LSR Enhancement Project on the Bartle range allotment., August 20, 2015.
Wiens, J.D. 2012. Competitive Interactions and Resource Partitioning between Northern Spotted Owls and Barred Owls
Wilbur-Ellis. N.D. . Sporax, a Borax Fungicide for Control of Annosus Root Disease. s.l. : Label published by Wilbur-
Ellis Co., Fresno, California. Accessed online at
Winward, A. 2000. Monitoring the vegetation resources in riparian areas. Monitoring the vegetation resources in riparian
areas. Ogden, Utah : USDA Forest Service Rocky Mountain Research Station, 2000. GTR-47.
Wisdom, M.J., et al. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia basin: broad-scale
trends and management implications. PNW-GTR=485. Portland, OR : U.S. Department of Agriculture, Forest
Woodall, Chris W., Miles, Patrick D., Vissage, John S. 2005. Determining maximum stand density index in mixed
species stands for strategic-scale stocking assessments. Forest Ecology and Management 216. May 20, 2005,
Southwest Forest Health Protection Report #NE02-03. s.l. : Woodruff, W.C. 2002. Partial cutting ponderosa
and Jeffrey pine stands infected with black stain root disease. USDA Forest Service, 2002.
WRCC. 2010. McCloud California weather and precipitation summaries. Western Regional Climate Center. [Online]
Young, D. 2009. Personal Communication between Jacqueline Foss and David Young on rate of disturbance for tractor
harvest. 2009.
Zhang, Jianwei, Oliver, William W. and Powers, Robert F. 2013. Reevaluating the self thinning boundary line for
Ponderosa Pine (Pinus ponderosa) Forests. s.l. : Canadian Journal of Forest Research, 2013. Vol. 43, pp. 963-
971.
Appendices
Appendix A - Unit-Specific Information, Treatments and Road Actions

Appendix A provides detailed road and silvicultural and fuels treatment actions. Unit specific information and fuels and silviculture treatments are provided in the first 2 tables, Table Appendix A-1 summarizes unit-specific existing conditions that pertain to treatments which are then summarized in Table Appendix A-2 starting on page A-6. The summary tables are followed by more detailed discussion of silvicultural treatments and how they are applied (starting on page A-6. Fuels treatments descriptions start on page A-29 and road specific actions start on page A-33.

Table Appendix A-1 Unit-Specific Existing Condition and Objective Information Pertaining to Treatment Prescriptions

<table>
<thead>
<tr>
<th>Unit</th>
<th>Forest Plan Allocation or LSRA Objective</th>
<th>CWHR Type 106</th>
<th>Stand type</th>
<th>Stand Age Range</th>
<th>Riparian Reserve in Unit</th>
<th>Western Pine Beetle Activity</th>
<th>High Density for Pine</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>1-U</td>
<td>II, III</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td>high</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>12</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>13</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>14</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>15</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>16</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>18</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>40-50</td>
<td>yes</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>106</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td>yes</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>107</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td>yes</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>110</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>112</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

105 Refer to Late Successional Reserve (LSR) objectives in the discussion of LSR starting on page 4. Units that have both LSR and Matrix allocations are prescribed based on LSR objectives.

106 California Wildlife Habitat Relationships vegetation type (CDFW, 2008). Key to habitat types found here: http://www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp

Shasta-McCloud Management Unit
<table>
<thead>
<tr>
<th>Unit</th>
<th>Forest Plan Allocation or LSRA Objective</th>
<th>CWHR Type</th>
<th>Stand type</th>
<th>Stand Age Range</th>
<th>Riparian Reserve in Unit</th>
<th>Western Pine Beetle Activity</th>
<th>High Density for Pine</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>113</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td>yes</td>
<td>high</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td>yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td>yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>115-16</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>122</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td>high</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>126</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>I</td>
<td>SMC</td>
<td>natural</td>
<td>80-120</td>
<td>yes</td>
<td></td>
<td>Yes</td>
<td>NSO Nesting/Roosting and Foraging habitat; fisher Some areas of fisher denning habitat</td>
</tr>
<tr>
<td>151</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Large overstory tree concentrations of white fir and incense cedar</td>
</tr>
<tr>
<td>152-1</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>yes</td>
<td>high</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>152-2</td>
<td>I</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>yes</td>
<td>high</td>
<td>Yes</td>
<td>Abundant California black oak in southeast portion</td>
</tr>
<tr>
<td>153</td>
<td>I, II</td>
<td>SMC</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Mix of NSO Nesting/Roosting and Foraging habitat; Some areas of fisher denning habitat; Some California black oak</td>
</tr>
<tr>
<td>154</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>Yes</td>
<td>high</td>
<td>Yes</td>
<td>Goshawk and NSO foraging habitat; some California black oak</td>
</tr>
<tr>
<td>155</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Goshawk territory with nesting and roosting foraging habitat</td>
</tr>
<tr>
<td>156</td>
<td>I</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>156-U1</td>
<td>II, III</td>
<td>PPN</td>
<td>plantation</td>
<td>20-30</td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>156-U2</td>
<td>II, III</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>157</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>yes</td>
<td>high</td>
<td>Yes</td>
<td>Some areas of fisher denning habitat along Ash Creek</td>
</tr>
<tr>
<td>Unit</td>
<td>Forest Plan Allocation or LSRA Objective$^{105}$</td>
<td>CWHR$^{106}$ Type</td>
<td>Stand type</td>
<td>Stand Age Range</td>
<td>Riparian Reserve in Unit</td>
<td>Western Pine Beetle Activity</td>
<td>High Density for Pine</td>
<td>Notes</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------</td>
<td>-------------------</td>
<td>------------</td>
<td>-----------------</td>
<td>--------------------------</td>
<td>----------------------------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>157-U</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>158</td>
<td>II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>159-U</td>
<td>II</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>161</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>162</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>yes</td>
<td>high</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td></td>
<td></td>
<td>Yes</td>
<td>High quality NSO foraging habitat mixed with lower quality and non-habitat due to dense small trees, Some California black oak</td>
</tr>
<tr>
<td>166</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>168-1</td>
<td>I</td>
<td>SMC</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td>California black oak within unit, primarily white fir</td>
</tr>
<tr>
<td>168-2</td>
<td>I, II</td>
<td>SMC</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td>High quality NSO foraging habitat, trending toward Nesting/Roosting; some California black oak</td>
</tr>
<tr>
<td>169</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>II</td>
<td>SMC</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Some California black oak</td>
</tr>
<tr>
<td>171</td>
<td>I, II</td>
<td>SMC</td>
<td>natural</td>
<td>80-120</td>
<td>yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>172</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Some California black oak</td>
</tr>
<tr>
<td>174</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>II, III</td>
<td>PPN</td>
<td>natural</td>
<td>60-100</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td>Aspen in portion of unit</td>
</tr>
<tr>
<td>176</td>
<td>I, II</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td>high</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>177</td>
<td>I, II (Matrix-CWP)</td>
<td>PPN</td>
<td>natural</td>
<td>80-120</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Some California black oak</td>
</tr>
<tr>
<td>178</td>
<td>I, II</td>
<td>SMC</td>
<td>natural</td>
<td>60-100</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Some California black oak</td>
</tr>
<tr>
<td>Unit</td>
<td>Forest Plan Allocation or LSRA Objective</td>
<td>CWHR Type</td>
<td>Stand type</td>
<td>Stand Age Range</td>
<td>Riparian Reserve in Unit</td>
<td>Western Pine Beetle Activity</td>
<td>High Density for Pine</td>
<td>Notes</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------</td>
<td>-----------</td>
<td>------------</td>
<td>-----------------</td>
<td>--------------------------</td>
<td>----------------------------</td>
<td>-----------------------</td>
<td>-------</td>
</tr>
<tr>
<td>179</td>
<td>I, II PPN natural</td>
<td>80-120</td>
<td>high</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>I PPN natural</td>
<td>80-120</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>I, II PPN natural</td>
<td>80-120</td>
<td>high</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>182</td>
<td>I PPN natural</td>
<td>60-100</td>
<td>high</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td>Goshawk territory with nesting and foraging habitat</td>
</tr>
<tr>
<td>201</td>
<td>I, II PPN natural</td>
<td>80-120</td>
<td>high</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td>Goshawk territory with nesting and foraging habitat</td>
</tr>
<tr>
<td>202</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203</td>
<td>II, III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>204</td>
<td>II, III PPN natural</td>
<td>60-100</td>
<td>high</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>206</td>
<td>II, III PPN natural</td>
<td>80-120</td>
<td>high</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td>Extensive mortality area with few pockets of large standing dead ponderosa pine intermixed with large live tree components</td>
</tr>
<tr>
<td>208</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>214</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>216</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>217</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>218</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>221</td>
<td>I PPN natural</td>
<td>80-120</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>222</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>223</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>224</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>226</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>231</td>
<td>III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>233</td>
<td>II, III PPN plantation</td>
<td>10-20</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>235</td>
<td>II, III PPN natural</td>
<td>60-100</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>317</td>
<td>II, III PPN (Matrix-CWP) SMC natural</td>
<td>60-100</td>
<td>Yes</td>
<td>California black Oak in unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>318</td>
<td>II, III PPN natural</td>
<td>60-100</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>346</td>
<td>III PPN natural</td>
<td>60-100</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>
Table Appendix A-2 summarizes unit specific treatments by alternative. The primary treatment is provided in the second column, with prescription element estimated acres in the following columns.
### Table Appendix A-2. Unit Treatments by Alternative

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1  2  3</td>
<td>1  2  3</td>
<td>1  2  3</td>
<td>1  2  3</td>
<td>1  2  3</td>
<td>1  2  3</td>
<td>1  2  3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Plantation Thin</td>
<td>75 TPA</td>
<td>34.1</td>
<td>34.1</td>
<td>34.1</td>
<td>30  30  30</td>
<td>34.1</td>
<td>34.1</td>
<td>34.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-U</td>
<td></td>
<td></td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Plantation Thin: Group Selection, Plant Groups</td>
<td>80-100 ft2/ac</td>
<td>58.6</td>
<td>58.6</td>
<td>58.6</td>
<td>51.6  51.6  51.6</td>
<td>58.6</td>
<td>58.6</td>
<td>58.6</td>
<td>10.3  10.3  10.3</td>
<td>51.6</td>
<td>51.6</td>
<td>51.6</td>
</tr>
<tr>
<td>7</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>80-100 ft2/ac</td>
<td>9.1</td>
<td>9.1</td>
<td>9.1</td>
<td>8   8   8</td>
<td>9.1</td>
<td>9.1</td>
<td>9.1</td>
<td>1.6  1.6  1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>12</td>
<td>Plantation Thin: Radial Thin</td>
<td>80-100 ft2/ac</td>
<td>8.3</td>
<td>8.3</td>
<td>8.3</td>
<td>7.3  7.3  7.3</td>
<td>8.3</td>
<td>8.3</td>
<td>8.3</td>
<td>1.7  1.7  1.7</td>
<td>7.3</td>
<td>7.3</td>
<td>7.3</td>
</tr>
<tr>
<td>13</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>80-100 ft2/ac</td>
<td>11.1</td>
<td>11.1</td>
<td>11.1</td>
<td>9.8  9.8  9.8</td>
<td>11.1</td>
<td>11.1</td>
<td>11.1</td>
<td>2        2        2</td>
<td>9.8</td>
<td>9.8</td>
<td>9.8</td>
</tr>
<tr>
<td>14</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>80-100 ft2/ac</td>
<td>108.7</td>
<td>108.7</td>
<td>108.7</td>
<td>95.7  95.7  95.7</td>
<td>108.7</td>
<td>108.7</td>
<td>108.7</td>
<td>19.1  19.1  19.1</td>
<td>95.7</td>
<td>95.7</td>
<td>95.7</td>
</tr>
</tbody>
</table>

107 Acreages are approximate and rounded to nearest 0.1. All acres are estimates used for planning purposes and were generated using the Forest’s Geographic Information System (GIS), ground measurements or digitized imagery. Actual sub-treatment acreages may range from this number based on site specific conditions at the time of implementation.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Plantation Thin: Radial Thin</td>
<td>80-100 ft2/ac</td>
<td>5.9</td>
<td>5.9 5.9 5.9</td>
<td>5.9 5.9 5.9</td>
<td>1.2 1.2 1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mech.</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>16</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>80-100 ft2/ac</td>
<td>57.8</td>
<td>57.8 57.8 57.8</td>
<td>57.8 57.8 57.8</td>
<td>10.2 10.2 10.2</td>
<td>11.7 11.7 11.7</td>
<td></td>
<td>10.2 10.2 10.2</td>
<td>Mech. Y Y Y ta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115-16</td>
<td>Underburn Only</td>
<td></td>
<td>12.8</td>
<td>12.8 12.8 12.8</td>
<td>12.8 12.8 12.8</td>
<td>10.2 10.2 10.2</td>
<td>11.7 11.7 11.7</td>
<td></td>
<td>10.2 10.2 10.2</td>
<td>Mech. Y Y Y ta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>80-100 ft2/ac</td>
<td>84.9</td>
<td>84.9 84.9 84.9</td>
<td>84.9 84.9 84.9</td>
<td>14.9 12.1 14.9</td>
<td>17.2 14 17.2</td>
<td></td>
<td>74.7 60.5 74.7</td>
<td>Mech. Y Y Y ta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Underburn Only</td>
<td></td>
<td>16.2</td>
<td>16.2 16.2 16.2</td>
<td>16.2 16.2 16.2</td>
<td>14.9 12.1 14.9</td>
<td>17.2 14 17.2</td>
<td></td>
<td>74.7 60.5 74.7</td>
<td>Mech. Y Y Y ta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Plantation Thin</td>
<td>75 TPA</td>
<td>9.5</td>
<td>9.5 9.5 9.5</td>
<td>9.5 9.5 9.5</td>
<td>8.4 8.4 8.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mech.</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>110</td>
<td>Plantation Thin: With Meadow Enhancement</td>
<td>75 TPA</td>
<td>41.6</td>
<td>41.6 41.6 41.6</td>
<td>41.6 41.6 41.6</td>
<td>41.6 41.6 41.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mast.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>Underburn Only</td>
<td></td>
<td>14.5</td>
<td>14.5 14.5 14.5</td>
<td>14.5 14.5 14.5</td>
<td>14.5 14.5 14.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-----------</td>
<td>------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>-----------------------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>-----------</td>
</tr>
<tr>
<td>113</td>
<td>Plantation Thin:</td>
<td>75 TPA</td>
<td>37.1</td>
<td>37.1</td>
<td>37.1</td>
<td>37.1</td>
<td>15</td>
<td>15</td>
<td>32.6 32.6 32.6 15 15 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interplant</td>
<td></td>
<td>37.1</td>
<td>37.1</td>
<td>37.1</td>
<td>37.1</td>
<td>15</td>
<td>15</td>
<td>32.6 32.6 32.6 15 15 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>Plantation Thin</td>
<td>100 TPA</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4</td>
<td>12.4 12.4 12.4 12.4 12.4 12.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Plantation Thin</td>
<td>100 TPA</td>
<td>15.3</td>
<td>15.3</td>
<td>15.3</td>
<td>15.3</td>
<td>15.3</td>
<td>15.3</td>
<td>15.3 15.3 15.3 15.3 15.3 15.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>Plantation Thin</td>
<td>100 TPA</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7 11.7 11.7 11.7 11.7 11.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>Plantation Thin</td>
<td>100 TPA</td>
<td>28.9</td>
<td>28.9</td>
<td>28.9</td>
<td>28.9</td>
<td>28.9</td>
<td>28.9</td>
<td>28.9 28.9 28.9 28.9 28.9 28.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>122</td>
<td>Underburn Only</td>
<td></td>
<td>5.8</td>
<td>5.8</td>
<td>5.8</td>
<td>5.8</td>
<td>5.8</td>
<td>5.8</td>
<td>5.8 5.8 5.8 5.8 5.8 5.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>Plantation Thin:</td>
<td>75 TPA</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7 15.7 15.7 15.7 15.7 15.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interplant</td>
<td></td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7</td>
<td>15.7 15.7 15.7 15.7 15.7 15.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>Plantation Thin:</td>
<td>75 TPA</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1 33.1 33.1 33.1 33.1 33.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interplant</td>
<td></td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1</td>
<td>33.1 33.1 33.1 33.1 33.1 33.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>Plantation Thin:</td>
<td>75 TPA</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1 10.1 10.1 10.1 10.1 10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interplant</td>
<td></td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1 10.1 10.1 10.1 10.1 10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>Underburn Only</td>
<td></td>
<td>141.6</td>
<td>141.6</td>
<td>141.6</td>
<td>141.6</td>
<td>141.6</td>
<td>141.6</td>
<td>141.6 141.6 141.6 141.6 141.6 141.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------------</td>
<td>-----------</td>
<td>------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-------------------------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------</td>
<td>------------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>151</td>
<td>Thinning of Natural Stand</td>
<td>150 ft2/ac</td>
<td>49.7</td>
<td>49.7</td>
<td>43.7 43.7 0 49.7</td>
<td>49.7</td>
<td></td>
<td></td>
<td>43.7 43.7</td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>152-1</td>
<td>Thinning of Natural Stand: Radial Thin, Group Selection, Skips, Plant Groups</td>
<td>125-175 ft2/ac</td>
<td>107.8</td>
<td>98.7 107.8 94.9 86.9 94.9</td>
<td>108 98.7 107.8</td>
<td>9.5 8.7 9.5 21.8 20 21.8</td>
<td>10.5 10.5 10.5 94.9 86.9 94.9</td>
<td>20 20 20</td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>152-2</td>
<td>Underburn Only</td>
<td>8.4</td>
<td>8.4 8.4</td>
<td>8.4 8.4 8.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>153</td>
<td>Thinning of Natural Stand: Radial Thin</td>
<td>125-175 ft2/ac</td>
<td>103.7</td>
<td>103.7 91.3 91.3 0</td>
<td>103.7 103.7</td>
<td>21 21</td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>154</td>
<td>Thinning of Natural Stand</td>
<td>125-175 ft2/ac</td>
<td>118.4</td>
<td>85.1 118.4 104.2 74.9 104.2</td>
<td>118.4 85.1 118.4</td>
<td>9 9 9 104.2 74.9 104.2</td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>154</td>
<td>Underburn Only</td>
<td>33.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>Thinning of Natural Stand: Radial Thin</td>
<td>125-175 ft2/ac</td>
<td>103.5</td>
<td>103.5 103.5 91.1 91.1 91.1</td>
<td>103.5 103.5 103.5</td>
<td>21 21 21</td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>156</td>
<td>Underburn Only</td>
<td>89.9</td>
<td>89.9</td>
<td>89.9 89.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>156-6</td>
<td>Underburn Only</td>
<td>48.8</td>
<td>48.8</td>
<td>48.8 48.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mech. Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
<td>------------</td>
<td>------------------</td>
<td>----------------</td>
<td>---------------------------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------</td>
<td>-----------</td>
<td>----------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>157</td>
<td>Thinning of Natural Stand: Radial Thin</td>
<td>125-175 ft²/ac</td>
<td>154.5</td>
<td>154.5</td>
<td>154.5</td>
<td>154.5</td>
<td>154.5</td>
<td>154.5</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>157-U</td>
<td>Underburn Only</td>
<td></td>
<td>0.4</td>
<td>0.4</td>
<td></td>
<td>0.4</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>158</td>
<td>Thinning of Natural Stand: Radial Thin, Interplant</td>
<td>80-140 ft²/ac</td>
<td>135.7</td>
<td>135.7</td>
<td>135.7</td>
<td>135.7</td>
<td>135.7</td>
<td>135.7</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>158-U</td>
<td>Underburn Only</td>
<td></td>
<td>0.4</td>
<td>0.4</td>
<td></td>
<td>0.4</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>Thinning of Natural Stand: Radial Thin, Interplant</td>
<td>80-140 ft²/ac</td>
<td>63.7</td>
<td>63.7</td>
<td>63.7</td>
<td>63.7</td>
<td>63.7</td>
<td>63.7</td>
<td>12.9</td>
<td>12.9</td>
<td>12.9</td>
<td>12.9</td>
<td>12.9</td>
</tr>
<tr>
<td>159-U</td>
<td>Underburn Only</td>
<td></td>
<td>2.5</td>
<td>2.5</td>
<td></td>
<td>2.5</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>Thinning of Natural Stand: Group Selection, Plant Groups</td>
<td>125-150 ft²/ac</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
</tr>
<tr>
<td>161</td>
<td>Thinning of Natural Stand</td>
<td>150 ft²/ac</td>
<td>33.3</td>
<td>33.3</td>
<td>29.3</td>
<td>29.3</td>
<td>29.3</td>
<td>0</td>
<td>33.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

A-10 Shasta-Trinity National Forest
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>80-140 ft²/ac</td>
<td>84 84 84</td>
<td>73.9 73.9 73.9</td>
<td>84 84 84</td>
<td></td>
<td></td>
<td></td>
<td>17 17 17</td>
<td>73.9 73.9 73.9</td>
<td>17 17 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>162</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>100-150 ft²/ac</td>
<td>88.9 87 88.9</td>
<td>78.2 76.6 78.2</td>
<td>88.9 87 88.9</td>
<td></td>
<td></td>
<td></td>
<td>15 15 15</td>
<td>78.2 76.6 78.2</td>
<td>15 15 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>1.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>100-150 ft²/ac</td>
<td>30.7 30.7 30.7</td>
<td>27 27 27</td>
<td>30.7 30.7 30.7</td>
<td></td>
<td></td>
<td></td>
<td>5 5 5</td>
<td>27 27 27</td>
<td>5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>Thinning of Natural Stand</td>
<td>125-175 ft²/ac</td>
<td>27.8 27.8 27.8</td>
<td>24.5 24.5 24.5</td>
<td>27.8 27.8 27.8</td>
<td></td>
<td></td>
<td></td>
<td>24.5 24.5 24.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>125-175 ft²/ac</td>
<td>12.1 12.1 12.1</td>
<td>10.6 10.6 10.6</td>
<td>12.1 12.1 12.1</td>
<td></td>
<td></td>
<td></td>
<td>2.1 2.1 2.1</td>
<td>10.6 10.6 10.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>Thinning of Natural Stand</td>
<td>125-175 ft²/ac</td>
<td>4.9 4.9 4.9</td>
<td>4.3 4.3 4.3</td>
<td>4.9 4.9 4.9</td>
<td></td>
<td></td>
<td></td>
<td>4.9 4.9 4.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>168-1</td>
<td>Thinning of Natural Stand</td>
<td>125-175 ft²/ac</td>
<td>6.5 6.5 6.5</td>
<td>5.7 5.7 5.7</td>
<td>6.5 6.5 6.5</td>
<td></td>
<td></td>
<td></td>
<td>5.7 5.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>168-2</td>
<td>Underburn Only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>169</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>125-175 ft²/ac</td>
<td>32.2 32.2 32.2</td>
<td>28.3 28.3 28.3</td>
<td>0 32.2 32.2</td>
<td></td>
<td></td>
<td></td>
<td>9 9</td>
<td>28.3 28.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-----------</td>
<td>------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-------------------------------</td>
<td>------------------</td>
<td>----------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
<td>-----------</td>
<td>----------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>Thinning of Natural Stand 100-150 ft²/ac</td>
<td>10.1 10.1 8.9 8.9 0</td>
<td>10.1 10.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>Thinning of Natural Stand 100-150 ft²/ac</td>
<td>16.3 16.3 14.3 14.3 0</td>
<td>16.3 16.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>172</td>
<td>Thinning of Natural Stand 150 ft²/ac</td>
<td>4.7 4.7 4.1 4.1 0</td>
<td>4.7 4.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>Underburn Only</td>
<td>28.3 28.3 28.3</td>
<td>28.3 28.3 28.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>Thinning of Natural Stand 125-175 ft²/ac</td>
<td>12.9 12.9 12.9 11.4 11.4 11.4 12.9 12.9 12.9 11.4 11.4 11.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>Thinning of Natural Stand: Interplant 80-120 ft²/ac</td>
<td>25.7 21.1 25.7 22.6 18.6 22.6 25.7 21.1 25.7 5 5 5 22.6 18.6 22.6 5 5 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>Underburn Only</td>
<td>4.6</td>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>177</td>
<td>Thinning of Natural Stand: Interplant 80-120 ft²/ac</td>
<td>32 32 32 28.2 28.2 28.2 32 32 32 6 6 6 28.2 28.2 28.2 6 6 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>178</td>
<td>Thinning of Natural Stand 100-150 ft²/ac</td>
<td>12.1 12.1 12.1 12.1 12.1 12.1 12.1 12.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>179</td>
<td>Thinning of Natural Stand: Interplant 80-140 ft²/ac</td>
<td>5.4 5.4 5.4 4.8 4.8 4.8 5.4 5.4 5.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-----------</td>
<td>------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>-------------------------------------------</td>
<td>------------------------------------------</td>
<td>-----------</td>
<td>--------</td>
<td>-------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>Thinning of Natural Stand</td>
<td>80-120 ft²/ac</td>
<td>3.5 3.5 3.5</td>
<td>3 3 3</td>
<td>3.5 3.5 3.5</td>
<td>2.2 2.2 2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>125-175 ft²/ac</td>
<td>2.5 2.5 2.5</td>
<td>2.2 2.2 2.2</td>
<td>2.5 2.5 2.5</td>
<td></td>
<td>2.2 2.2 2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>182</td>
<td>Underburn Only</td>
<td>80-120 ft²/ac</td>
<td>36.1 36.1 36.1</td>
<td>36.1 36.1 36.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>80-120 ft²/ac</td>
<td>13.6 13.6 13.6</td>
<td>12 12 12</td>
<td>13.6 13.6 13.6</td>
<td>3 3 3</td>
<td>12 12 12</td>
<td>3 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>202</td>
<td>Underburn Only</td>
<td></td>
<td>14.9 14.9 14.9</td>
<td>14.9 14.9 14.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203</td>
<td>Interplant</td>
<td></td>
<td>12.4 12.4 12.4</td>
<td>12.4 12.4 12.4</td>
<td></td>
<td></td>
<td>6 6 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>204</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>80-120 ft²/ac</td>
<td>15.3 15.3 15.3</td>
<td>13.5 13.5 13.5</td>
<td>15.3 15.3 15.3</td>
<td>4 4 4</td>
<td>13.5 13.5 13.5</td>
<td>4 4 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>205</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>80-120 ft²/ac</td>
<td>114.2 113.3 114.2</td>
<td>29.3 29.3 29.3</td>
<td>114.2 113.3 114.2</td>
<td>60 60 60</td>
<td>100.5 99.7 100.5</td>
<td>60 60 60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>206</td>
<td>Underburn Only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>208</td>
<td>Plantation Thin</td>
<td>100 TPA</td>
<td>27.2 27.2 27.2</td>
<td>23.9 23.9 23.9</td>
<td>27.2 27.2 27.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>214</td>
<td>Underburn Only</td>
<td></td>
<td>6.7 6.7 6.7</td>
<td>6.7 6.7 6.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-----------</td>
<td>------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-------------------------------</td>
<td>-----------------</td>
<td>----------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>------------</td>
<td>-----------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>216</td>
<td>Underburn Only</td>
<td></td>
<td>16.8</td>
<td>16.8</td>
<td>16.8</td>
<td>16.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>217</td>
<td>Underburn Only</td>
<td></td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>218</td>
<td>Underburn Only</td>
<td></td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>221</td>
<td>Underburn Only</td>
<td></td>
<td>9.3</td>
<td>9.3</td>
<td>9.3</td>
<td>9.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>222</td>
<td>Underburn Only</td>
<td></td>
<td>6.7</td>
<td>6.7</td>
<td>6.7</td>
<td>6.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>223</td>
<td>Underburn Only</td>
<td></td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>224</td>
<td>Underburn Only</td>
<td></td>
<td>6.2</td>
<td>6.2</td>
<td>6.2</td>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>226</td>
<td>Interplant</td>
<td></td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>227</td>
<td>Underburn Only</td>
<td></td>
<td>6.7</td>
<td>6.7</td>
<td>6.7</td>
<td>6.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>228</td>
<td>Underburn Only</td>
<td></td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>229</td>
<td>Underburn Only</td>
<td></td>
<td>6.2</td>
<td>6.2</td>
<td>6.2</td>
<td>6.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>Underburn Only</td>
<td></td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
<td>10.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>231</td>
<td>Underburn Only</td>
<td></td>
<td>26.6</td>
<td>26.6</td>
<td>26.6</td>
<td>26.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>233</td>
<td>Plantation Thin</td>
<td>100 TPA</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>234</td>
<td>Thinning of Natural Stand</td>
<td>125-175 ft2/ac</td>
<td>19.8</td>
<td>19.8</td>
<td>17.4</td>
<td>17.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>317</td>
<td>Thinning of Natural Stand: Oak Release Underburn Only</td>
<td>100 TPA</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>318</td>
<td>Underburn Only</td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Elk LSR Enhancement Project

A-14

Shasta-Trinity National Forest
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>346</td>
<td>Underburn Only</td>
<td></td>
<td>54.7</td>
<td>54.7</td>
<td>54.7</td>
<td>54.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>346-U</td>
<td>Underburn Only</td>
<td></td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
<td>3.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>347</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>80-120 ft²/ac</td>
<td>11.5</td>
<td>11.5</td>
<td>11.5</td>
<td>10.1</td>
<td>10.1</td>
<td>10.1</td>
<td>4</td>
<td>4</td>
<td>10.1</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>401</td>
<td>Underburn Only</td>
<td></td>
<td>147.4</td>
<td>147.4</td>
<td>147.4</td>
<td>147.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>402</td>
<td>Meadow Enhancement: Partial Conifer Removal, Underburn</td>
<td>0-60 ft²/ac</td>
<td>518.3</td>
<td>493.9</td>
<td>518.3</td>
<td>378.5</td>
<td>378.5</td>
<td>378.5</td>
<td>518.3</td>
<td>518.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>402</td>
<td>Underburn Only</td>
<td></td>
<td>24.4</td>
<td>24.4</td>
<td>24.4</td>
<td>24.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td>3,483</td>
<td>3,483</td>
<td>3,483</td>
<td>2,962</td>
<td>2,236</td>
<td>2,154</td>
<td>1,969</td>
<td>1,969</td>
<td>1,461</td>
<td>1,402</td>
<td>1,366</td>
</tr>
</tbody>
</table>

**Table Notes**

1. This column shows the maximum estimated need for piling natural and activity-generated surface fuels based on total unit acres minus unthinned patches. Whole-tree yarding where feasible will decrease activity slash within the units and decrease piling needs from activity-generated slash. Piling will not take place unless needed and is constrained to one entry per unit. Table Appendix A-3 starting on page A-31 provides additional estimates of actual piling needs by unit.

2. Estimated need based on estimated acres of planting needed. Only areas that require site prep to assure seedling/sapling survival will actually be site prepped. Mechanical site preparation is most often done using a machine scalp in strips or patches (pods) to peel back thick grasses. All acres are not impacted by site preparation.

3. If thinning or removal of trees 4 to 9.9” DBH is included in the treatment, the most likely method is listed here as either mech.=mechanical removal (whole tree is chipped and removed for biofuel, or mast.=mastication (tree is shredded and left on site).

4. Salvage adaptive management
Silvicultural Prescription Descriptions

The following silvicultural treatment prescriptions for Thinning (Plantation Thinning p. A-21 and Natural Stand Thinning p. A-25), Meadow Enhancement (A-29), and Reforestation (A-27), Aspen restoration adaptive management (p. A-28) and Adaptive Management Salvage (p. A-28) provide general guidance by treatment. The general marking guidelines below provide prescription elements of thinning including designation of unthinned patches (UTPs), habitat roost/rest clumps, tree selection, and other treatments for site specific conditions (for example, the presence of predominant trees, aspen, oak, or sugar pine) within units. Stands may have one to several different prescription elements in order to address site specific conditions and issues of density, insects or disease and to develop and retain key late-successional habitat features.

Thinning prescriptions are discussed in two primary treatment groups: natural stands and plantations. Within each of these primary groups several prescription elements vary by stand conditions. Table Appendix A-2 above lists the treatments by unit, and unit-specific detailed information is provided on the stand record cards in the project record.

Variable density thinning would accomplish all thinning treatments for natural stands and some older plantations. Variable density thinning does not include a singular density target, and instead is a treatment that thins to retain a range of densities by including unthinned patches (UTPs that are also referred to as skips), areas of heavy thinning or small openings (radial release, gaps, or group selections), and thinning within a target basal area range elsewhere within the stand. More information on the placement of designing the UTPs, gaps, group selections and radial release treatments, along with other specifics such as release around oak or aspen are included in the general marking guidelines.

Biomass (4 to 9.9-inch DBH) would be mechanically thinned on a prescribed spacing, or to a prescribed basal area, in those natural and plantation thinning units that have a biomass thinning component as listed in Table Appendix A-2. As an adaptive management strategy dependent on market feasibility at the time of implementation, biomass material may not be mechanically thinned and removed under the implementation contract, but instead treated with a combination of mechanical treatments or hand thinning and left on site or thinned through prescribed fire.

Borate fungicide such as Sporax® or Cellu-Treat® would be applied to stumps over 14 inches in all harvested areas within 4 hours of harvest to prevent the spread of Heterobasidion annosum in all harvested areas as listed in Table Appendix A-2.

General Marking Guidelines

Marking guidelines apply primarily to the natural stands, although they also apply in some plantations, and are meant to be used in conjunction with individual stand prescriptions. Table Appendix A-2 summarizes some of the unit specific information pertaining to how the general marking guidelines are implemented based on unit specific conditions and the resulting unit specific treatments. Additional stand-specific marking instructions are provided on the stand record cards in the project record.

Tree Selection Criteria for Thinning - Conifers

Tree selection for thinning is a process of identifying those trees that are desirable for the habitat objectives, and removing the remaining trees to reduce competition for resources and reduce live ladder and canopy fuels. Trees to be retained would include healthy large overstory dominant trees of all species, healthy pine of any size where pine is underrepresented, a component of healthy small understory and midstory trees, a component of heavily damaged or diseased trees that provide habitat, and all hardwood trees as operationally feasible.
While there is no prescribed upper diameter limit for the project, or within specific treatment units, the largest oldest trees (predominants and dominants) that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops would be retained as long as they are not a safety hazard. In some treatment units, diameter limits are prescribed (e.g., when conducting California black oak release within critical habitat for the northern spotted owl, certain species of snags). All predominant trees would be retained, regardless of their current health/condition when marking. Trees to be removed would primarily be midstory intermediate and smaller co-dominant trees (see exceptions for radial thinning, group selections, oak and aspen release, and meadow enhancement); primarily the shade tolerant white fir that has grown up through the understory over the last several decades because of fire suppression and stand succession. For example, white fir that are larger in relation to adjacent healthy trees of other less common mixed conifer species such as Douglas-fir and incense cedar would be removed in some cases to promote species diversity.

**Desirable (Healthy) Tree** - A tree exhibiting no signs of defect, damage or disease. Crown appears full and vibrant, bole is regular in form without excessive lean. Live crown ratio is 40 percent or greater. Desirable trees should be preferred over acceptable trees as leave trees.

**Acceptable tree** - A tree that may exhibit some minor defect, damage or disease, but these characteristics are not excessive - defect, damage or disease is not expected to appreciably reduce tree growth or its ability to survive into the future. Live crown ratio is 30 percent or greater. Where they exist, desirable trees should be selected for leave over acceptable trees.

**Unacceptable Tree** - A tree exhibiting damage, successful insect attack, defect or disease such that the tree is not expected to thrive or survive long term, or the tree poses as an undesirable vector for the spread of disease. Predominant trees or trees with late-successional characteristics are not included under this definition, all large predominant trees are to be retained. Unless exceptions are stated in the unit-specific silvicultural prescription, trees with the following characteristics should not be considered for leave trees:

1. A live crown ratio less than 30 percent.
2. Fading, thinning, off-color foliage dominating the crown appearance.
3. It is suppressed.
4. It is leaning more than 15 degrees from vertical – i.e. showing signs of torn or upheaved roots such that the tree is likely to become unstable over time.
5. There is Excessive damage – A tree with 50 percent or more of the circumference of the bole cambium damaged, or occupied by an open and bleeding mistletoe canker, at any location along the stem is classified as excessively damaged. Trees with broken tops in the lower two thirds are classified as excessively damaged and should not be considered as a leave tree. Trees with broken tops in the upper third are not considered excessively damaged if they are not expected to prevent the tree from reaching maturity. These trees should only be left if no better formed trees meeting "leave tree" exist to meet prescription objectives.
6. There is Excessive disease/insect attack – the following describes symptoms of the most common diseases in the project area and western pine beetle activity:
   a. Dwarf Mistletoe - The Hawksworth six point rating system is used to determine the level of dwarf mistletoe infection\(^{108}\) in host trees. Trees bearing visible dwarf mistletoe plants on the trunk or have a Hawksworth rating of 4 or greater for the tree should be classified as being excessively damaged. Where dwarf mistletoe is present, select healthy non-infected trees regardless of species.

---

\(^{108}\) Mistletoe "infection" refers to visible dwarf mistletoe fruiting bodies. Damage caused by prior infections, such as witches brooms, should not be factored into a dwarf mistletoe rating without seeing fruiting bodies.
first, then infected trees with a Hawksworth rating of 3 or less as leave trees in order to meet stocking (basal area or spacing) requirements. Infected trees are rated as follows:

1. Divide the crown into thirds
2. Rate each third separately as follows:
   
   0 = No infection
   1 = Less than 50% of the branches infected, or infection on the stem.
   2 = More than 50% of the branches infected.
   3 = Add ratings of thirds to obtain rating of total tree.

7. White Pine Blister Rust - This disease and its accompanying symptoms apply to sugar pine and western white pine only. These trees should be considered as excessively blister rust infected if they are bearing any visible blister rust cankers on the trunk or branches. Branch cankers can appear as "flags" in which all the branch needles turn brown. Dead branches void of needles should not be considered blister rust infected unless cankers are visible where the branch extends from the bole.

8. Western Pine Beetle – Successful attacks by beetles are visible by red pitch tubes that have a clear opening or evidence of red frass on the ground or in bark crevices below. Pitch tubes that are white or clear are signs of unsuccessful attack. Western pine beetle typically attack near the center of the tree bole. Large patches of exposed inner bark from woodpeckers feeding on beetle larvae are another indicator of successful beetle attack. Trees crowns typically begin to fade from pale green to red usually within one year of a successful attack. Within the Elk project area and with extended drought conditions, it is unlikely that trees with successful pine beetle attacks will survive long term. With the exception of predominant trees, trees showing signs or symptoms of successful beetle attack should be removed unless they are to be counted towards snag retention objectives.

Density/Fuels Thinning
Thin the portions of the stands not retained as unthinned patches or treated under the other prescription elements described below, to a range of stand-specific basal areas provided (see individual stand prescriptions). Generally retain the largest healthiest trees and remove suppressed and intermediate trees with exceptions (see below). Recognizing that historically most stands in the eastern and southeastern portions of the project area were pine dominated with a mix of species; promote pine health and survival and emphasize removal of encroaching shade tolerant trees while retaining structural and species diversity in these areas.

Basal area can vary by locale to select the healthiest trees and promote diversity while maintaining the desired stand average basal area. Most stands have a target basal area range rather than a single basal area value, to meet the variable density thinning objectives. The stand specific prescriptions describe when to thin to a lower or higher basal area, depending on the presence of disease, species mix and average tree diameter. As a general rule of thumb, consider varying the basal area by 20% of the target average at any locale to achieve stand health and habitat objectives. Objectives of variable density thinning include reducing overstocking while promoting stand structure variability, biological diversity and characteristics of old-growth forests by inducing fine-scale variation in homogeneous second-growth forest canopies and is expected to facilitate the development of the structural and functional characteristics of late-successional forests. Retain all large predominant trees of any species and health, as operationally feasible and where not a safety hazard.

Unthinned Patches
Retain at least ten percent of a unit proposed for thinning within LSR allocation in an unthinned condition. Unthinned patches would be selected based on the presence of features that provide processes and conditions such as thermal cover, natural suppression and mortality. These features include dense pockets of trees (large or small), trees with cavities, trees with deformed or decadent limbs, large snags, large down logs,
undisturbed debris, and dense or multi-layered forest attributes. They may also include openings with dense brush, small trees, or other vegetation that contributes to natural size differentiation.

Unthinned patches would vary in size and placement across the LSR and while fire (during underburning) would be allowed to creep into these areas, there would be no direct ignition within some unthinned patches (RPM 24 p. 88 and RPM 30 p. 89).

Snag retention areas may comprise some of the unthinned patches in heavy mortality areas when the other features are not available to achieve the minimum ten percent threshold. Where safely feasible in LSR, snag retention areas (ranging from 5 to 10 acres) will be strategcally located within or adjacent to existing mortality pockets. Snag retention areas will be at least 150 feet from System roads that will remain open after project completion or 300 feet from private property boundaries. Snag retention areas will consist of a range of size classes and species with a preference for areas that contain larger diameter snags (≥24 inches) with a live tree component for wind-throw protection and little to no understory regeneration in known black stain infection areas. Retention areas will be delineated by the project wildlife biologist. Units 158, 162, 175, 176, 204 and 206 are known to be affected by mortality and likely to have snag retention areas. No piling, reforestation or other mechanical activities will occur in these areas under the project.

Habitat Roost/Rest Clumps
These are distinct groups of tightly spaced overstory trees/snags, often with late-successional characteristics and with smaller (<10-inch size class) shade tolerant trees growing underneath that provide avian and bat roosting or fisher or Pacific marten rest and potential den sites. Clumps would be composed of white fir, cedar, sugar pine or Douglas-fir, or any combination thereof and usually consist of a grouping of 3 to 6 trees/snags growing tightly spaced, with decadent branching, cavities, defect, or broken tops with smaller (<10-inch size class) trees surrounding the larger live or dead trees. Clumps can range from a tight grouping of trees/snags to an area about 1/10 acre or larger. These clumps would be retained at the rate of at least 4 to 6 small clumps per acre and at least 3 larger clumps per acre and These habitat features are one element of consideration when marking for the low or high end of a variable density basal area target.

Radial Release – Predominant Pine
Conduct radial thinning around large legacy pine to reduce density, remove fuels and promote tree vigor and long term survival. Large "legacy" predominant trees are trees that are distinctly older and larger than trees in the main canopy layer of a stand. Radial thin around a maximum of two legacy pine per acre, except unit 157 which is a maximum of four trees per acre, where specified in the stand prescription. Generally remove all smaller diameter trees within a 50 foot radius of the bole except for other predominant legacy trees of any species. Select legacy pine that appear the most healthy and likely to survive long term (refer to attachment 1 as an aid in determining tree health and selection priority). Focus radial release where thinning can have the greatest beneficial effect: on pine that are relatively healthy and are crowded by advanced second growth trees, often shade tolerant white fir. Some dominant trees surrounding the predominant legacy tree may be removed.

Sugar pine and hardwood retention
Retain healthy sugar pine that do not show symptoms of white pine blister rust, are not suppressed or heavily damaged and otherwise are expected to survive long term. In unique instances of sugar pine aggregates, sugar pine may be thinned to reduce density and achieve target basal area, but otherwise healthy sugar pines are priority for retention.

Retain and promote oak and aspen as described below (p. A-20 to A-21), unless as otherwise prescribed within critical habitat for the northern spotted owl. Thin overtopping conifers not otherwise designated for retention (for example do not remove predominant trees or trees with late-successional characteristics).
Snag Recruitment

Live trees with decadent late-successional characteristics may count towards the snag retention objective (see RPM 40a, page 91) where snags are not available.

Black stain or western pine beetle (WPB)

Pockets of western pine beetle mortality ranging from a few trees to large expanses occur throughout the project area. In this project area and vicinity, pine beetle mortality is frequently tied to black stain root disease – a vascular disease that weakens the trees and predisposes them to insect attack. Where black stain root disease is detected or deemed likely, basal area retention is lower than prescribed elsewhere.

Map and notify the Silviculturist or project coordinator of any areas of suspected black stain root disease. Symptoms of black stain disease include reduced growth and fading of crowns, slow or rapid decline (slower in old trees and faster in young trees), and crown wilt. Another indicator of black stain is trees in different stages of mortality, typical of root disease infection centers, instead of a uniform onset of mortality, typical of mass attacks by bark beetles.

Western pine beetle mortality in ponderosa pine occurs throughout the project area and is expected to be ongoing. Trees (other than large predominant pine) that are recently dead, or have been successfully attacked and are dying or likely to die should be removed to reduce future fuel loadings, when they are not needed to meet wildlife snag retention needs.

Because of rapid decay, these trees may have little or no merchantable value at the time of harvest. These trees would be designated for removal.

Riparian Reserves

Equipment may enter into Riparian Reserves; trees may be removed that can be reached from the edge of the equipment exclusion zone (such as equipment using a boom arm). Do not designate trees for removal that cannot be reached by equipment from the edge of the equipment exclusion zone. This generally means trees may be removed that are 20’ or less from the equipment exclusion zone edge.

Gaps and Group Selections in Dense White Fir

Group selection is the creation of small openings (or gaps) to provide for regeneration of a new age and often species class, while leaving most of a stand’s overstory intact. Group selection is a tool to develop species and age/size diversity in stands that lack heterogeneity. Group selection is also a tool to regenerate pine, which requires high amounts of direct sunlight if they are to thrive and survive to grow into the overstory. Young pine in contrast to white fir are not shade tolerant and do not survive well in a shaded understory environment. In order to regenerate pine in areas of dense homogenous white fir that have developed because of past management practices and the exclusion of natural frequent fire, group selection and gap creation would occur in several natural stands. To a limited extent, create group selections of 1 to 2 acres for pine regeneration and in stands with homogenous white fir create small gaps in the canopy openings of 1/10 to ¼ acre to develop structural heterogeneity for natural understory vegetation development.

Unit-specific installation of groups and gaps in dense even-aged white fir are further described in the stand specific prescriptions in the project record and pertain to LSR natural stands 151, 152-1, 153, 160, 170, and 178.

Oak Release

Release oaks 4 inches DBH and greater by removing adjacent conifers. Do not remove predominant (legacy) trees, dominant trees that have late-successional characteristics or healthy sugar pine (not infected with blister rust) when releasing oaks. Using a quadrant system, remove all conifers within 30’ of the dripline of oaks 4 inches DBH and greater to the west, north and east, remove all conifers within 60’ of the dripline in the south
quadrant. Use directional felling away from oaks to minimize damage to oak (especially when interlocking crowns). This in effect makes an egg-shaped clearing around the released oak – see diagram in Table Appendix A-2. Units 6, 14, 153, 154, 155, 165, 168-1, 170, 173, 178, and 317 are known to contain oak. (unit 318, 168-2 are also known to contain oak however it is not a thinning unit therefore the oak release treatment would not be applied).

**Oak Release in Critical Northern Spotted Owl Habitat**

In units 6, 14, 153, 161, 168-1, 169, 170, 171, 172, 178 and 235, do not remove Douglas-fir, sugar pine or incense cedar ≥24 inches DBH within the oak prescription radius. In addition, some conifers would be retained around oak that have cavities or good resting or denning structure for fisher, roosting structure for NSO, or where release would damage the oak. This occurs primarily in units 153 and 178, but also in 155, 165 and 154.

**Aspen Release**

Thin around aspen clones to remove conifer encroachment. Remove conifers for a distance of 150 feet from the most distal live aspen tree or sprout. Retain large predominant conifers regardless of species or health or density. Additionally retain healthy sugar pine 10 inches DBH or larger for a combined total of up to 10 trees per acre (waive the 10 conifer tree maximum only if large predominant trees are in excess of 10 TPA.) Ten trees per acre equates to approximately 70 foot spacing to reflect estimated pre-settlement forest conditions. Favorably select trees with late-successional characteristics for retention where available. Aspen are known to occur in units 157, 175, 402 and 318 (although 318 is not prescribed for release except through underburning). The 150 foot buffer may extend into adjoining units (units 112 and 317) if near a boundary, but would be truncated at project area boundaries. The release treatment would be applied to other areas if additional aspen are located.

**Plantation Thinning**

Plantation thinning prescriptions are prescribed by age of the plantation then further divided by variations based on site specific conditions. The age division is made for younger plantations at 39 or younger and older plantations at 40 or older. Within older pine plantations, group selections are proposed in dense homogenous stands to facilitate development of multiple-canopied and multiple-species stands that will be more resilient to stocking pressure, drought stress and disease and insect impacts. Group selections would comprise up to 20 percent of a stand and would be re-planted with a mix of conifer species to increase diversity. Group selections may range from approximately one to two acres.

Biomass material would be thinned through mastication or thinned mechanically and removed as noted for each unit in Table Appendix A-2. Tree selections will be made per the general marking guidelines as described starting page A-16 and as applicable for each unit conditions.

Table Appendix A-2 also lists borax applications for stumps greater than 14 inches to inhibit the spread of *Heterobasidion* root disease.

---

109 Jerry Franklin described that success has been observed when you remove conifers from 2 times the individual oak's dripline distance; and then on Southwest / South aspects, remove conifers within 1/2 the dominant tree height. (Franklin, 2013). In order to provide uniformity and feasibility the oak release treatment described was developed for the Elk project based on this information.
The thinning prescription for plantations varies not only by age and conditions, but also by site-specific features such as bordering the Elk Flat meadow or the presence of black stain root disease or western pine beetle.

**Young Plantation Thin**

Young Plantation Thinning is prescribed for units 1, 106, 107, 114, 115, 116, 117, 208 and 233 which are ponderosa pine plantations ranging from 10 to 39 years since establishment with scattered residual pole to young mature overstory. The objective is to reduce density for stand plantation development, remove ladder fuels and retain and promote species diversity as available. Trees within some of the 20 to 30 year-old plantations, pre-commercial thinning of trees less than 8 inches DBH would be removed by either mechanical thinning, hand thinning or mastication. utilized to reduce future stand density. If treatments of larger size material (8 to 9.9 inches) are warranted, this material would be harvested as biomass. Black stain root disease has been observed in some of the younger plantations (e.g., unit 113) and appears to be spreading. The thinning prescription varies by site specific features such as bordering the Elk Flat meadow or the presence of black stain or western pine beetle. This prescription would:

- thin trees 4 inches DBH and larger to 75 trees per acre (TPA) to an average 24 foot spacing (+-4 feet) (units 1, 106, 107), or to 100 TPA to an average 21 foot spacing (+-4 feet) (units 114, 115, 116, 117, 208, 233),
- retain generally the healthiest larger trees,
- promote species diversity and structural heterogeneity through favoring minor species while considering tree health for diversity, and crown position (e.g. suppressed, dominant, etc.),
- remove ladder fuels adjacent to healthy residual larger trees,
- apply borax fungicide to stumps greater than 14 inches in those units likely to have stumps above 14 inches (106, 115, 116, and 208.)

**Young Plantation Thin with Meadow Enhancement**

Plantation stands 110 and 126 would be thinned as described in the young plantation prescription described above (thinning to 75 TPA and 100 TPA, respectively), and will be thinned more heavily to enhance meadow habitat within 100 feet of the Elk Flat meadow. The meadow enhancement would:

- create a “feathered” effect near the meadow edge by thinning to approximately 25 TPA on an average spacing of approximately 42 feet (+-8 feet),
- favor leaving pine near the meadow edge, and
- leave a few small groups (2 to 4 trees) of naturally clumped healthy co-dominant trees to reflect natural stand development, while staying near 25 TPA average.

**Young Plantation Thin with Interplant in Areas with Black stain or Western Pine Beetle (WPB) Mortality**

The “young plantation thin with interplant” prescription applies to those young ponderosa pine plantations with recent mortality from black stain root disease or Western Pine Beetle activity. These plantations have
moderate/WPB varying to high levels of mortality, and often include scattered residual pole to young mature overstory trees (e.g. units 113, 123, 124 and 125). This prescription would:

- thin trees 4 inches DBH and larger to create buffer zones around mortality pockets and promote survival and growth of remaining pine,
- favor retention of non-susceptible species especially adjacent to areas of pine mortality,
- remove ladder fuels adjacent to healthy residual larger trees,
- remove all pine symptomatic of black stain and remove pine within 100 feet of symptomatic trees and mortality pockets,
- retain any healthy non-susceptible trees within buffer zones,
- outside of mortality pockets and the 100’ buffer zones, thin pine to an average 50’ spacing to avoid root-to-root contact and maximize growth,
- retain healthy non-susceptible trees within these thinning areas up to an average of 24’ spacing. In other words, there should be 50’ spacing between pine but other tree species can be retained in between the pine as they are available,
- select the healthiest largest trees for retention, favoring minor species for diversity,
- interplant mixed species in existing mortality openings to increase diversity and provide a disease barrier, and
- apply borax fungicide to stumps greater than 14 inches in those units likely to have stumps above 14 inches (unit 124.)

Young plantations that are not excessively dense and are not showing signs of disease would be treated with prescribed underburning. In most instances, these plantations do not contain heavy surface fuel loadings; rather, fire would creep through some areas and naturally extinguish in others. Including these plantations in prescribed underburning treatments makes for efficiency of implementation, reducing ground disturbance impacts from creation of fire lines and more closely reflects the frequency of a natural fire disturbance.

**Older Plantation Thinning**

The “older plantation” prescription applies to plantations that are currently 40 to 50 years old (units 6, 7, 12, 13, 14, 15, 16 and 18). Stocking is very dense and these plantations are at high risk for bark beetle attacks. Basal areas generally range from 180 to 240 square feet with average diameters of 16 to 22 inches DBH. The prescription reduces stand density to reduce risk of future beetle attacks, breaks up fuel continuity and promotes species and structural diversity and encourages the healthy growth of residual trees. Group selections would contribute toward development of a second age class and increases species diversity by interplanting a mix of conifer species. This prescription would:

- Retain species and structural diversity with trees that are expected to survive long term into the future while meeting fuels and stand density objectives.

---

110 Unit 113 includes a Riparian Reserve and the guidelines for Riparian Reserves included in the general marking guidelines would be applied.
- Retain an average basal area between 80 to 100 square feet (can vary by locale from approximately 60 to 120 square feet. Generally, basal area should not exceed 120 square feet except within unthinned patches or natural aggregates of mixed species composition with generally larger trees sizes.) Where black stain root disease is detected or deemed likely, basal area retention would be lower than prescribed elsewhere.

- Retain all healthy sugar pine that do not show symptoms of white pine blister rust, are not suppressed or heavily damaged and otherwise are expected to survive long term.

- Retain and promote all oak. Thin conifers from oaks 4 inches DBH or larger as described on page A-20.

- Retain all large predominant trees of any species and health. Implement radial thinning around residual larger pines in units 12, 13, 14, 15, 16 and 18 as described on page A-19.

- Install unthinned patches as described on page A-19.

- Conduct radial thinning only around large healthy predominant pine (per general marking guidelines). Thin all trees except for other predominant trees (any species) for a distance of 50’ from the bole of healthy large predominant pine.

- Remove trees in group selections in units 6, 7, 13, 14, 16 and 18 to further promote vegetation structural and species diversity to create openings for natural and planted reforestation to promote a second layer of mixed conifer species. Plant only in group selection areas and with mixed species for diversity and to serve as a disease barrier. The thinning and group selections would also promote shrub, forb and grass growth to a small extent given the created openings.

- Promote diversity through selection of minor species. A healthy smaller conifer (not pine) may be selected as a leave tree over larger adjacent healthy pine only when it is a minor species, is not suppressed, does not appear damaged or diseased and is expected to thrive after thinning. Minor species within the plantations include Douglas-fir, white fir, and incense-cedar.

- Remove trees (other than large predominant pine) to reduce future fuel loadings, that have been successfully attacked and are dying or likely to die when they are not needed to meet Forest Plan, wildlife and LSRA snag retention requirements.

- Apply borax fungicide Borate fungicide such as Sporax® or Cellu-Treat® would be applied to stumps over 14 inches in diameter in all thinned areas within 4 hours of harvest to prevent the spread of Heterobasidion root disease.

Variation for Habitat
As available, the retention of roost/rest clumps for wildlife use and habitat structure, as described for Natural Stand Thinning, would also be retained within older plantations. During the release of California black oak, no sugar pine, Douglas-fir, or incense cedar that are 24 inches DBH or larger would be removed. While these species are less likely to be present within these older ponderosa pine plantations, the plantation units are adjacent to natural stands that may have these species/size classes.)
Natural Stand Thinning

Natural stands prescribed for thinning range from approximately 60 to 120 years old. Natural stand thinning includes a summary of the prescriptions for units 151, 152-1, 153, 154, 155, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168-1, 169, 170, 171, 172, 174, 175, 176, 177, 178, 179, 180, 181, 201, 204, 206, 235, 317, and 347. Natural stand thinning prescriptions are prescribed primarily by target basal areas as listed by unit in Table Appendix A-2 starting on page A-6, and further divided by variations based on site specific characteristics such as northern spotted owl foraging or dispersal habitat, the presence of aspen, oak or insect or disease activity.

The prescriptions in natural stands do not purely thin-from-below as some lower and mid-story trees would be retained (as is consistent with the thin-from-below technique). Residual density in the natural stand thinning units would vary from an average 125 to 175 square feet of basal area per acre, but may be higher or lower depending on species composition and current habitat function for NSO. Depending on the average tree diameter, this equates to approximately 60 to 100 trees per acre. Lower densities would be retained in areas that are predominantly dominated by ponderosa pine, higher densities would be retained in mixed conifer, and white fir dominated stands. Higher densities would also be retained where clumped groups of large trees, and smaller biomass sized (trees <10 inches DBH), occur to provide for age class and structural variability. Instead of applying one target basal area across a stand, the variable density thinning prescription would help promote within-stand structural heterogeneity that contributes to habitat function for late-successional species while providing the needed growing space, nutrients and water for the remaining trees. Biomass thinning would occur in some units through mastication or thinned mechanically and the material removed by means listed in Table Appendix A-2.

In all natural stand thinning units in LSR, and as available, structural components (or clumps) that provide avian or bat roosting or mammal fisher or Pacific marten rest and potential den sites would be retained at the rate of at least four to six small clumps per acre and at least three larger clumps per acre. Clumps would be composed of white fir, cedar, sugar pine or Douglas-fir, or any combination thereof and usually consist of a grouping of three to six trees/snags growing tightly spaced, with decadent branching, cavities, defect, or broken tops with smaller (<10-inch size class) trees surrounding the larger live and or dead trees. Clumps can range from a tight grouping of trees or snags to an area about 1/10 acre or larger.

Borate fungicide such as Sporax® or Cellu-Treat® would be applied to stumps over 14 inches in all harvested areas within 4 hours of harvest to prevent the spread of Heterobasidion root disease.

*Thinning of Natural Stand - Variation for Critical Northern Spotted Owl Habitat*

Thin from below to a target basal area of 150 applies to units 151, 161 and 172 with the following stand specific guidelines. Species retention priority is SP, DF, IC, PP, WF, LP, KP, which is slightly different from the “standard” retention priority in the general marking guidelines.

Unit 151

- Thin smaller understory/midstory and co-dominant trees 4 inches DBH and greater. Focus on removing and retaining the healthiest largest trees.

- On up to 10% of the treatment unit create small gaps between 75 – 115 feet across in areas of white fir dominated smaller trees (gaps would not be installed in areas of healthy pine or large predominant trees) at the rate of no more than one gap on any one acre to develop structural heterogeneity and small openings for natural understory development.
• In addition to unthinned patches, no thinning would occur where pockets or areas of large overstory white fir and cedar occur; these areas may also have a pine component but the key feature is distinct large overstory trees of mixed species, with generally white fir predominant.

Units 161 and 172

• Outside of leave islands, thin from below trees 10 inches DBH and greater up to some codominant trees, as needed (generally 24 inches DBH or less) to retain a fairly closed overstory and understory.

Retain all predominant trees and dominant trees that meet the desirable or acceptable leave tree criteria (see p. A-16)

Thin from below to a target basal area of 150 applies to units 151, 161 and 172 with the following stand specific guidelines. Species retention priority is: Sugar pine (SP), Douglas-fir (DF), incense cedar (IC), ponderosa pine (PP), white fir (WF), lodgepole pine (LP), knobcone pine (KP), which is slightly different than the “standard” retention priority in the general marking guidelines.

Unit 151

• Thin smaller understory/midstory and co-dominant trees four inches DBH and greater. Focus on retaining the healthiest largest trees.

• On up to 10% of the treatment unit create small gaps of 75 to 115 feet across in areas of white fir dominated smaller trees (gaps would not be installed in areas of healthy pine or large predominant trees) at the rate of no more than one gap on any one acre to develop structural heterogeneity and small openings for natural understory regeneration and development.

• In addition to unthinned patches, no thinning would occur where pockets or areas of large overstory white fir and incense cedar occur; these areas may also have a pine component but the key feature is distinct large overstory trees of mixed species, with generally white fir predominant.

Units 161 and 172

• Thin from below trees 10 inches DBH and greater up to some codominant trees as needed (generally 24 inches DBH or less) to retain a fairly closed overstory and understory.

• Retain all predominant trees and dominant trees that meet the desirable or acceptable leave tree criteria (see A-16) which may cause target basal area to be exceeded.

• Leave undesirable overstory trees to meet snag requirements if needed.

Thinning of Natural Stand, Radial Thin, Group Selection, Skips, Plant Groups - Variation for Group selection for Heterobasidion root Disease

In order to regenerate pine in areas of dense homogenous white fir that have developed as a result of past management practices and the exclusion of natural frequent fire, group selections would be installed in units 152-1 and 160 (natural thinning stands) where Heterobasidion root disease has been observed and reforested with pine. Group selections would generally range from one to two acres but would not exceed one acre in natural stand 152-1 in order to retain larger areas of existing late-successional habitat function.
Thinning of Natural Stand, Interplant - Variation for Natural Stand Thinning to Trees per Acre or Hardwood Release

Unit 317 would be thinned from below per the tree selection criteria (page A-16) to a target of 100 TPA (average spacing 20 feet ± 4 feet) with a primary objective of oak release per the oak release prescription on page A-20.

Unit 175 has an aspen component that will be treated per the aspen release prescription (page A-21).

Reforestation

A combination of planting and natural seed fall would provide regeneration. Openings created by mortality pockets approximately one acre or larger would be evaluated for the need to site prep and interplant following thinning or fuels treatments. Pockets of mortality less than one acre are expected to regenerate naturally from seed fall of nearby residual trees. No site prep will occur within Riparian Reserves.

Planting would promote stand resiliency by planting a mix of species that include non-host trees for black stain and *Heterobasidion* root disease, and help assure pine reestablishment in areas where it is lacking. Hand planting would be conducted in mortality openings and in group selections where:

- Natural regeneration is not expected to sufficiently establish within five years of thinning or fuels treatments, typically from a lack of nearby seed source or ground conditions not favorable to natural seedling establishment.

- A mix of tree species is desired to discourage the spread of disease (for example, interplanting non-susceptible pine in pockets of white fir *Heterobasidion* root disease).

- A mix of tree species is desired to promote diversity or certain species are not expected to establish naturally. These may include ponderosa pine, sugar pine, Douglas-fir, incense cedar and hardwoods such as black oak.

All group selections regardless of size, and openings created by mortality pockets two acres or larger would be planted. Openings created by mortality pockets between one and two acres would be evaluated post-treatment for planting needs.

Table Appendix A-2 (starting p. A-6) lists approximate acres of group selections and mortality openings in applicable units.

Mechanical site preparation would be implemented as needed to remove competing understory vegetation, such as grass, prior to planting. Planting areas would be evaluated for site preparation needs after completion of thinning and fuels treatments. Where the need is determined, mechanical site preparation would be conducted in group selections and in large expanses of mortality (generally five acres or larger such as units 113 and 206) or areas of numerous concentrated smaller mortality gaps. Mechanical site preparation is typically completed with a small tractor with a wildland rototiller or drum masticator. Competing vegetation would be treated down to a soil depth of 4 inches to 6 inches to effectively sever grass/forb roots below the root crown and brush below the first lateral root. Where mortality openings are smaller (generally less than 5 acres) and less contiguous, site preparation would be conducted as needed by hand scalping using hand tools.

Planting in areas generally five acres or larger would occur in a pattern of widely spaced clusters or groups of three to five seedlings for a total of approximately 250 trees per acre, otherwise known as cluster planting. Cluster planting helps establish seedling dominance in the vicinity of the cluster. Typically one or two seedlings establish dominance over the others. Later excess smaller saplings may be removed adjacent to the dominant conifers within the clusters. Smaller openings, generally less than 5 acres, would be planted with up to approximately 150 trees per acre scattered as individuals throughout the planted area.
Reforestation treatments would be monitored for the need to control competing vegetation such as grasses, forbs, brush and dense naturally seeded in conifers from the surrounding stand (typically white fir in an area where ponderosa pine is being reestablished) that could inhibit the survival and growth of desirable seedlings. Hand or mechanical cutting of competing vegetation may be implemented within the first one to five years following reforestation, depending on monitoring results. Hand treatments would be most anticipated in the areas of less than five acres that where mechanical site preparation was not utilized.

Interplanting-Only - Units 203 and 226 do not have thinning treatments but mixed species would be interplanted as described above in existing openings after the first entry of prescribed underburning.

Adaptive Management

Aspen Restoration Adaptive Management
Aspen restoration would be completed through the marking guidelines for release of aspen during thinning (see p. A-21). If aspen monitoring indicates clumps or stands are not actively suckering within three years of conifer removal or fuels-only treatments, underburning or mechanical soil disturbance treatments (such as diskig) may be used to stimulate suckering. Use and timing of burning or mechanical treatments will depend on readiness indicated by:

a. An overstory and understory made up primarily or completely of aspen, with few competing conifers present. The overstory condition ranges from vigorous to declining aspen,
b. Newly regenerated trees below or around the edges of a more mature overstory of aspen. Where overstory aspen are declining and dead, lack of a vigorous aspen understory indicates very poor aspen health, and
c. An understory including a diverse plant community of native shrubs, grasses, sedges, rushes and forbs (non-grass flowering plants), free of noxious weeds.

The need for removal of new conifer encroachment or enhancement of aspen age class variability through application of underburning will be assessed on a site-specific basis once the initial objective of aspen establishment as described above is achieved.

If aspen monitoring indicates browse damage at a level that may prevent achievement of healthy aspen establishment, the appropriate type and size of fencing will be installed and maintained until monitoring indicates it is no longer necessary:

a. Deer/Elk fencing constructed of poly mesh on T-posts, with a height of 6 feet or greater.
b. Cattle fencing constructed as a 36 to 48 inch 4-wire let-down fence on T-posts, with the top wire being barbed.

Salvage Adaptive Management
Under adaptive management, salvage of dead and dying pine trees would be included in units experiencing excessive ongoing mortality. The total potential on the harvest acres are listed in Table Appendix A-2 (starting page A-6) and represent what could be subject to salvage in the event conditions deteriorate further post-decision and post-marking. Salvage treatment areas would be defined by white fir and ponderosa pine trees showing symptoms of rapid decline such as: chlorotic foliage and poor needle retention; insect damage (white frass or pitch tubes on white fir; multiple pitch tubes on ¾-bole circumference or with signs of successful attacks on pine). Areas would typically be within or adjacent to larger mortality areas which are signs of an ongoing stocking, insect or disease problem. During any salvage, the snag and CWD retention levels prescribed would be in accordance with the project’s design, and resource protection measures would be met (as would all RPMs and standard operating procedures). The adaptive management would extend only until the area was closed under the implementation contract.
Meadow Enhancement

The meadow enhancement prescription applies to unit 402. Thinning for meadow enhancement is different from thinning a forested stand in that there is no target density level such as a desired basal area or spacing. Rather than manage for a forested stand, the intent is to create conditions more reflective of those found historically; namely few scattered pine within an otherwise open meadow. A tree’s size, age and position – within the meadow and in relation to adjacent trees, are considerations when selecting trees for retention or removal.

Predominant trees would be retained. All other trees that have grown into and along the meadow edges would be removed. A basal area of approximately 60 square feet per acre of the largest diameter trees would be retained where the meadow transitions into conifer stands along the edge. This thinning prescription, combined with the plantation thinning prescription in units 110 and 126 described above, would create a ‘feathered’ effect of few trees within the meadow, transitioning to an open forest stand along the meadow’s edge. Prescribed burning would be utilized every five to ten years after initial treatments to maintain the meadow, mimicking the effects of a historic natural fire regime and serving as an important tool in restoring and enhancing ecological function and processes by promoting soil nutrients, perennial grass and forb regeneration. While prescribed fire would be employed across Elk Flat, it is recognized that vegetation varies and some areas of the meadow will carry fire readily while other areas may not.

Borate fungicide such as Sporax® or Cellu-Treat® would be applied to stumps over 14 inches in all harvested areas within 1 to 4 hours of harvest to prevent the spread of *Heterobasidion annosum*.

Fuels Treatment Descriptions

The fuel treatments described below would comply with the Resource Protection Measures Common to All Action Alternatives (RPMs) (starting on page 84), Standard Operating Procedures (SOPs) (starting p. C-1) and Best Management Practices (starting p. C-3) for all applicable resources. The Standard Operating Procedures for Silviculture and Fuels (SOP 17, p. C-3) describe the required burn plan that would be completed prior to implementation to prescribe the onsite burning conditions, public safety, and measures to implement the project objectives and resource protection measures. Also, see the Standard Operating Procedures for Air Quality on page C-1 for routine practices pertaining to prescribed fire to comply with air quality requirements.

**Underburn**

Underburning or broadcast burning (burning in a stand with little or no overstory, such as the meadow restoration units) involves a prescribed burn utilizing a low to moderate intensity fire, often under a timber canopy. Underburning would be phased in incrementally over the project area (unless restricted by RPMs). Table Appendix A-2 (starting p. A-6) lists units where underburning-only would be implemented without prior thinning. The alternative maps for fuels (Appendix D – Maps) show the fuels prescriptions. Due to the high degree of departure from the natural fire regime, one burn entry is unlikely to achieve the objective of returning the natural role of fire to the ecosystem. Instead, 2 to 3 incremental underburns, repeated every 5 to 10 years would be implemented. The entire area would not be burned in any one year, contributing to a diverse mosaic of treated area conditions. Achieving underburning treatments would require the following connected actions:

- Heavy concentrations of natural or activity-generated coarse woody debris would be machine piled as a pretreatment before underburning to limit adverse fire severity effects to soils, wildlife and overstory trees.

---

111 The terms underburning and broadcast burning may be used interchangeably in this document.
Fire containment methods such as hose lay, sprinkler system, hand line, or mechanical fire line construction may be utilized to reduce impacts to resources of concern including but not limited to cultural sites, visual resources, sensitive plant populations or wildlife habitat. Existing roads would be the primary control lines where practical, resulting in fire moving across unit boundaries. In some unthinned patches, no direct ignition would occur (RPMs 24 p. 88 and RPM 30 p. 89). Control lines to prevent prescribed fire from entering private lands or to manage the fire within the project area would be constructed by hand crews or small to medium crawler tractors where existing barriers are not available. Where resource protection is required, such as to retain large down logs, within sensitive Riparian Reserve areas, or near cultural sites or plant populations, line may be constructed in accordance with the developed resource protection measures.

New fire control lines are approximately 2 feet wide when constructed by hand and up to 8 feet wide where constructed by machine. Construction entails pushing the litter to the outside of the area to be burned, resulting in a small berm of material alongside the line. Some small trees (typically smaller than 10 inches DBH) and brush may be removed where there are limited openings to place the lines. Alternatives 1 and 2 would require up to approximately 9.3 miles of control line with Alternative 3 requiring approximately 10.1 miles as shown in the fuels Alternative 3 map in Appendix D (Figure Appendix D-6).

Natural and activity-generated fuels would be ignited by ground crews or aerial ignition and burned with a low to moderate intensity surface fire. When underburning within unthinned patches, vary the ignition pattern to achieve minimal heat and scorching of residual trees and downed wood and the levels of acceptable mortality for non-thinned areas listed in Table 27 and Table 28 and per RPM 24 (p. 88).

Prescribed burning will be implemented to provide a result in a mosaic of retained levels of live understory vegetation and will be in accordance with the prescribed levels of mortality listed in Table 27 and Table 28, as developed by the resource specialists and as agreed to with the U.S. Fish and Wildlife Service and as described in (see RPM 24.)

Rehabilitation of control lines post-burning includes dragging the bermed material, brush, and small trees back over the line.

Naturally ignited fires would be utilized and managed to accomplish underburning objectives as appropriate.

**Machine Pile and Pile Burn**

Where there are heavy concentrations of coarse woody debris, typically more than 40 tons/ac (or as specified by the Project RPMs such as 11 and 40), machine piling will be utilized as a pretreatment before underburning to increase consumption of excess fuels over what underburning would accomplish.

Treatment-generated and natural fuels in excess of desired retention levels would be piled with mechanized equipment such as an excavator or tractor with a mounted brush rake or grapple designed to minimize soil disturbance.

Post-harvest piling will focus on the high fuel load/mortality pockets and machine piling passes will be limited to the extent needed to reduce fuel loads to the levels described in the resource protection measures.

Treated areas would not be rigorously cleaned of slash material, and duff materials would be largely left in place for soil cover and erosion protection consistent with Forest Soil Quality Standards (Forest Plan p. Appdx. O), RPMs and BMPs.
Piles would be burned when there is low fire danger and per the project burn plan specifications.

Table Appendix A-3 lists units where machine piling and pile burn treatments may occur to address potentially high fuel loading from ongoing mortality. The table lists the maximum potential piling acres (unit acres minus the unthinned patches) and the percentage and acres actually estimated to need piling. Monitoring would determine the actual need and extent of piling at the time of implementation.

Table Appendix A-3. Estimation of Actual Machine Piling by Unit

<table>
<thead>
<tr>
<th>Unit</th>
<th>Treatment Summary</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Piling Acres</td>
<td>Highest % Estimated Need</td>
<td>Estimated Piling Acres</td>
<td>Maximum Piling Acres</td>
</tr>
<tr>
<td>6</td>
<td>Plantation Thin: Group Selection, Plant Groups</td>
<td>51.6</td>
<td>15%</td>
<td>7.7</td>
</tr>
<tr>
<td>12</td>
<td>Plantation Thin: Radial Thin</td>
<td>7.3</td>
<td>5%</td>
<td>0.4</td>
</tr>
<tr>
<td>13</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>9.8</td>
<td>5%</td>
<td>0.5</td>
</tr>
<tr>
<td>14</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>95.7</td>
<td>10%</td>
<td>9.6</td>
</tr>
<tr>
<td>18</td>
<td>Plantation Thin: Radial Thin, Group Selection, Plant Groups</td>
<td>74.7</td>
<td>15%</td>
<td>11.2</td>
</tr>
<tr>
<td>106</td>
<td>Plantation Thin</td>
<td>8.4</td>
<td>20%</td>
<td>1.7</td>
</tr>
<tr>
<td>107</td>
<td>Plantation Thin</td>
<td>9.9</td>
<td>20%</td>
<td>2.0</td>
</tr>
<tr>
<td>112</td>
<td>Underburn Only</td>
<td>14.5</td>
<td>100%</td>
<td>14.5</td>
</tr>
<tr>
<td>113</td>
<td>Plantation Thin: Interplant</td>
<td>32.6</td>
<td>10%</td>
<td>3.3</td>
</tr>
<tr>
<td>115</td>
<td>Plantation Thin</td>
<td>13.5</td>
<td>15%</td>
<td>2.0</td>
</tr>
<tr>
<td>123</td>
<td>Plantation Thin: Interplant</td>
<td>13.8</td>
<td>20%</td>
<td>2.8</td>
</tr>
<tr>
<td>124</td>
<td>Plantation Thin: Interplant</td>
<td>29.1</td>
<td>30%</td>
<td>8.7</td>
</tr>
<tr>
<td>125</td>
<td>Plantation Thin: Interplant</td>
<td>8.9</td>
<td>30%</td>
<td>2.7</td>
</tr>
<tr>
<td>126</td>
<td>Plantation Thin: With Meadow Enhancement</td>
<td>19.2</td>
<td>15%</td>
<td>2.9</td>
</tr>
<tr>
<td>151</td>
<td>Thinning of Natural Stand</td>
<td>43.7</td>
<td>70%</td>
<td>30.6</td>
</tr>
<tr>
<td>152-1</td>
<td>Thinning of Natural Stand: Radial Thin, Group Selection, Skips, Plant Groups</td>
<td>94.9</td>
<td>80%</td>
<td>75.9</td>
</tr>
<tr>
<td>154</td>
<td>Thinning of Natural Stand</td>
<td>104.2</td>
<td>80%</td>
<td>83.4</td>
</tr>
<tr>
<td>157</td>
<td>Thinning of Natural Stand: Radial Thin</td>
<td>136.0</td>
<td>100%</td>
<td>136.0</td>
</tr>
<tr>
<td>158</td>
<td>Thinning of Natural Stand: Radial Thin, Interplant</td>
<td>119.4</td>
<td>80%</td>
<td>95.5</td>
</tr>
<tr>
<td>159</td>
<td>Thinning of Natural Stand: Radial Thin, Interplant</td>
<td>56.1</td>
<td>80%</td>
<td>44.9</td>
</tr>
<tr>
<td>160</td>
<td>Thinning of Natural Stand: Group Selection, Plant Groups</td>
<td>34.3</td>
<td>100%</td>
<td>34.3</td>
</tr>
</tbody>
</table>
### Extensive Mortality Area

An approximate 79-acre area of contiguous pine mortality in units 158, 163, 175, 204 and 206 was identified with little to no opportunity remaining to conduct thinning (see the fuel maps for alternatives in Appendix D). Hazardous conditions from the numerous snags present a safety hazard to project implementers and present a risk to surrounding stands. The Extensive Mortality Area would instead be burned (see discussion of underburning above) to reduce treat heavy fuels, most likely utilizing aerial ignition techniques since it is unsafe to put firefighters on the ground or conduct other machine-based fuels reduction within this area. The Extensive Mortality Area fuels subunit overlays the underlying thinning units, however, no thinning will take place within it. This has been reflected in the greatly reduced harvest acres for unit 206 shown in Table Appendix A-2. The harvest acres for the other underlying units were not adjusted since the acres occupied by the extensive mortality area were not as substantial. The Extensive Mortality Area is not listed separately in Table Appendix A-2 or Table Appendix A-3, but enhances the treatments already described for the underlying units.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Treatment Summary</th>
<th>Alternative 1</th>
<th></th>
<th>Alternative 2</th>
<th></th>
<th>Alternative 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Maximum Piling Acres</td>
<td>Highest % Estimated Need</td>
<td>Estimated Piling Acres</td>
<td></td>
<td>Maximum Piling Acres</td>
<td>Highest % Estimated Need</td>
</tr>
<tr>
<td>162</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>73.9</td>
<td>70%</td>
<td>51.7</td>
<td></td>
<td>73.9</td>
<td>70%</td>
</tr>
<tr>
<td>163</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>78.2</td>
<td>80%</td>
<td>62.6</td>
<td></td>
<td>76.6</td>
<td>80%</td>
</tr>
<tr>
<td>164</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>27.0</td>
<td>80%</td>
<td>21.6</td>
<td></td>
<td>27.0</td>
<td>80%</td>
</tr>
<tr>
<td>165</td>
<td>Thinning of Natural Stand</td>
<td>24.5</td>
<td>30%</td>
<td>7.4</td>
<td></td>
<td>24.5</td>
<td>30%</td>
</tr>
<tr>
<td>166</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>10.6</td>
<td>80%</td>
<td>8.5</td>
<td></td>
<td>10.6</td>
<td>80%</td>
</tr>
<tr>
<td>168-1</td>
<td>Thinning of Natural Stand</td>
<td>5.7</td>
<td>10%</td>
<td>0.6</td>
<td></td>
<td>5.7</td>
<td>10%</td>
</tr>
<tr>
<td>169</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>28.3</td>
<td>80%</td>
<td>22.6</td>
<td></td>
<td>28.3</td>
<td>80%</td>
</tr>
<tr>
<td>174</td>
<td>Thinning of Natural Stand</td>
<td>11.4</td>
<td>60%</td>
<td>6.8</td>
<td></td>
<td>11.4</td>
<td>60%</td>
</tr>
<tr>
<td>175</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>22.6</td>
<td>100%</td>
<td>22.6</td>
<td></td>
<td>18.6</td>
<td>100%</td>
</tr>
<tr>
<td>176</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>28.2</td>
<td>60%</td>
<td>16.9</td>
<td></td>
<td>28.2</td>
<td>60%</td>
</tr>
<tr>
<td>177</td>
<td>Thinning of Natural Stand</td>
<td>12.1</td>
<td>40%</td>
<td>4.8</td>
<td></td>
<td>12.1</td>
<td>40%</td>
</tr>
<tr>
<td>179</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>4.8</td>
<td>100%</td>
<td>4.8</td>
<td></td>
<td>4.8</td>
<td>100%</td>
</tr>
<tr>
<td>181</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>2.2</td>
<td>100%</td>
<td>2.2</td>
<td></td>
<td>2.2</td>
<td>100%</td>
</tr>
<tr>
<td>201</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>12.0</td>
<td>100%</td>
<td>12.0</td>
<td></td>
<td>12.0</td>
<td>100%</td>
</tr>
<tr>
<td>204</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>13.5</td>
<td>100%</td>
<td>13.5</td>
<td></td>
<td>13.5</td>
<td>100%</td>
</tr>
<tr>
<td>206</td>
<td>Thinning of Natural Stand: Interplant</td>
<td>100.5</td>
<td>100%</td>
<td>100.5</td>
<td></td>
<td>99.7</td>
<td>100%</td>
</tr>
<tr>
<td>235</td>
<td>Thinning of Natural Stand</td>
<td>17.4</td>
<td>40%</td>
<td>7.0</td>
<td></td>
<td>17.4</td>
<td>40%</td>
</tr>
<tr>
<td>347</td>
<td>Thinning of Natural Stand</td>
<td>10.1</td>
<td>75%</td>
<td>7.6</td>
<td></td>
<td>10.1</td>
<td>75%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1,461</strong></td>
<td></td>
<td><strong>944</strong></td>
<td></td>
<td><strong>1,402</strong></td>
<td></td>
</tr>
</tbody>
</table>
The unthinned patches within the underlying units primarily consist of the larger snags, as described above in the Unthinned Patch section. The ignition patterns would vary within and around the snag retention areas to reduce impacts to standing snags as well as the natural regeneration and live tree components within and on the periphery of the units.

Hydrologic Restoration Actions

Recontouring
Heavy equipment such as an excavator would be used to recontour old landings followed by seeding to restore floodplains, channels and meadows to pre-disturbance conditions. Recontouring would improve features to allow overland flow, infiltration and groundwater storage across Elk Flat meadow and Ash and Swamp Creek Floodplains. Recontouring would improve or maintain water table depth. Buried large woody debris would add structure to meet natural contours.

Decommissioning of Unauthorized Routes
Routes would be decommissioned as described in the transportation section to remove stream/road interactions, and improve infiltration and function of intermittent channels. Decommissioning near stream interactions would involve recontouring as described above.

Riparian Revegetation
After initial activities are completed, follow-up treatments will include planting and seeding of native riparian and upland (mesic) species that support riparian function. Areas will be planted with riparian vegetation along the channel banks and seeded with shrub species where needed, including within UTP areas. Several old landing areas (outside of UTP areas) will be recontoured and planted within the Ash Creek Riparian Reserve. Road decommissioning in Elk Flat will remove stream crossings along Swamp Creek Riparian Reserves where road runoff has eroded the channel. Planting and seeding will follow recontouring activities.

Thinning in Riparian Reserves
Units proposed for thinning within Riparian Reserves are 113, 154, 157, 163, 347, 152-1 and 152. Thinning as described starting on page A-6 within the Riparian Reserves would increase instream structure. Riparian Reserve thinning, machine pile (outside of EEZs and UTP’s), handpiling and underburning may occur within these units (see also Table Appendix A-4 Part B).

Table Appendix A-4 below lists the actions proposed for hydrologic function restoration.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Feature</th>
<th>Location</th>
<th>RR Acres</th>
<th>RR Length (ft.)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>402</td>
<td>Swamp Creek</td>
<td>U41N10A</td>
<td>3.7</td>
<td>800</td>
<td>UA route parallel to, and crosses channel.</td>
</tr>
<tr>
<td>347</td>
<td>Ash Creek</td>
<td>U41N02YB, U41N02YBA, U41N02YBB</td>
<td>4.4</td>
<td>900</td>
<td>Includes old landings in floodplain.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subtotal 8.1 acres 1,700 ft</td>
</tr>
</tbody>
</table>
# Table Appendix A-4 PART A. Restoration

<table>
<thead>
<tr>
<th>Unit</th>
<th>Feature</th>
<th>Location</th>
<th>RR Acres</th>
<th>RR Length (ft.)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stream Channel and Floodplain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Restoration: Recontour Stream</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Floodplain, Add Low Profile/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Embedded Woody Debris Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>402</td>
<td>Swamp Creek</td>
<td>41N01YC</td>
<td>7.2</td>
<td>1569</td>
<td>Channel Parallel to Road no restoration</td>
</tr>
<tr>
<td></td>
<td>Riparian Reserve Revegetation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Ash Creek</td>
<td></td>
<td>1.11</td>
<td>42</td>
<td>No route.</td>
</tr>
<tr>
<td>107</td>
<td>Ash Creek tributary</td>
<td>41N97, U41N97A</td>
<td>1.23</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Ash Creek</td>
<td>U41N338</td>
<td>1.77</td>
<td>125</td>
<td>100 ft. decommission</td>
</tr>
<tr>
<td>150</td>
<td>Ash Creek</td>
<td></td>
<td>30.40</td>
<td>4241</td>
<td>No routes, 2641 ft. plant, 1600 ft. no plant</td>
</tr>
<tr>
<td>154</td>
<td>Ash Creek</td>
<td></td>
<td>11.81</td>
<td>3220</td>
<td>No routes.</td>
</tr>
<tr>
<td>157</td>
<td>Ash Creek</td>
<td></td>
<td>10.45</td>
<td>330</td>
<td>No routes.</td>
</tr>
<tr>
<td>163</td>
<td>Ash Creek</td>
<td></td>
<td>7.46</td>
<td>2800</td>
<td>No routes.</td>
</tr>
<tr>
<td>180</td>
<td>Ash Creek</td>
<td></td>
<td>3.40</td>
<td>575</td>
<td>No routes.</td>
</tr>
<tr>
<td>346</td>
<td>Ash Creek</td>
<td></td>
<td>17.06</td>
<td>780</td>
<td>No routes.</td>
</tr>
<tr>
<td>152-1</td>
<td>Ash Creek</td>
<td></td>
<td>5.00</td>
<td>1800</td>
<td>No routes.</td>
</tr>
<tr>
<td>152-2</td>
<td>Ash Creek</td>
<td>U41N19XD</td>
<td>3.86</td>
<td>1100</td>
<td>190 ft. route decommission</td>
</tr>
<tr>
<td>346-U</td>
<td>Ash Creek</td>
<td></td>
<td>1.33</td>
<td>115</td>
<td>No route</td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td></td>
<td><strong>94.9</strong></td>
<td><strong>16,127</strong></td>
<td></td>
</tr>
</tbody>
</table>

# Table Appendix A-4-PART B. Approximate Riparian Reserve Acres and Treatment

<table>
<thead>
<tr>
<th>UNIT</th>
<th>RR ACRES (UTPs included)</th>
<th>Planting and Seeding within RR Acres (UTPs included)</th>
<th>Vegetation Treatment within RR (UTP acres excluded)</th>
<th>Fuels Treatment (UTP acres excluded)</th>
<th>Recontouring Past-Landings in RR (Ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>018</td>
<td>1.5</td>
<td>0</td>
<td>Plantation Thin</td>
<td>Machine Pile and Burn (1.5)</td>
<td>0</td>
</tr>
<tr>
<td>106</td>
<td>1.5</td>
<td>1</td>
<td>Plantation Thin</td>
<td>Machine Pile and Burn (1.04)</td>
<td>0</td>
</tr>
<tr>
<td>107</td>
<td>4.6</td>
<td>1</td>
<td>Plantation Thin</td>
<td>Machine Pile and Burn (4.17)</td>
<td>0</td>
</tr>
<tr>
<td>110</td>
<td>2.93</td>
<td>0</td>
<td>Plantation Thin</td>
<td>Machine Pile and Burn (1.72)</td>
<td>0</td>
</tr>
<tr>
<td>113</td>
<td>1.8</td>
<td>1</td>
<td>Plantation Thin Interplant</td>
<td>Machine Pile and Burn (1.72)</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td>30.68</td>
<td>5</td>
<td></td>
<td>Underburn Only</td>
<td>0</td>
</tr>
<tr>
<td>154</td>
<td>12.4</td>
<td>2</td>
<td>Thinning Of Natural Stands</td>
<td>Machine Pile and Burn (11.92)</td>
<td>0</td>
</tr>
<tr>
<td>157</td>
<td>20.5</td>
<td>3</td>
<td>Thinning Of Natural Stands</td>
<td>Machine Pile and Burn (10.91)</td>
<td>Past-Landing Recontouring (0.1 ac, part of one of the larger old landings in floodplains in Unit 347)</td>
</tr>
<tr>
<td>160</td>
<td>0.78</td>
<td>0</td>
<td>Thinning of Natural Stands</td>
<td>Machine Pile and Burn (0.78)</td>
<td>0</td>
</tr>
</tbody>
</table>
Table Appendix A-4-PART B. Approximate Riparian Reserve Acres and Treatment

<table>
<thead>
<tr>
<th>UNIT</th>
<th>RR ACRES (UTPs included)</th>
<th>Planting and Seeding within RR Acres (UTPs included)</th>
<th>Vegetation Treatment within RR (UTP acres excluded)</th>
<th>Fuels Treatment (UTP acres excluded)</th>
<th>Recontouring Past-Landings in RR (Ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>163</td>
<td>16.3</td>
<td>2</td>
<td>Thinning Of Natural Stands</td>
<td>Machine Pile and Burn (7.80)</td>
<td>0</td>
</tr>
<tr>
<td>170</td>
<td>0.87</td>
<td>0</td>
<td>Thinning of Natural Stands</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>171</td>
<td>10.62</td>
<td>0</td>
<td>Thinning of Natural Stands (8.96)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>180</td>
<td>3.4</td>
<td>1</td>
<td>Thinning Of Natural Stands (2.62)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>216</td>
<td>3.85</td>
<td>0</td>
<td>Underburn Only</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>346</td>
<td>14.7</td>
<td>2</td>
<td>Underburn Only</td>
<td></td>
<td>Recontouring Past-Landings (2.45 ac)</td>
</tr>
<tr>
<td>346-U</td>
<td>1.14</td>
<td>1</td>
<td>Underburn Only</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>347</td>
<td>4.4</td>
<td>1</td>
<td>Thinning Of Natural Stands</td>
<td>Machine Pile and Burn (4.3)</td>
<td>Recontouring Past-Landings (Landing 1 = .6 ac, landing 2=.49 ac, landing 3=.67 ac)</td>
</tr>
<tr>
<td>152-1</td>
<td>7.3</td>
<td>1</td>
<td>Thinning Of Natural Stands</td>
<td>Machine Pile and Burn (4.97)</td>
<td>0</td>
</tr>
<tr>
<td>152-2</td>
<td>3.84</td>
<td>1</td>
<td>Underburn Only</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>401</td>
<td>24.97</td>
<td>0</td>
<td>Underburn Only</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>402</td>
<td>68.43</td>
<td>0</td>
<td>Underburn Only (64.94)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>233.6</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Road and Landing Actions

Road actions are those necessary to directly respond to the Purpose and Need for Action or needed to implemented the other actions designed to meet the Purpose and Need for Action. Existing roads and temporary roads would provide access for harvest operations. Consistent with the tree selection criteria, no predominants, dominants or trees with late-successional structure would be removed during road actions unless deemed a safety hazard. Most roads are suitable for hauling forest products with pre-haul maintenance, and maintenance level 1 roads now closed to vehicles would be reopened for the project then closed again upon completion. Table Appendix A-5 lists actions by individual road or unauthorized route number. The alternative maps in Appendix D display the road actions, and descriptions of the actions follow the table below. All road and landing actions would conform to all resource protection measures (starting p.84). RPMs specific to roads and landings include 13 (p. 86), 14 (p. 86), 15 (p. 86), 16 (p. 87) and 17 (p. 87). Also see Standard Operating Procedures numbers 2 (p. C-1), 14 (p. C-2), 15 (p.C-3), 18 (p. C-3), and 19 (p. C-3) and BMPs starting on page C-3.
### Table Appendix A-5. Proposed Road Actions by Alternative

<table>
<thead>
<tr>
<th>Route Number</th>
<th>Maint. Level</th>
<th>Road Name</th>
<th>Miles</th>
<th>Land Allocation</th>
<th>Alternatives 1 &amp; 2 Action</th>
<th>Alternative 3 Action</th>
<th>Alternative 3 Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>41N01Y</td>
<td>2</td>
<td>Elk Flat</td>
<td>1.83</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N01YB</td>
<td>1</td>
<td>Elk Flat</td>
<td>0.27</td>
<td>LSR</td>
<td>Reconstruction, Use and Maintain for Project, Close</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N02Y</td>
<td>1</td>
<td>Ash</td>
<td>0.88</td>
<td>LSR</td>
<td>Open, Use and Maintain for Project, Close</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N06Y</td>
<td>2</td>
<td>Flat</td>
<td>0.38</td>
<td>Matrix</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N09</td>
<td>2</td>
<td>Thicket</td>
<td>0.55</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N12</td>
<td>2</td>
<td>Cramer Springs</td>
<td>1.13</td>
<td>Matrix</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N12D</td>
<td>2</td>
<td>Cramer Spring</td>
<td>0.10</td>
<td>Matrix</td>
<td>Addition to the System</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N13</td>
<td>2</td>
<td>Swamp Creek</td>
<td>1.66</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>1.37 [-0..29]</td>
</tr>
<tr>
<td>41N14</td>
<td>2</td>
<td>Widow Spring East</td>
<td>1.04</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N19X</td>
<td>3</td>
<td>FA -19 Sugarpine/Military</td>
<td>2.34</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>2.22 [-0..12]</td>
</tr>
<tr>
<td>41N26Y</td>
<td>2</td>
<td>Sugarpine Intertie</td>
<td>0.24</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N33</td>
<td>2</td>
<td>Coonrod Flat</td>
<td>0.69</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N33A</td>
<td>2</td>
<td>Coonrod Flat</td>
<td>0.91</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N33A</td>
<td>2</td>
<td>-</td>
<td>0.08</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N46</td>
<td>2</td>
<td>Sugar Pie</td>
<td>1.12</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>0.79 [-0..33]</td>
</tr>
<tr>
<td>41N54</td>
<td>2</td>
<td>Grey Eagle</td>
<td>0.45</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N64</td>
<td>2</td>
<td>Elk Horn</td>
<td>0.88</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N77</td>
<td>1</td>
<td>Ash Flat</td>
<td>0.47</td>
<td>LSR</td>
<td>Open, Use and Maintain for Project, Close</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N96</td>
<td>1</td>
<td>Ash Pot</td>
<td>0.58</td>
<td>LSR</td>
<td>Open, Use and Maintain for Project, Close</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N96A</td>
<td>1</td>
<td>-</td>
<td>0.66</td>
<td>LSR</td>
<td>Open, Use and Maintain for Project, Close</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>41N97</td>
<td>2</td>
<td>Deer Alley</td>
<td>0.37</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>42N13</td>
<td>4</td>
<td>Pilgrim Creek (FA13)</td>
<td>1.06</td>
<td>LSR</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>42N13</td>
<td>4</td>
<td>Pilgrim Creek (FA13)</td>
<td>0.92</td>
<td>Matrix</td>
<td>Maintenance</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>Route Number</td>
<td>Maint. Level</td>
<td>Road Name</td>
<td>Miles</td>
<td>Land Allocation</td>
<td>Alternatives 1 &amp; 2 Action</td>
<td>Alternative 3 Action</td>
<td>Alternative 3 Miles</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>-----------</td>
<td>-------</td>
<td>----------------</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>U41N02YA</td>
<td>-</td>
<td>-</td>
<td>0.13</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N02YB</td>
<td>-</td>
<td>-</td>
<td>0.23</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N02YBA</td>
<td>-</td>
<td>-</td>
<td>0.02</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N02YBB</td>
<td>-</td>
<td>-</td>
<td>0.03</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N06YA</td>
<td>-</td>
<td>-</td>
<td>0.16</td>
<td>Matrix</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N09A</td>
<td>-</td>
<td>-</td>
<td>0.04</td>
<td>LSR</td>
<td>Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N09B</td>
<td>-</td>
<td>-</td>
<td>0.19</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N10A</td>
<td>-</td>
<td>-</td>
<td>0.56</td>
<td>Matrix</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N10A</td>
<td>-</td>
<td>-</td>
<td>0.07</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N10AB</td>
<td>-</td>
<td>-</td>
<td>0.08</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N10AC</td>
<td>-</td>
<td>-</td>
<td>0.19</td>
<td>Matrix</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N12A</td>
<td>-</td>
<td>Cramer Spring</td>
<td>0.22</td>
<td>Matrix</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N13A</td>
<td>-</td>
<td>-</td>
<td>0.23</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N13B</td>
<td>-</td>
<td>-</td>
<td>0.25</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N19XD</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
<td>LSR</td>
<td>Decommission Only</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N19XE</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
<td>LSR</td>
<td>Decommission Only</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N19XF</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
<td>LSR</td>
<td>Decommission Only</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N19XG</td>
<td>-</td>
<td>-</td>
<td>0.05</td>
<td>LSR</td>
<td>Decommission Only</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td>U41N33</td>
<td>-</td>
<td>-</td>
<td>0.62</td>
<td>LSR</td>
<td>Existing Temporary Road and Decommission</td>
<td>No Change</td>
<td>No Change</td>
</tr>
</tbody>
</table>
Road actions include:

Addition to the System

A 0.10 mile segment of unauthorized road U41N10A in the Matrix land allocation needed for current and long-term management objectives as recommended by the Travel Analysis Process completed for the Elk Project (Bonivert, 2015a p. Appdx. X) would be added to the system as a maintenance level 2\textsuperscript{112} road and maintained under all action alternatives. The road will remain open after completion of the project.

\textsuperscript{112}Forest Service Handbook 7709.59 (62.32) described maintenance levels (also see (Bonivert, 2015a)). Maintenance Level 1 roads are placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. A maintenance level 2 road is open to high clearance vehicles. Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria.
**Maintenance**

Over the course of the project approximately 17.9 miles of road (includes roads described in all FTS road actions) would be actively maintained to standard as described in Standard Operating Procedures number 18 on page C-3. Approximately 15 miles would require only road maintenance. Maintenance activities can include grading, resurfacing, culvert cleaning, hazard tree removal, snow plowing, and slide removal (36 CFR 220.6(d)4). After a road has been restored to its original condition, typical maintenance activities consist of dust abatement (watering) and administrative monitoring. The volume of road maintenance conducted on individual roads is directly proportional to unit size, treatment type and removal volume. Road adjacent to larger units will require more truck trips over more days for treatment, increasing maintenance frequency and intensity.

Closed roads, classified as level 1 maintenance, are included in the total maintenance mileage. Typical maintenance activities for level 1 roads include maintaining the road barricade, signage and administrative monitoring for effectiveness.

**Reconstruction**

Approximately 0.27 miles of existing FTS level 1 road (41N01YB) would be reconstructed to bring the road to standard, then maintained for the project and closed. Reconstruction is required when the existing road condition will not accommodate chip vans and logging trucks for removal of wood products and equipment transport and the work is beyond the scope of road maintenance. Road Reconstruction for this project consists of clearing and brushing, and installing, upgrading or replacing drainage structures, increasing road width and turn radius widening to restore the road to a useable condition.

**Temporary Roads and Landings**

Temporary roads in harvest units across the project area would be used or constructed to provide access for harvest operations. Temporary roads provide access to landings, facilitate treatments and to comply with log skidding limitations where access is needed beyond ¼ mile from a FTS road. Temporary roads provide a minimal road bed to direct operational traffic within harvest treatment units to protect resources. Previously created skid trails and the unauthorized routes in the project area would serve as temporary roads rather than constructing new temporary roads when possible to avoid new disturbance. Sections of unauthorized routes used as haul routes would be improved for equipment access and hauling as needed. Once project operations are completed temporary roads would be decommissioned.

Landings averaging approximately 0.75 acres each would be utilized as available or constructed if needed to facilitate transfer of forest products to haul trucks. Actual landings would be approved on an individual basis based on the operator’s requests at the time of implementation and consistency with RPMs.

Temporary roads, and landings would be decommissioned after project activities are concluded (see “Decommission” below). Given the generally flat terrain, temporary road construction will be minimal and the extent of decommissioning activities will be determined by the construction of the road. Typically, the entrance will be blocked, drainage patterns will be restored and the temporary road surface will be disturbed to break down compaction and allow the reestablishment of vegetation.

Table Appendix A-5 lists unauthorized routes that would be available for use as a temporary road then decommissioned at the end of the project.

The table below displays the estimated temporary road needs by estimated landing within each unit, whether the temporary road utilizes an existing unauthorized route or is new construction, and by Alternative.
### Table Appendix A-6. Estimated Temporary Road Needs by Unit

<table>
<thead>
<tr>
<th>Units</th>
<th>Alternative 1 (feet)</th>
<th>Alternative 2 (feet)</th>
<th>Alternative 3 (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Temporary Roads Associated with Existing Landings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>16</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>18</td>
<td>900</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>106</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>123</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>124</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>154</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>154</td>
<td>425</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>158</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>158</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>159</td>
<td>175</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>159</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>160</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>162</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>162</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>162</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>163</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>163</td>
<td>750</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>174</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>178</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>208</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>402</td>
<td>700</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>110, 158</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>110, 402</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>115, 154</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>117, 181</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>14, 153</td>
<td>700</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>152-1</td>
<td>750</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>153, 13</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>154, 18</td>
<td>1175</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>155, 226</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>157, 124</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>177, 402</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>179, 125</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>204, 402</td>
<td>175</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>206, 175</td>
<td>600</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>318, 317, 402</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

Subtotal New Temporary Roads from Existing Landings: 9,500 ft. (1.8 miles), 3,500 ft. (0.7 miles), 3,400 ft. (0.6 miles)

New Temporary Roads from New Landings
<table>
<thead>
<tr>
<th>Units</th>
<th>Alternative 1 (feet)</th>
<th>Alternative 2 (feet)</th>
<th>Alternative 3 (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>6</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>14</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>14</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>16</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>18</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>107</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>151</td>
<td>125</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>153,13</td>
<td>125</td>
<td>125</td>
<td>350</td>
</tr>
<tr>
<td>155</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>157</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>157</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>157</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>157</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>158</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>158</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>165</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>166</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>167</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>170</td>
<td>125</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>172</td>
<td>125</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>174</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>178</td>
<td>125</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>206</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>206</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>402</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>402</td>
<td>700</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12,178</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>151,15</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>153,14</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>157,164</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>16,152-1</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>165,115</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>165,117</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>169,235</td>
<td>125</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>170,171</td>
<td>125</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>201,157</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>206,175</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>169</td>
<td>125</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>6,154</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>6,154</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
</tbody>
</table>
Elk LSR Enhancement Project

<table>
<thead>
<tr>
<th>Units</th>
<th>Alternative 1 (feet)</th>
<th>Alternative 2 (feet)</th>
<th>Alternative 3 (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtotal New Temporary Roads from New Landings</td>
<td>5,650 ft. (1.1 miles)</td>
<td>4,950 ft. (0.9 miles)</td>
<td>4,550 ft. (0.9 miles)</td>
</tr>
<tr>
<td>Total New Temporary Roads</td>
<td>15,550 ft. (2.9 miles)</td>
<td>10,150 ft. (1.6 miles)</td>
<td>7,950 ft. (1.5 miles)</td>
</tr>
</tbody>
</table>

**Closure**

Five roads, totaling approximately 3 miles, are currently closed and will need to be opened for project related activities and closed again once project operations are complete. Approximately 0.27 miles of the 41N01YB road will also be reconstructed prior to project related use and closure. Road closure methods consist of physically blocking the road entrance, and may include installing water bars, removing and restoring drainage structures and stabilizing drainage features depending on site conditions. Maintenance Level-1 closed roads are not open to motorized vehicles but are considered to be in storage, retained for future management activities. Road closures would be implemented after project treatments are complete. Table Appendix A-5 lists road-specific actions including closure.

**Decommissioning**

Decommissioning involves the demolition, dismantling, removal, obliteration\(^{113}\) or disposal of a deteriorated or otherwise unneeded road including the necessary cleanup work. Decommissioning eliminates the deferred maintenance needs for the road. Portions of a road or component may remain if they do not cause problems nor require maintenance. Decommissioning reestablishes vegetation and, if necessary, initiates restoration of ecological processes interrupted or adversely impacted by the unneeded road. Decommissioning includes applying various treatments, including one or more of the following 36 CFR 212.1 and as described in (USDA-FS, 2014a p. FSM 7734.1):

1. Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation;
2. Blocking the entrance to a road or installing water bars;
3. Removing culverts, reestablishing drainages, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed;
4. Completely eliminating the roadbed by restoring natural contours and slopes; and
5. Other methods designed to meet the specific conditions associated with the unneeded road.

In the Elk project, decommissioning methods for unauthorized routes will be determined on a route by route basis and may include seeding or mulch consistent with RPMs 15 and 12 in addition to the actions listed above.

---

\(^{113}\) Obliteration is to unbuild, decommission, deactivate, or dismantle a road; the denial of use, elimination of travel way functionality, and removal of the road from the forest development road system; return of the road corridor to resource production by natural or designated means (Moll, 1996)
Appendix B - Issue Management

Introduction
The Notice of Intent (NOI) was published in the Federal Register on February 28, 2013 (USDA-FS, 2013). The NOI asked for public comment on the proposal by April 1, 2013. In addition, as part of the public involvement process, the agency prepared a scoping document that was mailed or emailed to interested individuals, organizations and agencies on February 14, 2013 (USDA-FS, 2013b). A Notice of Intent was published in the Redding Record Searchlight on February 27, 2013 and March 3, 2013. Public meetings were held March 5 and March 26, 2013 in McCloud and Mt. Shasta. The Forest Service received 11 comment letters or emails.

The following individuals/groups responded to scoping:

3. Phil Fesheen, phone call 3/1/13 and 4/1/13
4. Robert Hoover, Sierra Pacific Industries, letter dated 3/22/13
5. Doug Heiken, Oregon Wild, email dated 3/26/13

All comments were reviewed. Issues were identified from public scoping comments. Issues are statements of cause and effect, linking environmental effects to actions. Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand (FSH 1909.15 Ch. 12.4).

The Council on Environmental Quality regulations for the National Environmental Policy Act explains this delineation in Sec. 1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…” As such, issues were categorized into two groups for this proposal: key and non-key issues. Key issues will be carried forward in the environmental analysis process as a way to develop alternatives (alternative driving issues) or analyze alternatives (analysis driving issues) (FSH 1909.15 Ch. 12.4). Key issues were defined as those directly or indirectly caused by implementing the proposed action. Non-key issues were identified as those that are: 1) outside the scope of the proposed action; 2) irrelevant or unrelated to the decision to be made; 3) already decided by law, regulation, Forest Plan, or other higher level decision; or 4) conjectural and not supported by scientific or factual evidence. Other Comments were non-issues (e.g. no cause effect) or were identified as a question or a general statement (general in nature). They will be addressed in this document.

The following are issues and comments identified from public scoping. Comments/issues were paraphrased from sometimes lengthier or duplicative comments. Comments are also grouped by subject. The number preceding the comment indicates the commenter. For example, (1) = Richard Artley.
Analysis Driving Issues/Non-Key Issues/Other Comments

Fuels/Fire

Comment-1: Even though severe wildfire can be a significant CO2 emissions event, its chance of occurring and reaching a given stand relative to where the wildfire started is still very low, with or without fuel treatments on the landscape. (5)

In spite of what we often hear, that federal forests are not at imminent risk of destruction by wildfire. Fire return intervals remain relatively long, due to both natural factors and active fire suppression policies. Wildfire severity also remains moderate. Most wildfires are NOT stand replacing. Most fires are in fact low and moderate severity. (5)

In an effort to advance the discussion and help the agencies conduct better risk assessments in the NEPA context we have prepared a white paper in an attempt to clarify the critical considerations in a probabilistic risk assessment that compares the risk of logging versus wildfire. This report is most relevant in SW Oregon but the proposed evaluative framework is applicable in the east Cascades, northern California, and elsewhere. (5)

The probabilistic element of the risk equation demands careful consideration. Both logging and fire have meaningful consequences, so the issue really boils down to a comparative probabilistic risk assessment where risk is characterized by two quantities: (1) the magnitude (severity) of the possible adverse consequence(s), and (2) the likelihood (probability) of occurrence of each consequence. (5)

Discussion: See also the response to Comment-122 that addressed carbon and fire effects in the Northwest Forest Plan area over the last 20 years, including to late-successional old growth and northern spotted owl habitat. While fire occurrence has been very low in the Elk Flat LSR, fire hazard/fire risk in the 1999 LSRA was determined to be moderate/moderate due to several large pockets of standing dead trees. Lightning caused fires accounted for 92 percent of the recorded fire occurrences. Due to the ongoing beetle outbreak, the incidence of dead trees has increased substantially. While snags and large down logs are an important habitat component in the project area, they also serve as a high fire hazard at the current densities. Widespread high concentrations of snags and down wood create a fuel hazard. With the current and projected fuel loads, the risk of human caused starts has increased, notably along roads, due to public firewood cutting.

If a wildfire were to start during the summer fire behavior, current modeling (based on stand exam data) predicts rates of spread, flame lengths, and resistance to control that would lead to high acreage burned and significant post-fire adverse effects on resources. The high heat and potential for torching and spotting that would result from a fire in the heavy mortality areas presents a risk to current and developing late-successional habitat, adjacent private lands and WUI. Without action, the density-related mortality, further exacerbated by drought, disease and future insect attacks will continue to increase and spread throughout the project area, contributing to higher levels of standing and dead fuels and increasing the risk of high severity, stand-replacing fire. The high incidence of tree mortality leads to a high safety hazard for suppression activities. If no actions are taken, the tree mortality leads to our inability to safely place firefighters in these areas during a growing incident. This difficulty can lead to larger fires (Titus, 2015).

This is the fourth year of drought in California. The United States Drought Monitor- California, classifies the area where the Elk project is located as “severe” (U.S. Drought Monitor, 2015). The severely dry local conditions resulted in unusual pre-fire season wildfires on the Shasta-McCloud Management Unit as well as a relative high number of fires on the unit that spread fairly rapidly, though were contained at relatively small acreages due to aggressive initial attack and availability of necessary resources. There were 82 total wildfires on the Shasta McCloud Management Unit this year, 48 of which were lightning caused ignitions. Some notable fires on the Unit include the following:

- February 24th- Stevens Fire 200 Acres
- July 31st- Water Fire 30 Acres
- October 10th- Military Fire 58 Acres
The 10-year historical average of total fires in the United States has been 63,790 fires for a total acreage of 6,571,723 acres. Total fires in the United States for 2015 to date have been 54,493 for a total acreage of 9,753,465 acres. Overall, the number of fires has somewhat decreased across the United States but the fires we are having are getting larger (Titus, 2015).

Comment-2 - We urge the USFS to aggressively treat areas in the McCloud Flats that are unhealthy due to various issues such as Annosus, overstocking, hazardous fuel loading, etc. Previous efforts by the Forest to treat only “Red & Dead” have proved unsuccessful and the Flats are now primed for catastrophic mortality from fire, insects, or both. (4)

Sierra Pacific Industries urges the Forest Service to continue proposing and implementing similar projects aimed at improving forest health and restoring fire adapted ecosystems. (4)

Discussion: The Elk project was designed to treat current mortality (red and dead), along with the surrounding forest stands to increase the resilience of the late-successional reserve and reduce the risk of further stand and late-successional habitat loss. Treatments in natural stands and plantations are designed to reduce stocking levels, increase tree size (thereby contributing to larger snags and down wood in the LSR), and increase diversity and within-and between-stand heterogeneity making the stands more resilient to uncharacteristic fire or epidemic insects and disease.

The goal for the U.S. Forest Service’s Pacific Southwest Region is to retain and restore ecological resilience of the National Forest lands to achieve sustainable ecosystems that provide a broad range of services to humans and other organisms. A portion of the Forest’s ecological resilience strategy includes the Integrated Vegetation Management Strategy. The dominant Forest values emphasized for restoration and protection through enhancing wildfire resiliency were water, wildlife, and wildland-urban-interface. Key components of implementing the strategy include designing and developing treatments that meet multiple resource objectives and taking advantage of large contiguous areas for landscape scale (USDA-FS, 2013c p. SHF p. 99). The Forest is also operating in compliance with direction and standards and guidelines from the Northwest Forest Plan (NWFP), Forest Plan and Forest’s Late-Successional Reserve Assessment (LSRA) with the project where the balance between improving forest health, restoring fire-adapted ecosystems needs to be carefully weighed with the intent of the LSR’s function.

Comment-3 - Yarding tops and lopping and scattering should take care of most of the fuels issues within the treated stands. (2)

Discussion: Yarding tops and lopping and scattering is expected to minimize contributions to existing fuel loading in treated stands. To the extent possible, felled trees would be whole-tree skidded to designated landings for processing. Some slash would remain in the woods due to branch and top breakage during felling and skidding, or because of mechanical felling and yarding equipment limitations. For example, some trees that are over 24 inches at the stump may be hand felled with chainsaws, with the first two logs getting limbed to protect the residual stand from undue damage. The need for fuels treatment is based primarily on the existing natural fuels.

In areas with high levels of mortality (50-80% of more of a stand), the size and volume of fuels are too great to safely and effectively pile by hand or underburn only and thus are proposed for machine piling. Where there are heavy concentrations of surface and standing dead fuels that exceed the desired conditions as specified in the resource protection measures (typically more than 40 tons per acre), machine piling and burning of some piles would be utilized as a pretreatment before underburning. This would increase consumption of excess fuels over what underburning would accomplish, and would limit adverse effects to overstory trees, soils and wildlife habitat. Prescribed burning would help reduce excess fuels, but is also proposed to begin returning the natural role of fire to the ecosystem.

Comment-4 - The location, timing, and severity of future fire events cannot be predicted making it difficult to determine which forests will benefit from treatment - consequently fuel treatments must be extensive and many
stands will be treated unnecessarily, thus incurring all the costs of fuel logging, but receiving none of the beneficial effects on fire behavior. (5)

**Discussion:** The commenter is correct that it is not possible to know exactly where, when, how many acres, or what the effects would be from a wildfire in the analysis area. As part of the No Action analysis, modeling of existing conditions and a fire start on 90th and 97th percentile weather days, and projected mortality, will be completed. As described in Comment-1, the project area conditions are such that if a wildfire were to start, the results could lead to high burned acreage and substantial resources effects. Project treatments are intended to reduce the risk of large-scale disturbance and increase stand resiliency to natural disturbances such as wildfire, insects, disease, and drought. Returning the natural role of fire to landscape is also an objective. Treatments will promote stand structure and variability, biological diversity and characteristics of old-growth forests, while reducing overcrowding and fuel levels, allowing these stands to persist and/or grow into late-successional habitat (Franklin, et al., 2007; Blate, et al., 2009; Franklin, et al., 2002; Kennedy, et al., 2009; Stephens, et al., 2008; Stephens, et al., 2010). Restoring these features would also further allow disturbance processes to play their inherent role in maintaining these features (Noss, 2006).

**Comment-5:** Both the habitat and the NSO evolved with fire and can live with fire; the LSRA states wildfire is expected to occur in LSRs; and we are not persuaded by the WUI arguments. McCloud is 9 miles away and can't be considered a WUI under any definition. The McCloud sub-division is 1.25 miles away and that area too is not considered a WUI by FS wildland fire researcher Bechsta. (7)

**Discussion:** LSRA desired conditions do indicate it is desirable to have low to moderate intensity fires burn in LSRs/MLSAs (p. 163). The LSRA also includes that the greatest threat to further loss and degradation of habitat for late-successional associated species is catastrophic wildfire within the California Klamath and California Cascades Provinces. It goes on to explain that fuel reduction treatments within LSR/MLSAs will be necessary given the extent of LSRs on the Forest landscape. Furthermore, fuel reduction activities within stands of late-successional and old-growth forest habitat will be essential to maintaining and protecting them.

Low and moderate intensity fire is one of the important ecological processes that is essential for the development and maintenance of late-successional and old-growth forest ecosystems (LSRA p. 174). If meeting the LSR objectives, fuel reduction treatments are not considered incompatible with the LSRA. While NSO evolved with fire, the Revised Recovery Plan for Northern Spotted Owl includes, among other important range wide threats to spotted owl, “... ongoing loss of spotted owl habitat as a result of...habitat loss or degradation from stand replacing wildfire and other disturbances...” (USDI-FWS, 2011 pp. viii, II-2).

The “Guidance for Implementation of Federal Wildland Fire Management Policy” (USDA-FS, 2009) defines WUI as “The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels”. Generally, the WUI on the Shasta-Trinity is concentric rings around structures, or groups of structures up to 1.5 miles, as described in the Fire Reference System. Within the Elk project boundary, the WUI is not associated with the community of McCloud, or the Mount Shasta Forest subdivision, but private land, with infrastructure to the southwest of the project boundary. Wildland-Urban interface overlays land allocations and is displayed in Appendix D – Maps (Figure Appendix D-8).

The project area incorporates approximately 1,135 acres of WUI within the Zone 4-Threat Zone as defined in the Forest’s Fire Reference System (USDA-FS, 2015). Zone 4 is the area beyond the ¼-mile defense zone surrounding structures out to an approximate distance of 1.5 miles. The goal is to achieve an environment where crown fires, headed towards communities, become surface fires within this zone before encountering the “defense zone”. The wildfire behavior goal is to develop a fuels profile that will have moderate wildfire intensities determined by flame length of 4 to 8 feet or less on a 90th percentile fire weather day over most of the land base.”

**Comment-6:** The project should carefully look at fuels reduction options. Hand piling should be the last option as it is very expensive and can lead to a nonviable project. (2)
Discussion: Fuel reduction options will be carefully assessed. As noted in Comment-3, some fuels are too large and thus hand piling is not a feasible option. In sensitive areas, hand piling may be used as long as it is safe to do so (material size, amount).

Comment-7 - The FS continues to trumpet the risk of wildfire which is virtually non-existent in the SMMU due to all the roads and clearcuts on private lands, and FS lands. In fact, the ‘risk’ of wildfire is driving this entire project. Again, we are curious to see the BAS the Forest is using in light of virtually all of the science in the past 5 years refuting the FS assertions, including papers researched by the FS. (7)

Discussion: Project area stand conditions indicate that wildland fire hazard is high for the project area even though historical starts (risk) are relatively low. As noted in Comment-1, the fire risk/hazard was identified in 1999 as moderate/moderate due to the mortality pockets which have since substantially increased. As discussed in Comment-1, if a wildfire were to start during the summer, modeling predicts a high acreage burned and significant post-fire adverse effects on resources. High heat and potential torching and spotting from a fire in the heavy mortality areas presents a risk to current and developing late-successional habitat, adjacent private lands and WUI. This EIS and the fire and fuels analysis cite scientific literature relied upon.

Comment-8 - The entire project area is proposed for underburning after thinning treatments are completed. Multiple similar projects have been proposed and implemented throughout the eastside of the Shasta-Trinity National Forest. Please provide timelines for fuel treatments and analyze and disclose; how successful or unsuccessful follow-up fuels treatments have been on forest timber sales, the likelihood of such treatments happening and how treatment goals and objectives would be affected if fuels treatments are not carried out. (9)

Discussion: Fuels treatments can begin as soon as the timber sale is released by the timber sale administrator. We would typically burn the landing piles in the first winter after they are released. Any machine piling within post-harvest units, or other areas with high fuel accumulations, would typically begin the summer after is the area is available/released from the timber sale. Piling is typically done during the summer to ensure the material is dry, making for better consumption during burning. Machine piles would typically be burned the winter after they are piled, and the project may include protection measures for leaving some piles unburned. Underburning only could potentially occur at any time (depending on LOPs), but would be contingent on the timber sale operator and contract agreement. Underburning in harvest units could begin in the spring or fall (depending on LOP’s) after pile burning is completed. The SMMU fuels department also typically waits for an entire “burn block” to be available in order to take advantage of using roads as control lines.

The SMMU fuels department also utilizes our own employees and our own equipment to complete all of the fuels treatments. We do not need to wait on funding to become available, or follow timelines for contracting. Our employees and our equipment are funded every year.

The SMMU fuels department has completed all of the piling that is available from past timber sales and restoration projects. We have approximately 1000 acres of underburning to complete. In fall 2015, we were able to complete second entry underburning.

The SMMU has been very successful in completing follow-up fuels treatments quickly, and in accordance with any protection measures and new information by working with staff (soils, wildlife, botany and hydrology). Based on monitoring, most treatments have been very effective in reducing surface fuel loading and returning fire back to the landscape. In other cases, timing of burns or soil/duff conditions either resulted in too hot of a burn in certain areas (aspen), or inadequate fuel consumption in other areas. The SMMU will continue to monitor underburning, piling/burning and any other fuels treatments on a project-by-project basis and incorporate any lessons into an adaptive management program.

If follow-up fuels treatments are not completed for the Elk project in those areas where they are deemed necessary (machine piling, hand piling, underburning), the stands will not be entirely resilient for uncharacteristic wildfire, insects and disease. Surface fuel loading within the project area is currently well above Forest Plan standards. Fire exclusion has resulted in overstocking of white fir, cedar and pine
regeneration in the understory in some areas, excessive surface fuel loading and reduced nutrient cycling. Follow-up fuels treatments are essential for meeting the objectives of the Elk project.

**Forestry/Silviculture**

**Comment-9** - We urge the planning team to consider the following findings from your colleagues in the Rogue River Siskiyou National Forest contained in the 2012 Bybee timber sale EA indicating that proposed logging activities in the LSR may increase the impacts of existing pathogens:

A-15: Armillaria Root Disease “is often associated with trees under stress or where human caused disturbance is evident.”

A-15: Annosus Root Disease “fungus can be found fruiting in scuffed white fir and western hemlock stumps...infection and mortality are much greater in true fir stands that have been entered more than once than in stands that have not been entered…”

A-16: Black Stain Root Disease is “associated with roadsides, skid trails, landings, [and] with trees on compacted soils, recently cut thinning stumps and slash.”

A-17: Pine engravers are associated with logging slash and windthrow material.

**Discussion:** We recognize the insects and disease are important components of LSR, and that activities intending to reduce large scale risk can in fact contribute to changes in existing pathogens. The project includes design features or resource protections to limit undesired increases.

Armillaria is a root disease typically associated with sites that have been converted from oak stands to plantations. It can also be found around dead oaks that have died from suppression or other causes and are spreading the root disease to the surrounding conifers. Since this disease is more damaging in stressed stands, thinning to avoid overcrowding, and not cutting or killing oaks near conifers are recommended.

Black stain root disease usually is found in areas where there has been significant site disturbance or substantial amounts of tree injury. Stands with black stain are usually densely stocked and consist of either pure or predominantly ponderosa pine. The largest and most rapidly expanding disease centers are often in cool, low lying sites with high soil moisture levels in the spring. Thinning to reduce the frequency of harvest entries and opening stands for warmer soils would inhibit black stain and reduce root contact between susceptible trees. Trees that are not hosts to black stain would be retained. Thinning generally from late June to early September would help limit impacts when insect vectors are most active. When establishing new stands near areas where black stain has been a concern, a mix of species should be planted. Reintroducing frequent low intensity ground fires into the landscape also disfavors black stain.

Annosus infection centers start when airborne spores produced by the conks land and grow on freshly cut stump surfaces of all species. Infection in true fir may also occur through fire and mechanical wounds on the butt. Fresh basal wounds on species other than true fir are rarely colonized. Treating freshly cut conifer stumps greater than 14” across with a borate compound will help reduce the infection sites created by the newly made stumps.

Pine engraver beetle (Ips) is most easily recognized by the rows of spines on the posterior ends of their wing covers. In standing trees, fading tops of large trees or whole crowns in small trees can be indicators of Ips infestation. Other external evidence consists of accumulations of boring dust in bark crevices and at the base of the tree. Thinning activities should be concentrated between the months of August and December so slash will dry out and will no longer be suitable for the first generation of beetles flying in April. An alternative approach is to generate enough additional fresh slash in mid-summer to absorb the emerging second generation and provide the beetles with an alternative to standing trees. Also, slash less than 3 inch diameter is of little consequence in terms of brood production for Ips.
Comment-10 - Ground-based logging causes higher incidences of root damage and scarring of residual trees (compared to skyline systems). (6)

Discussion: The DEIS will disclose the effects of the proposed activities relative to forest health. Logging can create tree scars, which become potential infection sites for diseases, and insects can be attracted to the wounds. Tree wounds and root damage are kept to a minimum by discouraging operators from damaging trees. Mechanical and staged falling operations, proper skid trail design and contract provisions that limit tree damage (e.g. B6.32 Protection of Residual Trees) can address root damage and tree scarring as well as onsite sale administration of the contract. Project RPMs also help to minimize disturbance of soil and other resources values. Skidding and landing use will be restricted to existing skid trails and landings where possible. Adhering to BMPs will minimize erosion, compaction and subsequent root damage. The sale administrators work with operators to minimize disturbance and damage.

Comment-11 - Logging to control insects and disease is controversial and scientifically debatable. It has not proven to work in these watersheds. Please include and make available all science used to support any conclusions in the forthcoming NEPA document. (9)

There is even less evidence that we can control insects once an outbreak starts. Citing several sources Hughes and Drever (2001) assert that the weight of opinion seems to be that most control efforts to date have had little effect on the final size of outbreaks, although they may have slowed beetle progress and prolonged outbreaks in some cases. (6)

Bark beetles are always widespread and quite common. Even if an agency can control them in a stand of trees it is likely to have little impact on infestation on a landscape scale. According to Wilson and Celaya (1998), removal of infested trees may provide some protection to surrounding trees, but these insects [Western pine beetle] are very common, so removal of a few infested trees is not a guarantee of protection. (6)

Although the Forest Service often asserts that the most effective means of reducing losses to the western pine beetle is by risk rating trees with subsequent removal of those that are high-risk. There is no evidence that this works to protect trees in a diverse forest. (6)

In some situations, removal of infested trees prior to emergence of brood is recommended in an attempt to protect surrounding trees. However, the overall effectiveness of this strategy is unproven (Wilson and Celaya 1998). Further, in most forest situations, it is not feasible to locate and remove all trees prior to emergence. (Wilson and Celaya 1998) (6)

A recent report by the Xerces Society includes a summary of relevant studies on the importance of insects to forest function and the methods used to control forest "pest" insects, and a compilation of summaries of over 150 scientific papers and Forest Service documents. The report may be downloaded in .pdf format from http://www.xerces.org/Forest_Pest_Myths/Logging_to_Control_Insects.htm*

Key findings in the report include:

Native forest pests have been part of our forests for millennia and function as nutrient recyclers; agents of disturbance; members of food chains; and regulators of productivity, diversity, and density.

Fire suppression and logging have led to simplified forests that may increase the risk of insect outbreaks.

Forests with diverse tree species and age classes are less likely to develop large insect outbreaks.

There is no evidence that logging can control bark beetles or forest defoliators once an outbreak has started.

Although thinning has been touted as a long-term solution to controlling bark beetles, the evidence is mixed as to its effectiveness. The report also outlines general guidelines to follow when considering pest insects and forest management.

A review of over three hundred papers on the subject reveals that logging is not the solution to forest insect outbreaks and in the long run, logging could increase the likelihood of forest insect epidemics. (6)

Even more striking is the paucity of studies that have examined the consequences of human intervention on pest movement patterns. In fact, we know of no studies that have experimentally evaluated the effects of management strategies on the dispersal of insect pests in forest systems. (6)
As in the Elk project, logging is often recommended to control outbreaks of bark beetles but there is little direct evidence that this works. Much relies on the assumption that as tree vigor increases the trees are able to ward off infestation by insects. Some scientists have suggested caution in using thinning to control bark beetles as geographic and climatic variables may alter the effect. (Hindmarch and Reid 2001). Hindmarch and Reid (2001) found that thinned stands exhibited a higher attraction rate of mates by males of Ips pini, while females had longer egg galleries, more eggs per gallery and higher egg densities. Warmer temperatures in thinned stands also contributed to a higher reproduction rate. The number of males and females setting on logs was also higher in thinned stands. However, pine engravers in Arizona responded differently to thinning (see Villa-Castillo and Wagner 1996). (6)

Wickman (1990) detailed the effort to control the Mountain pine beetle (Dendroctonus ponderosae) at Crater Lake National Park from 1925 to 1934. Although he did not calculate how many trees in the areas were treated (cut down and then burned) in the nine year period, over 48,000 were treated in a three year period alone. The main lesson learned was that once a mountain pine beetle population erupts over a large area of susceptible forest type, and as long as environmental conditions remain favorable, there really is no way to stop it until almost all the susceptible trees are either killed or removed by logging. Treating trees perhaps slows the progress of the outbreak, but the outcome is inevitable. (Pg 38) Wickman (1990) The report goes on to state “Perhaps the cold winter in 1932-33 helped, but most importantly, the depletion of susceptible trees ended the outbreak rather than the annual control efforts for 10 years. Wickman (1990)” (6)

“In 1984, lodgepole pine stands in central Oregon were once again infested with mountain pine beetle. By 1985 a severe outbreak covered thousands of acres and extended south nearly to the park boundary. In 1986, beetle-killed trees were found in the northern end of the park (Wickman 1990). In the end the control methods did not work.” (6)

Discussion: Logging to control insects and disease is not proposed. The proposed treatments are aimed at reducing inter-tree competition and increasing the resiliency of these stands, which will increase the tree’s resistance to insect attacks when they occur.

Diseases, insects, and other natural disturbance factors are important shapers of landscapes. As described in the purpose and need, it is desired that levels of mortality from these natural disturbance factors are closer to endemic levels; about 0.2 to 0.5 percent of standing live biomass mortality per acre per year, with occasional spikes of 1.0 to 1.5 percent during drought periods. The project does call for providing conditions in treated stands that increase the capacity of remaining stands to respond to and withstand natural disturbances so that large habitat losses are not sustained (USDA-FS, 1999).

Researchers began to recognize the importance of tree stocking control to reduce bark beetle activity in about 1941 (Eaton 1941 in (Oliver, 1995). Within the last several decades, a number of studies examined the relationships between tree thinning to reduce bark beetle activity and risk. Many of the studies observed decreased bark beetle activity with decreased tree stocking required to prevent endemic and epidemic levels of bark beetle mortality in even-aged pine stands in Northern California levels (Fettig, et al., 2007; Cochran, et al., 1995; Cochran, et al., 1999; Schmid, et al., 2005; Oliver, et al., 1997; Fiddler, et al., 1989; Oliver, 1995). They considered stand density index of 230 to be the “zone of imminent bark beetle mortality.” Variable density thinning does not include a singular density target, and instead is a treatment that thins to retain a range of densities by including areas of heavy thinning or small openings (radial release, gaps, or group selections), unthinned patches (UTPs that are also referred to as skips), and thinning within a target basal area range elsewhere within the stand. In any case, the thinning reduces stand densities. Scientific literature supports the use of thinning in ponderosa pine to lessen disease viability and spread (Kliejunas, 1992; Otrosina, et al., 2007; Woodruff, 2002). Silvicultural treatments can be used to create conditions that increase stand resilience (promoting sustainability) and accelerate the rate at which larger tree sizes are attained. It can also be used to introduce spatial and species heterogeneity within stands.

Comment-12 - While the Forest Service should examine, incorporate and respond to all of the relevant peer-reviewed citations regarding insects and disease contained in the Xerces Report, we hereby especially highlight four papers for your consideration.


Discussion: (Schowalter, 1990) and (Schowalter, 1995) are discussed in the Xerces Report. As summed in Xerces, the 1990 paper discuss that healthy trees and diverse forests, including old growth forest, are resistant to potential pests. The 1995 paper indicated that arthropod community structure diversity and abundance for several taxa was significantly lower in plantations than older forests and concluded that reduced predator diversity could lead to a greater likelihood of pest outbreaks. We were unable to locate Scholwalter et. al 1989.

The project maintains the largest oldest trees (predominants and dominants) that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops would be retained as long as they are not a safety hazard. All predominant trees would be retained, regardless of their current health/condition when marking. Some predominants would be removed in meadow enhancement and the group selections, radial release, oak release, and aspen release prescription elements. The preponderance of the activity is in thinning; reforestation of the groups/gaps is a small proportion of the treatment areas. Where that occurs though, the gaps will be planted with a mix of species to promote diversity.

The mixed conifer types in the project area support a variety of species in the overstory, while the ponderosa pine does to a lesser degree. Variable density thinning includes promoting stand structure variability, biological diversity and characteristics of old-growth forests by inducing fine-scale variation in homogeneous second-growth forest canopies. As noted about, the groups/gaps would be planted with a mixture of species. These may include ponderosa pine, sugar pine, Douglas-fir, incense cedar and hardwoods such as black oak. The assessment area also exhibits a mixture of age classes.

Comment-13 : AFRC wants to go on record of not supporting alternatives that set diameter limits within any land allocation. Concerned about diameter limited being counterproductive to meeting the purpose and need/hindering ability to meet identified desired conditions, incompatible with land management goals for this project area, arbitrary and capricious, not scientifically supported (e.g. why one particular diameter is more appropriate than another diameter. (2)

Instead of setting arbitrary diameter limits it is much better to describe the desired stand conditions following treatment. Meeting those desired conditions can easily be monitored following implementation. (2)

It is critical as part of the NEPA analysis that desired stand characteristics for late-successional habitat is displayed. We ask that you display the desired levels of trees per acre by size class, desired stocking levels, desired snag and down log levels, and desired species makeup.(2)

The FS disclosed age classes but not diameter limits for the units proposed for logging. We specifically request this information be disclosed in the DEIS. (7)

Discussion: The Forest Plan has no standard and guideline pertaining to diameter limits for timber management. While there is no prescribed upper diameter limit for the project, or within specific treatment units, the largest oldest trees (predominants) and those dominants that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops would be retained as long as they are not a safety hazard. In some treatment units, diameter limits are prescribed to meet certain habitat objectives (e.g., when conducting California black oak release within critical habitat for the northern spotted owl, certain species of trees that are 24” or larger would not be cut to release oak). Dominants may be removed in meadow enhancement and radial release, group selections, and hardwood release prescription elements. All
predominant trees would be retained, regardless of their current health/condition when marking. We recognize the importance of large trees on the landscape for a variety of reasons including fire resiliency, various species’ habitat needs (including NSO, northern goshawk, fisher and Pacific marten) and stand structural legacies, particularly in LSR. Desired stand conditions are described in the Purpose and Need in Chapter 1.

**Comment-14** - Note that the Thom Seider FEIS acknowledges that the diameter of conifer trees acts as a “measure of resistance to fire.” Hence the forest health and fire resiliency goals of the Elk LSR timber sale project may be best achieved by retaining such trees where they still exist in the watershed. (2)

**Discussion:** Fuel reduction actions designed to reduce fuels are based on several principles of forest fuel reduction in dry forests: reducing surface fuels, increasing the distance between surface fuel and the live tree crown (i.e. reducing ladder fuels), decreasing the density of tree crowns, and retaining fire-resistant trees (Agee, et al., 2005). Trees to be thinned would primarily be midstory intermediate and smaller co-dominant trees; primarily the shade tolerant white fir. See also Comment-13 regarding retention of the largest oldest trees.

**Comment-15** - As a forest industry and being professional foresters we are very concerned that good forestry be practiced on the Forest Service land base. (2)

**Discussion:** The prescriptions were developed by a Certified Silviculturist. Best available science has been reviewed in addressing project conditions and for methods to reach desired conditions and to meet direction for the LSR and habitat recommendations for late-successional dependent species.

**Comment-16** - Much of the area is currently experiencing extreme mortality due to black stain root disease and subsequent bark beetle attacks. Hundreds of acres are currently dying because of these conditions. It is imperative to control the spread of this mortality before the entire project area becomes affected. (2)

The Province Forest Pest Management (FPM) personnel have spent a considerable amount of time evaluating the current mortality. The FPM staff has prepared recommendations on what should be done to control the spread of the insect and disease problem. Many of these treatments are aggressive in terms of spacing treatments and tree removal. These treatments will be a cause concern by groups and individuals who do not have a concept of what it takes to deal with these disturbance factors or what it takes to responsibly manage the forest. It is imperative the Interdisciplinary Team fully utilize the findings of the FPM staff in order to fully meet the purpose and need of the project and stem the continued spread of mortality. It is also important because private lands are being affected by the lack of treatment occurring on the Forest Service land base. (2)

There have been enough public meetings for this project. This project has been on the radar since 2009. Given the dire conditions found across a large part of the project area, it is imperative that implementation occur very rapidly. The drought outlook highlighted by the Province Entomologist at the meeting re-emphasized the importance of enough talking and switching to emphasizing implementation. (2)

**Discussion:** As described in Chapter 1, there has been a marked increase in pine mortality over the past five years within the project area. Expanded areas of mortality were observed in 2010 and 2012 and have continued to expand. Mortality is occurring in the larger diameter (20-inch, plus) ponderosa pine as well as spreading throughout plantations of varying ages. The primary purpose of the Elk LSR project is to reduce the risk of stand and habitat loss in early, mid and late- successional habitat and to increase stand resilience to disturbance. Project actions were designed to address this need as well as other secondary needs, in order to meet the overarching objective for LSRs to protect and enhance conditions of late-successional forest ecosystems.

**Comment-17** - Much of the area within the project area cannot be maintained as dense stands over the long-term. They are not resilient and historically never contained those types of stand conditions. The current insect and disease problem clearly highlights what will happen if dense stands are desired for the future. We ask that the analysis clearly display what type of late-successional habitat is sustainable for the long-term within this project area. (2)

The document states that stand composition is shifting from predominantly pine to mixed conifer. This is actually desirable for LSR/CHU and should not be a concern of the Forest. (7)
Discussion: As described in Chapter 1, approximately 75% of the 3,519-acre project area is classified as Ponderosa pine (Pinus ponderosa) forest. In the northwest and western portions, approximately 10% is classified as Sierra Mixed Conifer (SMC) and 15% is perennial grassland (PGS). These designations for the project area are based on the California Wildlife Habitat Relationship (CWHR) System (CDFW, 2008) and cross-walked into the Forest’s 2007 Existing Vegetation Layer from the Regional Office’s Remote Sensing Lab. While ponderosa pine is the primary stand component in the majority of the project area, it is also nested within mixed-conifer pine, and white fir-pine stands. The ponderosa pine-dominated stands are located within the eastern and southeastern portions of the project area, and the majority of the 20-40+ year old plantations. The younger plantations have a wider range of species mix. Ponderosa pine cannot sustain in the long term at high stand densities that provide over 70% canopy cover, and ponderosa pine-dominated stands do not provide for NSO nesting, roosting or foraging habitat. They can provide dispersal habitat, depending on specific stand conditions and other abiotic factors.

Comment-18 - Radial thinning as disclosed is completely subjective and inappropriate in LSR/CHU. Discretion should not be given to either the FS or the timber contractors based on past performance. Trees must be marked for cut and that information disclosed to the public. (7)

Discussion: The described radial thinning is consistent with the goals and objectives of the Northwest Forest Plan, LSRA and recommendations for dry forest restoration principles within the Revised Recovery Plan. This type of treatment can help assure that legacy structures remain on the landscape and also contribute to increased heterogeneity and younger age classes. This type of treatment is primary proposed around the predominant legacy pine in the project area that remains at risk. How and where these pine will be released will be worked out through coordination and consultation with the public, the project silviculturist and wildlife biologist and the FWS during consultation. Based on the future prescription details of “how many” trees per acre or what species to radially thin, or areas to not use this treatment, the marking guides will dictate what trees are retained or removed. Additionally, LSRA activity design criteria 4 objectives, leave tree criteria, provide for culturing individual trees specifically for large crowns and limbs. The activity design criteria 4 treatment standards include up to 15 percent of the area in heavily thinned patches, or in openings up to 1/4 acre in size, to individual tree development.

Comment-19 - There are many plantations planned for treatment within the project area. We believe the proposed Rx’s developed for these plantations fully meet the purpose and need for the project. Very wide spacing, creating openings for age class diversity, and promoting species diversity are clearly needed for these plantations. We will continue to support your proposals for treating the plantations within the project area and ask that you not modify those proposed Rx’s because of other unwarranted concerns. (2)

We ask you to develop prescriptions that truly meet the particular needs of the stands and land base. We have recently seen too many instances where prescriptions are developed to address public concerns from entities that have personal agendas and biases and have no background or knowledge of the forest environment and ecosystem. Prescriptions developed in these instances do not meet the needs of the stands, land allocation standards and guides, project purpose and need, and long term forest protection and health. (2)

We feel this project needs to treat as many acres as possible in order to fully meet your designated purpose and need. We encourage you not to reduce the project any further. (2)

Discussion: The general proposed actions that were developed and scoped were fully intended to address differences between Forest Plan and LSR desired conditions and existing ground conditions. This includes maintaining and protecting late-successional habitat. It is recognized that 24 percent of the project area is within plantations (10-40+ years old) where thinning and other mechanical treatments would occur, they were developed to reduce stocking and increase diversity, tree size and resilience. Part of the project’s design, given existing conditions, also includes precluding treatment in certain areas that are functioning as quality late-successional habitat. Part of the NEPA process however, does involve scoping. Public scoping is used in several ways but includes refining issues, establishing analysis criteria, and exploring possible alternatives and their probable environmental effects (FSH 1909.15 ch.10 [11]). Issues derived from public scoping serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives,
giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand. As such, there may be instances when alternatives, project design features or resource protection measures are proposed to address issues and compare tradeoffs for better decision making. See also Comment-15.

Comment-20 - I am concerned about proposals to log snags in the Elk Flat LSR. (8)

Discussion: Generally, logging snags is not proposed. In the event conditions deteriorate post-decision and post marking, salvage of dead and dying trees may occur in conjunction with harvest in 19 ponderosa-pine dominated treatment units. The extensive mortality area would be prescribed burned to reduce heavy fuels. If safe, a combination of felling and machine piling may be used in this area. We recognize the importance of snags (and logs) on the landscape for a variety of reasons species’ habitat needs (including NSO) and stand structural legacies. The project includes specific criteria for retaining or protecting snags. For example, RPM 40a requires that within all thinning and fuels treatment units in LSR, 7 snags per acre ranging from 15 to 20+ inches diameter with a preference for snags larger than 20 inches or the largest size class available would be retained, on average. RPM 40b requires retention of Douglas fir, sugar pine and incense cedar snags larger than 20 inches diameter, safety and species ID permitting. Groups of snags would also be retained, where safely feasible, in existing mortality pockets.

Comment-21 - The proposed action calls for creating a “buffer” of 50 feet around pockets of disease to prevent root-to-root contact as a means to thwart the spread of black stain and/or annosus. Does this mean you will thin 50 feet past the most distal tree exhibiting mortality characteristics or signs of infection? What exactly is your definition of “buffer” in this situation? (4)

Discussion: The “young plantation thin with interplant” prescription applies to those young ponderosa pine plantations with recent mortality from blackstain root disease or Western Pine Beetle activity. These plantations have moderate/WPB varying to high levels of mortality, and often include scattered residual pole to young mature overstory trees (e.g. units 113, 123, 124 and 125). Among other things, this prescription would remove all pine symptomatic of black stain and remove pine within 100 feet of symptomatic trees and mortality pockets (dead and dying trees) and outside of mortality pockets and the 100 foot buffer zones, thin pine to an average 50 foot spacing to avoid root-to-root contact and maximize growth.

Comment-22 - We were somewhat amused at the Elk Flat 1944 photo that allegedly shows open space. The FS forgot to also state that the forested area in the 1944 photo no longer exists and has largely been clearcut. This isn’t 1944. We have climate change as well as a threatened species with designated critical habitat that didn’t exist in 1944. That photo is irrelevant to the discussion today. (7)

Discussion: It is not entirely clear what the commenter meant by “the FS forgot to also state that the forested area in the 1944 photo no longer exists and has largely been clearcut.” Based on 1998 aerial photography, the extent of the meadow at Elk Flat was less than 50 percent of its extent in 1944 (see also the 2012 and 1944 aerial photography comparison, which shows continued meadow area loss from encroaching conifer, Figure in Chapter 1 for more information on Elk Flat).

Elk Flat appears to be in a drying phase which is allowing tree encroachment to occur (in combination with other factors such as fire suppression). Currently, the water table is greater than a meter below ground surface in most years. In the past, sufficient seasonal runoff likely provided a higher water table with adequate soil moisture to support perennial grasses and forbs. Due to the current gully confinement, and lower seasonal water table, Swamp Creek is no longer able to hydrate the meadow. Although, during periods of snowmelt and rainfall, relict multiple channels on the meadow experience minor flooding and transport of sand and gravels, this is a minor contribution to the larger-scale disturbance required to maintain the natural opening. In addition to reducing conifer encroachment to restore the dry meadow system, restoration of the natural water table is also important to restoration of the Elk Flat dry meadow ecosystem.
While it is not specific to the treatment proposed in and around the edges of the meadow at Elk Flat, there is no designated critical habitat for the NSO in this area, and this area largely does not function as suitable or dispersal habitat for the NSO. See also the response to Comment-123 that addresses climate change.”

Comment-23 While it is not specific to the treatment proposed in and around the edges of the meadow at Elk Flat, there is no designated critical habitat for the NSO in these area, and this area largely does not function as suitable or dispersal habitat for the NSO. The fact the FS would consider salvage logging of large dead trees, preferred by late-successional species; with regeneration harvesting and planting in an LSR and CHU speaks volumes to the fact this project is nothing more than a timber grab of old growth and late-successional trees. There is simply no legitimate science to back-up this method of logging in LSR/CHU. (7)

I am concerned about proposals to conduct regeneration logging and proposals to log large trees in the Elk Flat LSR. (8)

Discussion: There is no regeneration logging or mechanical regeneration treatments proposed with the Elk project. The primary purpose of the project is to reduce the risk of stand loss in early, mid and late-successional habitat and increase stand resilience to disturbance. Other objectives include accelerating development of late-successional and old-growth forest characteristics and promoting connectivity; restoring Elk Flat meadow habitat; retaining and promoting hardwoods, etc., as described in Chapter 1. As described in the response to Comment-13, the largest, oldest trees are proposed for retention. Additionally, unthinned patches, designated no-treatment areas, and habitat roost/rest clumps would retain small and large tree patches, often with late-successional characteristics. Project actions and potential effects to habitat and species were and will be weighed seriously against the need for long-term habitat resilience and persistence. Best available science on restoring dry forest ecosystems and balancing those activities with species habitat and life-history needs was utilized to develop the project, including that provided by the public during scoping. The proposed silvicultural methods that increase resilience and restore heterogeneity within and between stands, and also maintain existing late-successional habitat elements (legacy structures such as large trees, snags, down wood) support the project’s intent (Franklin, 2002; Franklin, 2013; USDI-FWS, 2011; Blate, et al., 2009; Franklin, et al., 2007; Kennedy, et al., 2009) (Stephens, et al., 2008; Stephens, et al., 2010; Bull, et al., 1980; Marshall, et al., 2003a; Marshall, 2003; Lehmkuhl, et al., 2003; Wisdom, et al., 2000). The proposed action overall is consistent with the goals and objectives of the Northwest Forest Plan and LSRA, though certain actions will be reviewed by the Regional Ecosystem Office for consistency. For example, LSRA activity design criteria 6 addresses hazard reduction relative to blowdown, insects or wildfire (LSRA, 1999 p. 189). LSRA activity design criteria #9 addresses fuel reduction and prescribed burning (LSRA, 1999 p. 192).

Comment-24 We did not see any numbers regarding canopy closure? What is the canopy closure pre-project and post-project? This information needs to be disclosed in the DEIS. (7)

Discussion: A suite of attributes relative to wildlife habitat, including canopy closure will be summarized in the affected environment portion of the Chapter 3 wildlife section in this EIS. The Biological Assessment will also include the pre- and post-canopy closure/cover information for proposed thinning stands. The reported post-treatment information is based on FVS modeling however (combined with monitoring of similar treatments), and should not be considered an absolute representation of post-treatment stand conditions. For example, the thinning that is modeled will not account for the retained unthinned patches and retained rest/roost habitat within thinning units that would continue to contribute to canopy closure and thermoregulatory sites closures within the stand.

Comment-25 All treatments should be aggressive enough in order to maintain effectiveness for at least 30-40 years.(2)

The analysis needs to display time frame effectiveness for the proposed treatments in terms of meeting the designed purpose and need and long-term desired condition. (2)
Discussion: For the majority of natural stands, depending on the stand objective, the thinning prescriptions were developed to remain effective for about 20 years. Prescribed burning would be effective for about ten years and with the repeated burn entries (up to 3), would be effective for about 30 years. While not the 30-40 year timeframe as suggested, it is consistent with direction from the Regional Forester (Blackwell, 2004). Timeframe effectiveness is discussed in Chapter 3.

Comment-26 The current stand conditions are in dire need of treatment. The NEPA analysis needs to state whether the proposed action will meet the desired long-term stand and project objectives. If it doesn’t we want to know how many more entries will be required to meet the desired long-term stand characteristics. (2)

Discussion: The DEIS will discuss the alternatives achievement of purpose and need. A description of anticipated entries is included in Chapter 2, as needed (e.g. number of prescribed fire entries to meet desired conditions). See also Comment-25.

Comment-27 - We also request how much old growth remains in the LSR and how much this project will log. We also request how much old growth acreage (NOT general late-successional habitat) that remains in the 5th field watershed for this project. On the STNF, old growth is defined as trees 180 years old and above. The project will log 150 year old trees, well on their way to old growth status. How many of these trees will be cut? We request stand exam data be included in the DEIS or Silviculture Report that documents the exact units and number of trees 80 years old and above, that will be logged and their diameter limits. This information must be disclosed since the Forest states that variable density thinning will be based on “average tree diameter.” We are also opposed to this method of thinning since basal areas for units can’t be disclosed. The Forest can’t ensure adequate basal area will be maintained in late-successional habitat without disclosing the pre and post project basal areas for each unit. (7)

Discussion: The project will not treat old growth stands (there are none). Scattered, individual trees, remnants from historic stands, are occasionally present. Within treated stands, all predominant and most dominant trees would be retained, regardless of their current health/condition when marking. The largest oldest trees that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops would also be retained as long as they are not a safety hazard. The stand age range for the oldest treated stands in the project is 80-120 years old, though there are remnant trees that are older within these stands and these fit into the ‘predominant’ and late-successional trees with old-growth characteristics. Common Stand Exam data was collected in 2007 and will be included in the project record. It was and will be utilized to model the estimated tree growth and snag development post-treatment and 20 years post-treatment. Stand age ranges are also listed by unit in Appendix A, Table Appendix A-1. The seral stage information for the 5th field watershed will be included in the vegetation diversity report, the silviculture report or included in the EIS.

The scoping document does not state that “variable density thinning will be based on “average tree diameter”” as noted in the comment. Rather, it states: “Forest stand species diversity, hardwood diversity, existing openings, large down logs, snags and other structural components of suitable NSO habitat have been documented and these areas are either targeted for retention in variable density thinning prescriptions, or would be included in the 10 percent unthinned areas within LSR treatment units….Residual density in the natural stand thinning units would vary from an average 125 to 175 square feet of basal area per acre, but may be higher or lower depending on species composition and current habitat function for NSO. Depending on the average tree diameter, this equates to approximately 60 to 100 trees per acre. Lower densities would be applied in areas that are predominantly dominated by ponderosa pine and higher densities would be retained in mixed conifer and white fir dominated stands. Higher densities would also be retained where clumped groups of large trees, and smaller biomass sized (trees <10 inches DBH), occur to provide for age class and structural variability. Instead of applying one target basal area across a stand, the variable density thinning prescription would help promote within-stand structural heterogeneity that contributes to habitat function for late-successional species while providing the needed growing space, nutrients and water for the remaining trees.” While tree diameters are mentioned, it is not as a function of tree selection during the variable density thinning treatment, but as a measure to describe the estimated residual trees per acre.
Comment-28: The agency must carefully review and document their consideration of all the reasons not to log mature forests set forth in this paper. To address this short-fall of old-growth forests it is necessary to protect mature forests and trees because (a) they are already providing some values associated with old growth forests and b) they are poised to become old growth more quickly. This paper also urges not just conservation of existing old growth but also the ecological processes that sustain and continuously recruit old growth. (5)

If mature forest is left unprotected, some members of the environmental community will distrust the agencies and oppose them on many fronts. (5)

Leaving mature forests unprotected would leave substantial areas of roadless lands subject to future conflict. Many westside roadless areas may not qualify as old-growth, but still provide important values as roadless and mature forests. (5)

"Why Mature Forests Must be Protected. "As recognized by FEMAT, a conservation strategy for the Pacific Northwest must consider mature forests as well as OG. Forests are considered to enter maturity when their mean annual increment culminates, following which time they begin developing the characteristics that ultimately produce OG. Mature forests serve various important ecologic functions. They serve as future replacements for old-growth, help protect existing OG by reducing the starkness of age-class boundaries, and provide landscape connectivity and transitional habitat that compensate to some degree for the low levels of OG. Moreover, they are almost certainly more resistant to crown fires than younger forests, and hence contribute to buffering the landscape." (5)

Mature forests provide essential habitat for the species we are most concerned with such as: spotted owl, marbled murrelet, Pacific salmon, and most of the "survey and manage" species.

There is a serious region-scale deficit in mature and old-growth forest habitat. Over time, the Northwest Forest Plan seeks to re-establish 3.44 million acres of mature and old-growth forest (http://web.archive.org/web/20030402090844/http://www.fs.fed.us/land/fm/oldgrow/oldgrow.htm) (Accessed 7/31/2012). By continuing to log mature forests we are significantly slowing this recovery. If we are going to make a timely recovery from that deficit, and give struggling species a chance to survive the habitat bottleneck that we have created, we must protect mature forests so that they can become old-growth, and we must manage young forest so they can become mature. (5)

The transition from mature forest to old growth is a process that takes time and varies depending on factors such as location and species and disturbance events. In a mature forest, all the ingredients are there to make old growth (e.g., large trees) and the scientists agree that these forests need protection to help meet the current old-growth forest deficit. (5)

Protecting mature and old-growth forest leads to a real ecological solution, while protecting only old-growth is merely a partial solution to an ecological problem that is bigger than just old-growth. (5)

Cutting mature forest will remain controversial and socially unacceptable. If we seek to resolve conflict over management of older forests, protecting the old-growth while leaving mature forests unprotected would be only half a solution and would lead to more conflict. Shifting to a restoration paradigm gets everyone at the table working toward the same goal. (5)

The architects of the Northwest Forest Plan found that many of our best large intact forest landscapes are mature forests, not old-growth. Some large forest fires burned westside forests between 1840 and 1910 and many such areas were skipped over by the timber harvest planners because they were more intent on converting the very old forests to tree plantations. These former fire areas, now mature forests, offer some of our best hopes of recreating large blocks of intact older forest. (5)

The agency must protect mature forests because they are the best candidates to grow and develop into old-growth habitat in the shortest time frame. (5)

Discussion: Initial logging occurred in the project area in the late 1800s and early 1900s. Large overstory ponderosa pine and sugar pine as well as Douglas-fir were preferentially removed, with smaller trees and less marketable species being left. Selective overstory cutting has occurred over roughly the last 20 to 40 years. The average measured age of the natural stands is approximately 55 to 95 years (while the estimated stand ages in natural stands are 60-90 or 80 to 120), with a minor scattered component of older remnant trees (see also Comment-27).
Mature forests are defined as stands are generally greater than 80-100 years old and less than 180-200 years old (USDA-FS, 1994 pp. FEIS Glossary p. F-4, VIII-II) (FEMAT, 1993 pp. IX-20). Old-growth forests are defined as forest stands usually at least 180-220 years old (USDA-FS, 1994 pp. FEIS Glossary p. F-4, VIII-II) (FEMAT, 1993 pp. IX-24) in wet climates, on productive sites, old-growth characteristics can begin to develop as early as 150 years. On dry sites (such as the project area), stands may be well over 180 years before these characteristics develop (LSRA, 1999 p. 1). As described at Comment-36, per the Forest Plan (p. 4.37) and Northwest Forest Plan (pp. C-13), while risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the LSR from playing an effective role in the objectives for which they were established. The Northwest Forest Plan indicates younger stands are stands less than about 80 years old (USDA-FS & USDI-BLM, 1994 pp. C-12).

See Comment-13 for retention of the largest, oldest trees. The project specifically retains (does not treat) unthinned patches and habitat roost/rest clumps.

The project area is well roaded; containing an approximate road density of 3.32 miles per square mile (does not meet the criteria of a roadless area)\(^{114}\).

**Comment-29** - Cutting mature forests is not needed for ecological reasons. These forests are already exhibiting the characteristics that provide excellent habitat and they continue to develop and improve without human intervention. As recognized in the Northwest Forest Plan standards and guidelines for Late Successional Reserves, stands over 80 years old do not need to be manipulated to become old-growth. All the ingredients are there, they just need time. (5)

**Discussion:** Many of the natural stands in the Elk LSR contain elements of late successional habitat and provide stand structural conditions suitable as either spotted owl nesting/roosting or foraging habitat. These stands generally meet all of the Forest Plan classification elements of older late-seral stands except for canopy closure. Currently, there is a shortage of high quality late-successional habitat in the Elk Flat LSR. Many late-successional stands are deficient in structural diversity.

As described in the Chapter 1 however, these stands are at risk of loss from large-scale disturbance events such as insect outbreaks, diseases, and fire. The project was designed to enhance and protect important late successional habitat and components in the project area in the short term while addressing objectives to reduce large-scale risk, accelerate development of late successional habitat, and other stated project needs.

**Comment-30** - Complicated environmental analysis will be required for logging mature forests compared to thinning plantations. Wildlife surveys will be needed. Environmental Impact Statements will more often be needed instead of abbreviated Environmental Assessments. Formal consultation under the Endangered Species Act will more often be triggered. (5)

**Discussion:** The DEIS and/or supporting specialist reports will address Forest Plan and other laws, regulations, and policy including regulatory consultation requirements.

**Comment-31** - The FS states there are currently 46% late-successional habitat, 30% mid-successional habitat, and 24% early-successional habitat in the project area. What will these figures be post project? This information needs to be disclosed in the DEIS. The document states it takes several hundred years to grow old growth and late-successional habitat required by late-successional species. In our view this project will return the area to mostly early-successional habitat. How does that improve the LSR/CHU and old growth habitat? (7)

---

\(^{114}\) Undeveloped areas typically exceeding 5,000 acres that met the minimum criteria for wilderness consideration under the Wilderness Act and that were inventoried during the Forest Service’s Roadless Area Review and Evaluation (RARE II) process, subsequent assessments, or forest planning.
Discussion: None of the action alternatives would reduce the percentage of late-successional forest in the watershed or project area, though the no action alternative is actively reducing late-successional ponderosa pine forest (units 204, 206) and portions of this stand element in other parts of the LSR. Thinning treatments would retain all of the predominant trees as well as the majority of the dominant and most of the codominant trees within the stand (provided they are not a safety hazard). Thinning treatments would also result in lower basal areas overall by thinning from below the suppressed, intermediate and some codominant trees, but would not change the age classes that remain on the landscape. The thinning treatments would increase the average stand diameter and concentrate site growth potential on the residual trees maintaining, while enhancing, mature late-successional forest characteristics that are more resilient over time. In the long term, this would accelerate development of old growth late-successional forest characteristics in the thinned stands of larger diameter trees, larger diameter snags and larger down wood.

Comment-32 - We do not need to log mature forest to provide jobs. Less than 2% of the jobs in Washington and Oregon are in the lumber and wood products sectors, and only a small fraction of those are on federal land and only a fraction of those are related to mature forest logging. Many more environmentally benign jobs are available in restoring roads, streams, thinning young plantations, and managing fire and recreation. (5)

We do not need to log mature forest to prop up the economy. The NW economy has greatly diversified in the last decade. Our economy typically creates more new jobs every year than exist in the entire lumber and wood products sectors (5).

We do not need to log mature forest to prop up the timber industry. Less than 10% of the logging in Oregon and Washington in recent years has been on federal lands. Only a fraction of that is mature forest. Much more environmentally benign and socially acceptable timber can be derived from thinning young plantations or small diameter fuel reduction where it is appropriate. (5)

Discussion: The project actions were developed to address the gap between existing and desired conditions (and not to prop up the economy). Proposed treatments would be accomplished through a variety of methods, which may include service contacts, stewardship contracts, commercial timber sale contracts, force account crews, etc., which may result in jobs and economic benefits to the local area.

Comment-33 - Since managing these stands is not "needed" for any ecological reason or any economic or social reason, what would be the objective? (5)

Discussion: The project objectives are described in chapter 1, under the Purpose and Need section, which are based on an ecological need and direction from the NWFP, Forest Plan and Forest’s Late-Successional Reserve Assessment.

Comment-34 - When developing measurement standards for NEPA implementation do not use crown closure. There is no one set way to measure crown closure before or following treatment. No method has been developed that gives the same or an accurate measurement. (2)

The measurement standards need to be something that can be measured correctly before and following treatment; basal area, trees per acre, stand density index, spacing, etc. (2)

Discussion: Overall, crown closure will not be used as a target measure for purpose and need achievement. It may be used to describe certain effects or nuances, however in terms of qualifying and quantifying habitat changes from the treatments. It is also often used as a measure of connectivity, and to define dispersal, foraging, nesting/roosting, and resting/denning habitat for the NSO, northern goshawk, fisher and other species, such as rare plants and mosses.

Comment-35 - It is essential that that public and the Decision Maker know via NEPA the number and size of trees to be logged prior to a decision being made to implement the timber sale. This is particularly relevant for older trees >30”dbh. Please estimate the number mature trees (20-30” dbh) and the number of “old growth” trees >30” dbh that would be logged from each unit. The most informative way of disclosing this data would be to report the pre-logging number of trees in these size classes and the post-logging number and size of trees in these size classes. We have previously reviewed modeled results of these data for other timber sales thus the data is available for NEPA purposes and the Forest Service is required to disclose for comment and analysis prior to
issuing the decision to implement the project. The proposed action must demonstrate that this standard is being met for each unit logged. (6)

Discussion: Please refer to Comment-13 for retention of the largest oldest trees.

LSR

Comment-36 - Regen harvest in a LSR will have significant effects including: land allocation conflicts, precedence setting significant and long-term loss and degradation of forest cover and habitat, Forest Plan violation, public and scientific controversy, impacts to listed species, impacts to ecologically critical areas, etc. (5)

Discussion: There is no regeneration logging or mechanical regeneration treatment proposed with the Elk project. The DEIS and supporting analyses will disclose the effects of the proposed activities. Thinning or other silvicultural treatments inside LSRs may occur in stands up to 80 years of age if the treatments are beneficial to the creation and maintenance of late-successional forest conditions (USDA-FS & USDI-BLM, 1994 pp. 8, C-12, C-13, C-26). In addition, while risk-reduction efforts should generally be focused on young stands, management activities may be appropriate under the Northwest Forest Plan to reduce the risk associated with large-scale disturbance in existing late-successional habitat East of the Cascades and in the Oregon and California Klamath Provinces. These activities are considered appropriate -if: 1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat; 2) the activities are clearly needed to reduce risks, and 3) the activities will not prevent the LSR from playing an effective role in the objectives for which they were established (USDA-FS & USDI-BLM, 1994 pp. C-13). The project will be reviewed by the Regional Ecosystem Office and/or Regional Interagency Executive Committee where thinning or other silvicultural activities in LSR are neither consistent with the LSRA nor fall under a specific REO review exemption.

Comment-37 - Logging old growth, dominant and co-dominant trees over 80 years of age is a violation of the NWFP and 2011 Recovery Plan and will adversely modify habitat and adversely impact NSO. (7)

Discussion: The DEIS will disclose the effects of the proposed activities relative to consistency with direction from the NWFP, Forest Plan and the Forest’s Late Successional Reserve Assessment. Large-scale disturbance risk reduction activities may occur in stands older than 80 years of age if they meet the three criteria described in Comment-36. The 2011 Revised Recovery Plan for the Northern Spotted Owl also does not provide a definition of an old-growth tree, but instead discusses the suite of conditions that characterize old-growth forest, stating that “[o]ld-growth forests are forests that have accumulated specific characteristics related to tree size, canopy structure, snags and woody debris and plant associations….Old-growth forests support assemblages of plants and animals, environmental conditions, and ecological processes that are not found in younger forests (younger than 150-250 years) or in small patches of large, old trees,” (USDI-FWS, 2011). Recovery Plans are also non-regulatory (USDI-FWS, 2011 pp. I-3), and the Recovery Plan for the NSO includes recommendations for a recovery strategy and recovery actions. The Forest designed the Elk project to be consistent with applicable recovery actions (10 and 32). An in-depth analysis of treatment prioritization and rationale to support the Forest’s contention that it is consistent with the recommendations will be included in the project record. Certain proposed treatments may result in an adverse effect to elements of critical habitat, but are not expected to adversely affect any NSOs (e.g., oak release in critical habitat, radial thinning depending on amount of area and species affected). At present, there are no NSOs occupying the project area, or the historic activity center associated with the project. We kindly refer the reader to the Final Rule (USDI-FWS, 2012 p. 71939) for a description of what may potentially constitute an adverse effect to NSO critical habitat. If it is determined by the Forest Service that the project will adversely affect critical habitat elements, that determination will be disclosed and supported with the best available scientific rationale in the Biological Assessment. If that determination is made, then the FWS will make a determination during formal consultation on whether the project has an adverse modification on the entire designated critical habitat (also see the Final Rule (USDI-FWS, 2012 p. 71940) for a description of adverse modification and destruction of critical habitat and what the FWS’ responsibilities entail).
Comment-38: A considerable part of the LSR is not conducive to growing dense stands of conifer trees that are more representative of Northern Spotted Owl (NSO) habitat commonly found on the western portions of the Shasta Trinity National Forest. This area is more conducive to growing open grown forest stands, especially where ponderosa pine is the dominant species. (2)

We understand the US Fish and Wildlife Service (FWS) have canopy closure requirements for various habitat classifications (nesting/roosting, foraging, and dispersal) for the NSO. We are not sure whether there is research that shows 60% canopy closure can be sustained for nesting/roosting habitat in this forest type. (2)

The current stand characteristics are artificial only having developed over the last 100-150 years. These kinds of stand conditions did not exist prior to that time frame. Any treatment done to meet standard NSO canopy closure levels will only have short term effectiveness, 10 years or less, in terms of meeting the objectives of stand development and protection. Historically, old growth stands within this forest type did not have the levels of canopy closure required by the FWS. It will be absolutely necessary to articulate to the FWS what kind of vegetative conditions should be grown for long term sustainability and resiliency. (2)

Discussion: See the response to Comment-17. The Elk Flat LSR was identified as an area of important late-successional habitat during the late-successional mapping effort (LSRA p. 124). Stands that meet all of the Forest Plan classification elements of older late-seral stands do so except for canopy closure.

Comment-39: It must be remembered the LSR network was not just set up to grow NSO habitat. It was designed to grow late-successional habitat that can be resilient and sustained on any given vegetative type and ecosystem. The intent of the Northwest Forest Plan was to grow long-term late-successional habitat based on land capability. (2)

Discussion: Within the Elk Flat LSR, 2,836 acres are capable of supporting late-successional habitat (LSRA p. 125). Of lands capable of supporting late-successional habitat, 1,306 acres (46% of capable acres within the LSR) were in late-successional habitat as of the publication of the LSRA. Currently, there is a shortage of high quality late-successional habitat in the Elk Flat LSR. Many late-successional stands are deficient in structural diversity. See also Comment-29.

Comment-40: We believe that retaining large diameter trees and snags where they still exist would benefit the project in a number of ways. Large trees are a primary element of late successional habitat function, which this project seeks to retain. Retaining large trees in the project would greatly reduce the scientific and social controversy regarding the harvest prescription. Large trees provide disproportionate hydrological benefits to these watersheds. The crowns of such trees help moderate peak flow events via canopy cover. Large live and trees are the primary source of future large down wood, which also helps to filter and moderate water flow throughout the year. (6)

Discussion: Please refer to Comment-13 for retention of the largest oldest trees. The project includes design features and protection measures to assure that predominant trees, trees with late-successional characteristics, and large/small snags are retained during operations and prescribed fire. Due to the epidemic level of ponderosa pine snags in the area of extensive mortality (units 204, 206, 158, 159, parts of 163), not all snags will be retained. Some will fall naturally prior to project implementation, and some will fall during the treatment of this area. Snag retention patches in these areas of extensive mortality will be designated however, and they will be focused away from roads, private property boundaries and in areas where there is a component of large live trees to provide some protection from windthrow.

Comment-41: The document states desired late-successional and old growth characteristics includes multi species and multilayered assemblage of trees; moderate to high accumulations of large snags and logs, moderate to high canopy closure, moderate to high numbers of trees with physical imperfections such as cavities, broken tops, and large deformed limbs, and moderate to high accumulations of fungi, lichens, and bryophytes. How much of each of these criteria will be left post-project in the LSR and CHU when 90% of the habitat will be logged including all of these criteria? (7)
**Discussion:** The project analysis and DEIS will discuss the desired conditions and retention standards which meet Forest Plan direction and best available science recommendations for snags, coarse wood, decadent trees, vertical and horizontal heterogeneity, etc. The Biological Assessment will describe where mechanical thinning treatments will occur in natural stands (and plantations), underburning, other fuels treatments within the project area, and critical habitat.

Comment-42 - The fact this project will log old growth and “pre-dominant” trees makes this project a non-starter from the beginning. There is simply no legitimate reason to log any tree over 100 years old in the LSR. (7)

**Discussion:** Please refer to Comment-13 for retention of the largest oldest trees, Comment-14 regarding variable density thinning, and Comment-28 regarding stand age and LSR guidelines.

Comment-43 - The current levels are endemic at 7% not epidemic. Both insects and disease such as beetles and mistletoe are good for late-successional habitat and the species that rely on it. The LSR/CHU could benefit from MORE insect and disease, not less. We are not persuaded by Figure 4 in the document showing pine mortality. What we are persuaded by are the clearcuts, fragmentation and lack of habitat connectivity in the southern portion of the Elk LSR. The LSR was never intended to be a pine plantation for logging. Just what exactly does the Forest not understand about this simple concept? The only reason to log these areas is for timber production. We remind the FS once again that timber emphasis areas include Matrix lands – not LSR/CHU. (7)

**Discussion:** Please refer to Comment-11 regarding insects and disease and endemic levels, Comment-23 regarding the project’s objectives, and Comment-103 regarding clearcutting. The levels occurring in the southeastern, eastern and various pockets in the remainder of the LSR are considered epidemic for the stand loss that is occurring, which was described in the scoping document at about 15%, not 7% (it is not clear where the comment’s 7% figure originates from). This is notably a concern when the 15% or higher mortality is compared to the LSRA determination that 2% of the LSR would be subject to lethal effects (p. 125). The levels of mortality at scoping were approximated at 15% based on review of pockets and stands of dead and dying trees. By the time implementation occurs, these levels are likely to be steady or potentially higher, pending a stochastic event such as uncharacteristic or high-severity fire, extensive blowdown or subsequent bark beetle flights and attacks that stress the trees further.

Comment-44 - The authors of the Northwest Forest Plan accounted for large-scale disturbance in the design (and function) of the LSR system (e.g. Dr. Jerry Franklin’s comments regarding the proposed Biscuit Fire Salvage timber sale within Late Successional Reserves on the Rogue River-Siskiyou National Forest.) (6)

The LSRA network was designed to accommodate large, intense natural disturbances and allow for natural recovery processes. This is one reason that the FEMAT report and PNW Forest Plan provide for conservative direction with regards to salvage in LSRs and direct that activities should enhance or at least not interfere with natural recovery processes. Chapter and verse are cited in the text of these comments.

Salvage logging of large snags and down boles does not contribute to recovery of late successional forest habitat; in fact, the only activity more antithetical to the recovery process would be removal of surviving green trees from burned sites. Large snags and logs of decay resistant species, such as Douglas-fir and cedars, are

---

The Forest Plan Management Prescriptions 7 (Late Successional Reserve) standard and guideline D5 states, “Maintain dead/down material, hardwoods, and snags at naturally occurring levels” (Forest Plan p. 4-44). The LSRA describes desired conditions (desired naturally occurring levels) for Late Successional Reserves (and Managed Late Successional Areas). The LSRA describes that desired future conditions will vary according to the primary vegetative species, site class, topography and other site factors and these condition descriptions are to be used to guide the development of the prescriptions, with development and maintenance of late-successional habitat as the ultimate objective of the treatment. It further describes that the levels and ranges of various attributes should allow for long term viability of late-successional characteristics. For mixed conifer habitat, the average number of snags at least 20 inches in diameter is 2-4, per acre and 6-7, 20+ inch diameter down logs on north and east aspects and less on south and west aspects and the McCloud Flats (LSRA p. 166). The desired levels identified in the vegetative descriptions represent an average for a landscape or treatment area (i.e., 100 acres). Numbers of snags and down logs can vary on any particular acre (LSRA p. 164).
critical as early and late successional wildlife habitat as well as for sustaining key ecological processes associated with nutrient, hydrologic, and energy cycles. (6)

**Discussion:** As described in Comment-37 and Comment-36, the project was designed to reduce the risk of loss of LSR habitat from large scale disturbance as permitted by the Northwest Forest Plan (pp. C-12, C-13). Snags are being retained (see Comment-20) as well as the largest oldest trees that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops (as they are not a safety hazard) (Comment-13).

**Comment-45** - The ecological differences between biologically rich stands that result from natural disturbance and stands that are subject to regeneration logging, skid trail establishment, machine piling and road construction are well known and pronounced. Early-successional forest ecosystems that develop after stand-replacing or partial disturbances are diverse in species, processes, and structure. Post-disturbance ecosystems are also often rich in biological legacies, including surviving organisms and organically derived structures, such as woody debris. These legacies and post-disturbance plant communities provide resources that attract and sustain high species diversity, including numerous early-successional obligates, such as certain woodpeckers and anthropods... (6)

**Discussion:** There is no regeneration logging or mechanical regeneration treatments proposed with the Elk project. The Forest agrees that biological legacies are important, the project would retain important elements such as snags, CWD, shrubs, small trees /large trees, and untreated stands (e.g. unthinned patches, deferred units/areas, habitat roost/rest clumps). The project's design follows guidelines for the Management Prescription that are intended to protect and enhance conditions of late successional and old-growth forest ecosystems, of which early seral habitat is an important component to provide for prey base in certain areas (e.g., whitethorn, other shrub habitats, hardwoods for dusky-footed woodrats and other potential NSO, fisher and northern goshawk prey).

**Comment-46** - The disturbances occurring within the Elk LSR are considered more than small-scale in nature. (2)

The Elk proposal is dealing with reducing the risk of a large-scale disturbance that is currently occurring. Your project proposal is in complete compliance with the NWFP and Land and Resource Management Plan based on this direction/guidance. Nowhere is found direction or guidance to allow 100’s of acres of mortality to continue to spread across the landscape. (2)

**Discussion:** Please refer to Comment-23.

**Comment-47** - "The following highlights direction/guidance from the NWFP concerning treatments within LSR’s. All of the following quotes are found in the ROD within the Standard and Guidelines section. (2)

Page B-1: “In Late-Successional Reserves, standards and guidelines are designed to maintain late-successional forest ecosystems and protect them from loss due to large-scale fire, insect and disease epidemics, and major human impacts.”

Page B-1: “These standards and guidelines encourage the use of silvicultural practices to accelerate the development of overstocked young plantations into stands with late-successional and old-growth characteristics, and to reduce the risk to Late-Successional Reserves from severe impacts resulting from large-scale disturbances and unacceptable loss of habitat.”

Page B-4: “In the warmer, drier physiographic provinces (i.e., the Washington Eastern Cascades, the California Cascades, and the Oregon and California Klamath Provinces), fire is more frequent, less intense, and is an integral part of the internal dynamics of a typical stand (tens of thousands of acres). In the drier provinces, fire control and timber harvest have decreased the abundance of some types of old growth, such as ponderosa pine, that are dependent on frequent, low-intensity fires. Other types of late-successional forest that are less fire resistant or are less desirable for harvest have become more widely distributed. In these areas, the potential for stand-replacing wildfires has increased, resulting in a higher risk to the stability of current stands reserved for late-successional species.”

Page B-5: “Silvicultural systems proposed for Late-Successional Reserves have two principal objectives: (1) development of old-growth forest characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and (2) prevention of large-scale disturbances by fire, wind, insect, and diseases that would destroy or limit the ability of the reserves
to sustain viable forest species populations. Small-scale disturbances by these agents are natural processes, and will be allowed to continue."

**Discussion:** Thank you for the comment. Chapter 1, any LSR indicator analyses and sections of Chapter 3 of the DEIS, along with the supporting analyses, will disclose how the project meets the management direction and standards and guidelines. Please also refer to Comment-23.

**Comment-48** - The document states the current project area is 25% 10-50 year old plantations and another 20% of plantations will be logged in the project. That adds up to 45%. The document also states there is 46% late-successional habitat and 90% of the project is in LSR so it's appears that ALL of the late-successional habitat will be logged except for 380 acres. Again we are curious as to how the Forest believes this is "protecting" late-successional habitat. Instead of actually protecting and maintaining the habitat, the Forest is proposing to return the entire LSR to early-successional habitat. We believe this is a violation of the FOREST PLAN, NWFP, LSRA, and Recovery Plan. Please show us how we are incorrect. (7)

**Discussion:** The preponderance of activities proposed within the Elk Flat LSR consist of thinning and prescribed fire. There is no regeneration logging or mechanical regeneration treatment proposed with the Elk project. Limited group selections are proposed in some thinning stands that would create small openings (up to about 2 acres) within older plantations and natural stands, due to root disease or stagnated tree growth from density. Meadow enhancement treatments will also aim to restore the dry meadow habitat in Elk Flat by removing encroaching conifers. Silviculture treatments in the project will not appreciably change the current seral distribution in the Ash Creek 5th field watershed under any action alternative. Thinning will shift some stands from seral stage 4b to 4a for approximately one to two decades until residual tree canopies reoccupy thinning space. Thinning will also increase the 3b and 3c seral stage classes. Please also see Comment-23, Comment-28, and Comment-29. LSR protection and enhancement includes the Guidelines to Reduce Risks of Large-Scale Disturbance in forests in the California Cascades Provinces.

**Comment-49** - The Forest intends to leave a 380 acre island of late-successional habitat for the NSO AC stating it will "contribute" to late-successional processes. Where does the BAS document that leaving a small island of habitat surrounded by clearcuts benefit the NSO? The Forest is mandated to maintain and improve LSR habitat – not simply contribute to it. The Forest also intends to burn the 380 acres and expects to lose 5-10% of it to the burn. So in reality the project would lose between an additional 19 to 38 acres of the 380 acres. (7)

**Discussion:** The Proposed Action that was scoped deferred approximately 380 acres of stands in the project area from mechanical treatment and thinning. This acreage may increase, or decrease, depending on additional stand review and treatment prioritization. There will be untreated areas throughout the project area (in the form of the unthinned patches, roost/rest clumps, whole units deferred from treatment and other areas of high quality NSO, northern goshawk and fisher habitat). These stands would be excluded from silviculture treatments because they are not currently at risk, or they are at a density-related risk, but are being left untreated or unthinned at this time to maintain current nesting, roosting and foraging habitat for these species. As described in the February 2013 scoping document, this is "one element of an overall spatial and temporal strategy to retain high quality habitat function on the landscape and address forest change over time in the advent of disturbance events". Also as described in Comment-48, the unthinned blocks and areas of habitat will not be surrounded by clear cuts but rather will be mostly within a mosaic of varyingly thinned stands.

**Comment-50** - Since the Northwest Forest Plan was adopted there are even more reasons to protect and restore mature & old-growth forests, including: 1. to alleviate barred owl/spotted owl competition (even though there are not owls there now, there could be anytime in the future, and the LSR should be managed to accommodate them); 2. to store carbon and mitigate climate change; 3. to mitigate for the significant cumulative loss of snags and dead wood habitat from extensive logging on public and private lands.(5)

*The Northwest Forest Plan requires that: The Watershed Analysis] will serve as the basis for developing project-specific proposals, and determining monitoring and restoration needs for a watershed...Hence the following findings of the McCloud Flats Ecosystem Analysis should be addressed in project development and implementation.*

Distribution of snags and deadwood is spotty because large areas of plantations have almost no deadwood or snags. This reduces the average below forest minimums. Page 22.
[Habitat] connectivity among the LSR’s and MLSA’s will be a continuing problem. Page 61.

Goshawks populations are in a similar situation to the spotted owls, limited by lack of habitat and harassed by human activity. Page 62.

In Late-Successional Reserves and Managed Late Successional Areas, late successional forest stands are to maintain health and diversity components through the use of prescribed fire and thinning from below. Patches of dead trees are scattered throughout the landscape. Page 66.

A possible relationship between soil disturbance and black stain incidence has been reported. Disease incidence appears to be higher adjacent to recently constructed roads and old railroad beds. Page 67.

Roads have altered groundwater flowpaths in riparian meadows. Page 81.

Four priority areas have been identified for road closures. They are the Elk Flat LSR… Page 86.

Continue nesting and occupancy surveys for goshawks. Coordinate monitoring with Klamath NF. Page 87.

Minimize soil disturbance during thinning operations. Page 88.

Youngest stands have the highest priority for silvicultural treatment. Page 101.

Reduce road density. Page 102.

No silvicultural activities should be undertaken in current or recently active goshawk nesting territories. Page 102.” (6)

Discussion: The Elk LSR project is guided by direction in the NWFP, the Forest Plan, and the LSRA as described earlier in this DEIS. In addition, the need for action was determined by comparing existing conditions with the desired condition relative to the identified purposes. Existing conditions, causal mechanisms and needs for action in relation to the Forest Plan desired conditions were identified in Step 5 of the Edson WA and Chapter 5 of the Mount Shasta WA (both which overlap portions of the project and the 1995 McCloud Flats Watershed Analysis). Many of the watershed analysis recommendations have been incorporated or addressed in the project’s design. In regards to the comment and the project being used to “1. alleviate barred owl/spotted owl competition (even though there are not NSOs there now, there could be anytime in the future, and the LSR should be managed to accommodate them); 2. to store carbon and mitigate climate change; 3. to mitigate for the significant cumulative loss of snags and dead wood habitat from extensive logging on public and private lands,” the proposed and refined treatments all aim to meet some of these objectives, while remaining in accordance with the management direction. The Forest Service’s direction does not include “mitigating” for actions taken on private or public lands or climate change. The activities proposed are to increase stand and LSR habitat resilience to stressors however, such as prolonged drought, fire and insect attacks.

Comment-51 - Snags are currently at 10 snags, 20” dbh per acre. This is excellent for late-successional species. The document states “excess” snags will be taken. The amount of “excess” snags must be disclosed considering it is equally important habitat along with old growth for late-successional species. (7)

Discussion: Please see Comment-20. The project discusses retention standards which meet Forest Plan direction for snags.116

---

116 The Forest Plan Management Prescription 7 (Late Successional Reserve) standard and guideline D5 states, “Maintain dead/down material, hardwoods, and snags at naturally occurring levels” (Forest Plan p. 4-44). The LSRA describes desired conditions (desired naturally occurring levels) for Late Successional Reserves (and Managed Late Successional Areas). The LSRA describes that desired future conditions will vary according to the primary vegetative species, site class, topography and other site factors and these condition descriptions are to be used to guide the development of the prescriptions, with development and maintenance of late-successional habitat as the ultimate objective of the treatment. It
Comment-52 - A commenter present at a public meeting on March 26, 2013 stated there should be nothing wrong with leaving 100’s of acres of dead trees within the Elk LSR. It was stated this was expected in the Northwest Forest Plan. We don’t believe that was the full intent of what the authors of the Northwest Forest Plan had envisioned for LSR’s. (2)

Discussion: The NWFP includes information on the basis for the standard and guidelines including ecological principles for management of late-successional forests (USDA-FS & USDI-BLM, 1994 p. Section B). Dead trees are an important component in LSRs. Simultaneously, there is direction to protect and enhance LSRs (including reducing risks of large-scale disturbance in this province).

Comment-53 The document states that due to 100 years of fire suppression stands are dense and risk of wildfire is high. The need to "protect" late-successional habitat is great. We believe the proposed action is not a rational response to these assumptions that are not based on the best available science. The Forest wants to log 90% of the LSR leaving only 10% in un-thinned units and then burn it. The FS also intends to reduce basal area to a maximum of 150 ft./sq.ac. and in some areas much less. ... log a majority of 80-150 year old trees, including stands of old growth with trees 30” dbh and greater. ...convert the LSR to another pine plantation and regenerate Ponderosa pine rather than maintain the preferred mixed conifer species by late-successional animals. This will require REO approval because it violates the NWFP....also the LSRA, the 2011 Recovery Plan, and the 2012 Critical Habitat designation. (7)

Discussion: See also Comment-27, Comment-28 and Comment-48. The Elk LSR project is designed to move the landscape toward the desired condition for the Elk Flat LSR as guided by the visions, goals, strategies and design criteria embodied in the NWFP, the Forest Plan, and the LSRA as described in the scoping document and Chapter 1 of this EIS. It is consistent with general objectives from the LSRA, all of which fall under these LSRA Activity Design Criteria: 1 (Reforestation and revegetation), 4 (Thinning in early successional pole and mid-successional stands - Hazard Related), 5 (Thinning in early successional pole and mid-successional stands -Development of Late-Successional Habitat), 7, 9 and 10 (Fuel Reduction, Hazard Reduction - Prescribed Burning and Manual and Mechanical Fuels Reduction) and Miscellaneous Activity 7 (Maintaining Hardwood Stands, forest openings, meadows, and glades) (LSRA pp. 182-195). The proposed treatments require REO review to ensure consistency with the NWFP and LSRA (see also Comment-36). The proposed action was also designed to be consistent with recommendations from the 2011 Revised Recovery Plan for the NSO (see Comment-37) and the 2012 Critical Habitat designation. This information will be included in the project record and the project Biological Assessment.

Comment-54 With treatments planned in an LSR one would expect the decision maker to limit the number of entries required to fully achieve the desired stand characteristics. The intent of the Northwest Forest Plan was to minimize the number of entries within LSRs. One would also think the FWS would welcome proposals that limit the number of disturbance entries in order to achieve long term desired conditions. (2)

Discussion: See Comment-25 for thinning effectiveness (which can be roughly translated to expected re-entry). Due to the high degree of departure from the natural fire regime, one prescribed burn entry is unlikely to achieve the objective of returning the natural role of fire to the ecosystem. Instead, 2 to 3 incremental underburns, repeated every 5 to 10 years would be implemented. The entire area would not be underburned in any one year, contributing to a diverse mosaic of treated area conditions.

Comment-55 - Please also take a hard look as to the ecological contribution that snag forest habitat is providing this LSR and the possibility of spreading disease through logging, road and landing construction. (9)

further describes that the levels and ranges of various attributes should allow for long term viability of late-successional characteristics. For mixed conifer habitat, the average number of snags at least 20 inches in diameter is 2-4, per acre and 6-7, 20+ inch diameter down logs on north and east aspects and less on south and west aspects and the McCloud Flats (LSRA p. 166). The desired levels identified in the vegetative descriptions represent an average for a landscape or treatment area; i.e., 100 acres. Numbers of snags and down logs can vary on any particular acre (LSRA p. 164).
Discussion: Please refer to Comment-20 and Comment-51 regarding snags, and Comment-10 and Comment-11 regarding disease spread.

Comment-56 - The FOREST PLAN also encourages the agency to use prescribed fire and thinning from below, focus on younger stands, and accelerate development of late-successional characteristics in the LSR. None of these objectives will be furthered by removing large snag habitat from over 1,500 acres of the LSR. (6)

Discussion: Please refer to Comment-28 regarding treatment in mature stands, and comments Comment-20 and Comment-51 regarding snags. See also Comment-53 regarding consistency with the LSRA management direction.

Machine Piling

Comment-57 - Do not be forced into dropping the option of machine piling. This technique has been used effectively for decades with no detrimental effects to the soils resource. (2)

Discussion: The Forest Service will determine, based on review of the existing conditions prior to underburning and after thinning treatments, what type of surface fuels reduction methods to use that limit the most disturbance to soils, CWD, snags and residual vegetation. Where heavy concentrations of CWD exceed the desired conditions as specified in the resource protection measures (typically more than 40 tons per acre), machine piling and burning of some piles would be utilized. This method would reduce surface and activity fuels, and would be pretreatment before underburning to increase consumption of excess fuels over what underburning would accomplish and to limit adverse effects to overstory trees, soils and wildlife habitat (see also Comment-3). Piling would focus on the high fuel load/mortality pockets and machine piling passes would be limited to the extent needed to reduce fuel loads to levels described in the resource protection measures. Treated areas would not be rigorously cleaned of slash material, and duff materials would be largely left in place for soil cover and erosion protection consistent with Forest Soil Quality Standards, RPMs and BMPs.


Our organizations remain convinced that manual piling is far preferable to tractor piling. Manual piling has none of the negative impacts to soils associated with tractor piling, provides an increased opportunity for local employment and significantly reduces long term damage to soil health and productivity. Hence manual piling would better achieve the stated forest health purpose and need for the project. (6)

I am concerned about proposals to conduct machine piling in the Elk Flat LSR. (8)

Discussion: Machine piling was identified as a significant issue for this project and is discussed in Chapter 3. As described in Comment-6, as well as the existing condition section of Chapter 1, many of the surface and standing dead fuels are too large and too abundant to safely or effectively pile by hand. See also Comment-3 and Comment-57 that address when machine piling may occur.

Bull et al. 1977 (and 1997) discusses the importance of trees and logs to wildlife, including downed coarse wood. USDI BLM and USGS discuss biological soil crusts (in arid and semi-arid regions) as indicators of ecological health. The project incorporates project measures to retain and/or protect large CWD that is an important habitat component for wildlife (and soils). For example:

- Piling would focus on the high fuel load/mortality pockets and machine piling passes would be limited to the extent needed to reduce fuel loads to the levels described in the resource protection measures;
• Treated areas would not be rigorously cleaned of slash material, and duff materials would be largely left in place for soil cover and erosion protection consistent with Forest Soil Quality Standards (Forest Plan p. Appdx. O), RPMs and BMPs;

• Existing CWD would be maintained and protected from disturbance to the greatest extent possible within all thinning and fuels treatment units in LSR and matrix land allocation;

• An average of 6 to 10 large down logs per acre in a variety of decay classes with a preference for 20-inch diameter logs, or the largest size class available would be retained;

• Where piling and burning is conducted within NSO and NGO foraging habitat, two unburned slash piles per acre would be left to provide small mammal habitat.

No biological soil crusts were observed during soil surveys (Courtney, 2015). Machine piling earned a reputation as a harmful practice on soils in the past, from the era where machine piling almost exclusively referred to site preparation for planting after a clearcut, and often occurring on moderately steep slopes. However, slash piling as practiced in the past has not occurred on National Forest System lands since the mid-1990s. Mechanical operations are limited to slopes less than 35%. Much smaller tractors equipped with a brush rake on the blade are typically used, which result is little to no topsoil displacement or compaction that would be of any detrimental degree. In some areas of the project, an excavator may also be utilized to pile (see Chapter 2 description of machine piling and burning, and EIS Appendix A). Piles are to be “clean” (without soil), which helps them burn properly. Tractor piling often takes place in thinned stands, so there is much less slash generated when compared to regenerated stands. Combined with whole tree yarding, the overall results are much less slash material being moved into piles, and much less equipment traffic on the soils compared to past practices.

Forest monitoring found machine pile and burning overall effects on the soil were minimal due to clean piles that lacked displaced soil (Rust, 2013d). Fall burning consumed most of the slash, and had minimal loss of soil organic matter and topsoil. Soil heating was 2 to 4 inches deep had high levels of soil organic matter, roots, low to moderate levels of compaction. The areal extent of tractor piling is limited to slash concentrations in much if not most of the areas that include machine piling. Some soil displacement may occur associated with equipment operations but this should be limited in extent due to flat topography and the spatially patchy distribution of activity generated slash. Slash (LWD) and litter/duff remaining on site will provide for soil cover, erosion control, and provides a source of nutrient supply over time. If done properly, machine piling is expected to meet soil quality standards. The size of the material being piled is too large for manual methods.

Comment-59 Forest monitoring found machine pile and burning overall effects on the soil were minimal due to clean piles that lacked displaced soil (Rust, 2013d). Fall burning consumed most of the slash, and had minimal loss of soil organic matter and topsoil. Soil heating was 2 to 4 inches deep had high levels of soil organic matter, roots, low to moderate levels of compaction. The areal extent of tractor piling is limited to slash concentrations in much if not most of the areas that include machine piling. Some soil displacement may occur associated with equipment operations but this should be limited in extent due to flat topography and the spatially patchy distribution of activity generated slash. Slash (LWD) and litter/duff remaining on site will provide for soil cover, erosion control, and provides a source of nutrient supply over time. If done properly, machine piling is expected to meet soil quality standards. The size of the material being piled is too large for manual methods. - We continue to emphasize the need to carefully look at all fuels reduction options. We highly encourage you to keep

117 Heavy slash accumulations were “straight-bladed” into piles, often also piling large amounts of topsoil into the piles (sometimes purposely, to reduce re-growth of sprouting species as competition for planted trees). This practice was eventually widely recognized as harmful to soil productivity, and one of a few practices that directly led to topsoil displacement standards incorporated in national and regional soil management direction from 1991 to 1995.

118 The Forest has a long track record of working directly with equipment operators to achieve minimal soil displacement or other soil impacts historically associated with this practice.
all options open for treating fuels within the project area. Hand piling should be the last option as it is very expensive and can lead to a nonviable project. Do not be forced into dropping the option of machine piling. Given the current mortality conditions within many of the stands, machine piling is the only feasible option. This technique has been used effectively for decades with no detrimental effects to the soils resource. (2)

Discussion: See also the responses to Comment-3, Comment-6, Comment-57, and Comment-58. Machine piling is being evaluated for use in the Elk project. This activity would be limited to the areas where it is needed to reduce surface fuel loading to Forest Plan standards for the LSR and matrix lands, and the resource protection measures. The SMMU currently employs several equipment operators and owns various pieces of equipment, including two dozers and an excavator that may be used for piling. Hand piling is a less safe and viable option due to the size of the material to be piled, though this option may be used in sensitive areas.

Comment-60 - The Six Rivers National Forest recently concluded: “Machine piling/burn piles would increase ground disturbance and soil displacement when the machine turns.” -Little Doe and Low Gulch Timber Sale DEIS p 110. (6)

Discussion: It is difficult to compare a timber sale on the Six Rivers with one on the SMMU. The topography is greatly different. See also the discussion for Comment-71, Comment-3, Comment-6, Comment-57, and Comment-58. The description of proposed machine piling in EIS Chapter 2 and Appendix A, and the resource protection measures, describes the equipment and protection measures that would be used during piling activities.

NEPA

Comment-61 - Blending 36 CFR 215 and 36 CFR 218 is a NEPA violation. (7)

Discussion: There is no blending of these regulations in the scoping document, or other elements of the project. 36 CFR 218.16 addressed the effective dates for the 218 pre-decisional objection process as well as provisions for the process transition. This was fully described in the scoping document to assure that the Public was aware of the process transition.

Comment-62 - A proper consideration of the cumulative impacts of a project requires "some quantified or detailed information;...[g]eneral statements about some possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." (1998) . The analysis “must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present and future projects.” (6)

It appears that much of the LSR and surrounding Forest Service lands have been subjected to logging, road construction and fire exclusion. We have also observed implementation of regeneration logging, large tree logging, large snag logging, tractor yarding and machine piling activities in the matrix land use allocation in the Pilgrim and Mayflower timber sales on the McCloud District. These prescriptions have turned public forestlands into highly compacted dirt fields largely devoid of vegetation. See attached photos. The cumulative impacts of these practices are severe and significant.

"The many severe cumulative impacts from timber sale activities, road construction, fire suppression, and machine piling for this planning area must meet the requirements of NEPA such that: A proper consideration of the cumulative impacts of a project requires "some quantified or detailed information;...general statements about possible effects and some risk do not constitute a hard look absent a justifications regarding why more definitive information could not be provided." The analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present, and future projects.""

Given the repeated acknowledgements in the watershed analysis regarding the impacts of past logging and road activities on the hydrological and terrestrial health of the project area, it is vital that the Forest Service analyze and disclose the cumulative impacts of past activities and its future plans.

Please disclose and analyze all previous projects in the LSR that were mentioned in general in the document. How are these previous projects impacting habitat, species, soils and water quality in the project area?

Please provide a thorough cumulative impacts analysis of the proposed logging in combination with other federal logging and early 50% of this watershed has been commercially logged in the last 15 years. 480 acres of mature forests have been removed from this watershed. Please honestly analyze and disclose how continued grazing
and additional logging, road and landing construction will affect wildlife, soils, recreation, late successional characteristics and heritage resources.(6)

Discussion: The analysis will follow regulations and policy regarding NEPA cumulative effects, which are described in the DEIS. The IDT reviewed information from the past 30 years for activities that are contained within or intersect with the Elk project general cumulative effects review area. The specialists reviewed past actions to: (1) determine if past actions are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for action and its alternatives may have a continuing, additive and significant relationship to those effects, and (2) determine if past actions help illuminate or predict direct and indirect effects of the proposed action or its alternatives. This approach is consistent with the Council on Environmental Quality (CEQ) letter “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis” of June 24, 2005. Ongoing and future actions were also considered in this boundary. The wildlife analysis will also consider cumulative effects as they are defined under the ESA, pending the determination (formal vs. informal consultation).

Spatial and temporal boundaries are the two critical elements to consider when deciding which actions to include in a cumulative effects analysis. Spatial and temporal boundaries set the limits for selecting those actions that are most likely to contribute to a cumulative effect. The effects of those actions must overlap in space and time for there to be potential cumulative effects (FSH 1909.15 (15.2)). This is determined by how long, and how far reaching direct and indirect effects of a project are felt on a given resource area (FSH 1909.15 (15.3)). Therefore, relevant boundaries and projects assessed for cumulative effects vary by resource. Each resource’s cumulative effect area can be different and possibly larger or smaller. Details are described in individual resource analyses. The boundaries used for the resource analyses are described in Chapter 3.

Comment-63 - We are submitting four maps with our scoping comments that document all the timber sales in the SMMU by the FS as well as industry (THPs), owl ACs, and the Elk project in relation to the Pilgrim project. We included 10 major FS timber sales that fit together like a jigsaw puzzle. In fact the Elk project units are actually units left by the Pilgrim project. All 10 projects include designated critical habitat for the NSO yet the FS keeps insisting this “death by a thousand cuts” is not harming the owl. We also note there are approximately 40 THPs in the SMMU. We expect the FS will conduct a NEPA analysis of cumulative effects that considers the broader implications to owls.

Discussion: Please see Comment-62 for discussion of cumulative effects. A NEPA cumulative effects analysis will be completed for the NSO, as well as other species considered in the project analysis. The DEIS will summarize the cumulative effects relative to the NSO. Regarding overlap of Elk and Pilgrim treatment units, the DEIS describes that unit 401 overlaps with the Pilgrim project. Unit 401 will receive underburning under the Elk project to further enhance meadow characteristics, and implement the thinning treatments that were assessed under the Pilgrim project, and that is why it is included in the Project area and analysis.

Comment-64 - The document states that stands that are deferred from treatment (the 380 acres) will provide heterogeneity at the larger project area scale; therefore the Forest needs to analyze fragmentation and connectivity at the larger project scale. It also needs to disclose when it intends to log the 380 acres not treated in this project. The units in the Elk LSR are basically part of the Pilgrim project which logging began in 2010. So that analysis claimed units were also deferred and apparently they were only deferred for 2 years. If the only habitat the Forest intends to leave in late-successional condition is 380 acres, and states they were deferred, then the cumulative effects analysis must disclose when they are planned for treatment as a foreseeable impact.

Discussion: See also the response to Comment-48 and Comment-49. The scoping document states: “In addition to retaining a minimum 10 percent of the proposed thinning treatment units in LSR allocation [footnote omitted] in an unthinned condition to retain features such as thermal cover, dense pockets of trees, trees with cavities, deformed and/or decadent limbs and openings with dense brush, small trees, or other vegetation for size differentiation, approximately 380 acres of natural stands have been excluded from thinning treatments as field review shows they are either not currently at a high risk of loss or to maintain certain current late-successional habitat for northern spotted owl and northern goshawk.” When scoped, the 380 acres was deferred from mechanical treatment, but planned for underburning and that amount may
increase, or even decrease, during additional project planning and consultation with the FWS and other resource agencies and as conditions change in the stands. At this time, there is no plan to thin the stands that will not be mechanically thinned under the Elk project. Connectivity within the LSR will be assessed and discussed in the EIS and Biological Assessment/Biological Evaluation as it relates to treatment objective 4 of the LSRA, and late-successional habitat and dependent species.

**Comment-65**: All of the units have been identified and have associated prescriptions. We looked at the Elk LSR project in 2012 and it's marked. We have photographs and videos documenting this. The purpose of scoping is to notify the public that a project is being considered and to request general information prior to a proposed action. (7)

**Discussion**: The scoping document for the proposed action was detailed with maps and draft prescriptions for the existing conditions to permit the public an opportunity to comment on, contribute to, and identify issues with the proposed action. Responses to the proposed action and scoping document, as discussed in the Introduction to this Appendix, will be used to identify key issues, alternatives and indicators. In regards to the 2012 review noted in the comment, there had been no designation of timber (painted) in the project area. The national standard for surveyed property lines are blazes and portions of these trees are painted red to differentiate land ownership between private property and Forest Service property. The preliminary flagging (orange/blue), orange paint (draft unit boundaries) or tagging (yellow) that may have been observed in 2012 is used on the ground to assist resource specialists during the planning phase of most projects. It is not the final treatment boundary designation, but is a preliminary identification to help with development of different alternatives, resource protection measures, location of potential suitable landing locations, assessing logging systems, designating wildlife leave areas and identifying mortality areas. Unit boundaries and prescriptions are also sometimes marked prior to a decision being made. This allows for a better visual representation of what is proposed with thinning and other treatments. It permits FS specialists and other agency staff (FWS, NOAA’s National Marine Fisheries Service, SHPO, Water Board), county personnel and landowners the opportunity to review what the proposed or draft treatments are and visualize what conditions would be like post-thinning or harvest. It is not possible to pre-mark areas of underburning, but the SMMU has several post-burning examples that the public is able to review. If changes result during the NEPA analysis and decision process for mechanical thinning operations, or no-treatment areas (unthinned patches are modified, additional timber is designated for retention or removal, exclusion of units, etc.), marking, and cruise data, changes are made prior to implementation to ensure consistency with whatever decision is made.

**Comment-66**: The document states “If you reference scientific literature in your comments, you must provide a copy of the entire cited reference and include rationale as to how you feel it is pertinent to the project.” The 36 CFR 215 regulations have no such requirement. Generally scientific literature is submitted during the draft stage because of the assumption the FS is actually drafting alternatives and has not already come up with a “Proposed Action”. (7)

**Discussion**: Providing the scientific literature that is cited in scoping comments and response letters helps us understand the public’s and other agency’s concern(s). Often literature or other information is cited in scoping (and other comment) response letters and we are not able to locate it.

**Comment-67**: Regardless, we want to document this NEPA violation up front prior to the actual “comment period.” We are puzzled why the Forest is asking for public input when it already has a proposed action that is fully developed. We don’t see how a reasonable range of alternatives can be met considering the action is developed, units identified, and stands marked. (7)

**Discussion**: See also Comment-65. The IDT developed a draft proposed action that addresses the purpose and need, and law, regulation and policy. It was the Agency’s best effort at putting forth a draft proposal to close the gap between existing and desired conditions. Public comments on the draft proposed action and proposal are meant to help refine the proposal and identify preliminary and key issues. The results of scoping (usually transmitted through written or verbal comments or at the public meetings) are used to clarify public involvement methods, refine issues, select an interdisciplinary team, establish analysis criteria, and explore possible alternatives and their probable environmental effects (FSH 1909.15 ch.10 [11]).
Elk LSR Enhancement Project

Comment-68 - It would have been far more prudent to develop an action alternative that retained all Old Growth (predominant trees) and dominant and co-dominant trees. Instead, it intends to leave all trees under 10” dbh, and leave the current pine plantations that are only 10-20 years alone. We fail to see how regeneration harvest and planting in a late-successional reserve is preserving late-successional habitat? We also fail to see how creating a Ponderosa pine plantation that requires an open canopy and a lot of sunshine in an LSR is protecting late-successional habitat? (7)

Discussion: As described in Comment-13 and Comment-27, the project proposes to retain predominant trees and most dominant trees, and trees with late-successional attributes. There is no old growth in the project area, but legacy trees (predominants) would be retained. See also Comment-23, Comment-38 and Comment-39 regarding natural regeneration and pine. There is no regeneration logging or mechanical regeneration treatment proposed with the Elk project. The project does not propose to retain all trees <10” dbh; it would retain and thin this size class mechanically, depending on stand and habitat conditions, and this size class would also be affected during underburning operations.

Soils

Comment-69 - New road construction, landings, machine piling and tractor yarding have significant (and cumulative) impacts to forest soils. (6)

Discussion: The DEIS discloses the direct, indirect, and cumulative effects of the proposed activities on forest soils (see Chapter 3, Soils).

Comment-70 - Soil loss with respect to method of harvest is directly related to the amount of soil disturbed and bared by harvest activity, especially the density of skid trails and roads required to access the timber. Megahan (1981) found tractor logging on granitics to result in 28 percent of the soil disturbed, ground cables with 23 percent, suspended cables with five percent and helicopter logging with two percent. Similarly, Swanston and Dymess (1973) found tractor yarding in granitics to result in 35.1 percent bare soil, hi-lead in 14.8 percent and skyline in 12.8 percent. In a Trinity County study on mixed soil types, skid trails averaged four to eight percent (6-12 km/sq.km) for clearcut areas (Scott et al., 1980). (6)

Discussion: The project area is composed of generally deep to very deep (40 to 60 inches) sandy loams to loamy sands rather than granitics. The project is on flat terrain and will utilize ground based logging systems to accomplish most of the project. Slopes in within the Elk project are gently sloping and with proposed treatments the likelihood of erosion occurring due to slopes are very low. The EHR post-implementation remains low. The soils analysis indicates that all action alternatives in the Elk the project will meet or exceed the Forest Plan soil quality standards, maintaining soil productivity in support of healthy forests (see Chapter 3, Soils).

Comment-71 - We further encourage the agency to examine the soil compaction monitoring reports from 1985 through 1997 on the Payette National Forest. While the Payette contains different ecotypes and soil types than does the Trout Creek project area, the monitoring reports clearly show long-lasting and significant soil damage from tractor piling activities.

Similar monitoring in the Idaho Panhandle (Jerry Niehoff) and the Kootenai National Forest (Lou Kuennen) demonstrate significant impacts to soils. We also encourage the agency to review the findings of Geppert, R.R., Lorenz, C.W., and Larson, A.G., 1984. Cumulative Effects of Forest Practices on the Environment: A State of the Knowledge. (6)

Discussion: Copies of the referenced monitoring reports were not available, but the comment refers to the First Creek project area on the Klamath National Forest (USDA Forest Service, 2007), so the response of Tom Laurent (Soil Scientist, Klamath National Forest) for First Creek is included: Soil compaction monitoring on the Payette National Forest focused on tractor logged units that were on steep ground and tractor piled (referenced within USDA 2007: Dean Martens, Soil Scientist, Payette National Forest, pers. comm. March 6, 2007). Martens indicated that the monitoring units selected were those that had a high probability of not meeting soil disturbance guidelines, and the data concluded that post-treatment conditions in these steep units did indeed not meet the guidelines. This caused the Payette Forest to change its slope limitations for tractor piling from <45% to <35%. This monitoring indicates that tractor piling on slopes between 35 and 45% on the
Payette National Forest has a high probability of exceeding soil disturbance guidelines. Tractor piling proposed as part of the Elk project activities would occur on slopes <20%, so the Payette monitoring is not relevant to specific activities proposed. Other “similar monitoring” referenced is similarly dated and not relevant to specific activities proposed for this project.

Comment-72 - Edson Watershed Analysis (WA) page 28, “Overall, based on monitoring results using the Soil Disturbance Monitoring Protocol (Page-Dumroese, et al., 2009) and anecdotal evidence on pumice soils, Edson watershed soils show low levels with only one to four percent of the area with high levels of disturbance. Only relict converging main skidtrails on fine to medium fine-grained soils are over the soil quality standard threshold bulk density levels. With most soils being medium to coarse grained, soil compaction levels are low throughout the watershed along with soil disturbance.”(9)

Discussion: See also Comment-70. With protection measures in place (SOPs for wet weather and following BMPs for soil protection) and decompaction of units currently above threshold (4 units), the entire project area is expected to meet the soil porosity standard of at least 90% of the natural porosity for the soil over at least 85% of the treatment unit (see Chapter 3, Soils).

Comment-73 - “The Forest Service may only yard timber if the activity will be “carried out in a manner consistent with the protection of soil.” 16 USC §1604(g)(3)(F)(v); 36 CFR §219.27(c)(6). Management plans and projects must “insure that timber will be harvested from National Forest System lands only where—“soil, slope, or other watershed conditions will not be irreversibly damaged.”” (6)

Discussion: The EIS discloses evaluation of project actions for compliance with the Forest Plan soil quality standards and for National Forest Management Act compliance.

Comment-74 - Medford District BLM: Resource management plans call for limiting compaction in harvested areas in order to minimize soil productivity losses. Therefore, no additional use of mechanical equipment for fuels reduction was proposed, as ground-based logging would compact up to 12 10 percent of the harvest units. This is particularly important in the Cottonwood planning area as the majority of soils contain high rock content. It was identified that ripping the soils in this area would bring rocks and cobbles to the surface. The priority was given to minimizing the soil area compacted instead of trying to mitigate the effects. Additionally, the harvest prescription resulting in relatively few trees per acre being cut minimizes the slash, and consequently, also reduces the need for mechanical fuel treatment. (6)

Discussion: As described in Comment-3, there are areas of already high fuel loadings that are too large or too many to be addressed by hand piling or burning alone. The DEIS evaluates project actions for treatments, including mechanical fuel reduction, in the Soils section of Chapter 3.

Comment-75 - Soil integrity is a key issue for this timber sale. Please address soil chemistry, productivity, hydrology, and biological integrity on a site-specific (i.e., unit-by-unit) basis. Please map soil types and composites using field reconnaissance data and include the maps in the NEPA document. Include a qualified, journey-level soil scientist on the ID Team. Design actions and mitigation after you have collected field reconnaissance data on soils at every site proposed for action. (6)

Discussion: The project was field evaluated by a qualified soil scientist. Information relative to the analysis is described in the specialist report and summarized in the Soils section of DEIS Chapter 3.

Transportation

Comment-76 - Numerous road segments are proposed for Closure or Decommission conflict with the MVUM (the development of which included participation by recreation groups and the public); these closures infringe upon the Public’s ability to recreate on THEIR national forest. (4)

Discussion: A project travel analysis process (TAP) (Bonivert, 2015a) was completed for the project. Portions of the road analysis process completed for the Pilgrim project overlap the Elk project area and that document was incorporated as well. A need exists to increase Forest transportation system efficiency and provide access to a dispersed recreation area in Elk Flat. The TAP completed for the project recommends an approximately 0.10 miles of existing unauthorized route that is currently utilized as public access to a dispersed recreation area in Elk Flat should be added to the FTS as an open level 2 road to provide legal motorized access. A need
exists to remove several unauthorized routes in the project area from the landscape for restoration to a more natural condition.

Travel Management is an on-going effort that will continue to evolve as work is done to analyze and modify the transportation system to meet the recreational and access needs of local citizens and visitors, while protecting important resources. Subsequent decisions will be made using the National Environmental Policy Act (NEPA) process which allows the public to be involved in the decision making process. These decisions will result in changes to route designations on the forest. Route designations are reflected on the Motor Vehicle Use Maps (MVUM). The MVUM will be revised annually to reflect modification and improvements to the Forest transportation system.

**Comment-77** - Decommissioning temporary roads can result in sedimentation so they should be obliterated and seeded instead. (1)

**Discussion:** The DEIS discloses the effects of the proposed activities relative to hydrology. Temporary roads would be decommissioned following Forest Service policy and/or timber sale contract provisions, which include blocking normal vehicular traffic. The roads will be located in relatively flat areas with no streams or waterways nearby. Obliteration, which includes scarifying the road and re-contouring the road prism back to a properly functioning condition, is the highest level of decommissioning. Depending on ground conditions, obliteration is one of the decommissioning options for temporary roads.

**Comment-78** - Roads at 4.6 -> 3.1 miles per square mile cause significant impacts to habitat by fragmentation and increase of fire risk by humans. (7)

**Discussion:** The DEIS discloses the effects of the proposed activities relative to connectivity and fuels and fire effects.

**Comment-79** - We are very aware there will be undue pressure put on the decision maker to not develop any temporary roads for this project. We take the opposite view point. Temporary roads can allow for more effective and efficient management of the public’s land. They can provide for better economics and in many cases reduce environmental impacts as compared to alternative treatments such as long skids. (2)

**Discussion:** The need for temporary roads was carefully evaluated for the project. Temporary roads in thinning and meadow enhancement units across the project area would be used or constructed to provide access for harvest operations. Approximately 1.5 to 2.9 miles of new temporary road are proposed to facilitate the project’s proposed actions. About 4.7 to 5.7 miles of existing unauthorized routes may be used for the project and then decommissioned.

**Comment-80** - I am concerned about proposals to build roads in the Elk Flat LSR. (8)

**Discussion:** There is no new permanent road construction proposed for the project or in the LSR. Temporary roads are proposed and would be decommissioned after project completion, as discussed in Comment-79.

**Comment-81** - Edson WA page 74, “Transportation System -The current GIS transportation layer (4/09) shows the Edson watershed contains approximately 505 miles of road, including forest development roads, private timberland roads, and other unclassified roads. Approximately 212 miles of routes in the analysis area are designated for vehicle travel on national forest. Approximately 23.9 miles of unauthorized routes exist where motorized travel is prohibited.” Edson WA page 75, “Current road density in the watershed is approximately 4 miles of road per square mile of land.” Given that the current road density in the watershed is approximately 4 miles of road per square mile of land, we are curious to know how soils standards are being met in this throughout the Edson watershed. Please disclose the cumulative impacts to soils caused by reconstruction of four miles of road; construction of two miles of “temporary” roads, landing construction and machine piling. Please note that road closure does not substitute for decommissioning nor does it eliminate the negative environmental effects. (9)

**Discussion:** Please refer to Comment-62. The DEIS (Chapter 3, Transportation) describes the direct, indirect and cumulative effects of transportation.
**Comment-82** - It is important that an adequate road system be developed and utilized in order to effectively and efficiently harvest the timber from this project. (2)

**Discussion**: As noted in Comment-76, a TAP was prepared. The project area was evaluated for project facilitation as well as recreational and access needs and protection of important resources.

**Comment-83** - While decommissioning unneeded roads is understandable and supportable, we also ask that serious consideration be made for including temporary road construction that will assist with the implementation of this project. We encourage the building of temporary spurs where feasible to reduce the harvest costs and more effectively treat the land base. (2)

**Discussion**: The project utilizes existing unauthorized routes as well as limited temporary road construction to facilitate project actions. Temporary roads would be decommissioned post project.

**Comment-84** - Careful analysis should be done for those roads earmarked for decommissioning. Make sure they have been identified in your travel management planning efforts and that no roads are planned for closure that have been designated as open in the travel management plan. (2)

**Discussion**: Please refer to Comment-76.

**Comment-85** - Trombulack, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14(1): 18-30. “Various studies (e.g., Ortega and Capen 1999; Marsh and Beckman 2004) show that the negative impacts of roads to wildlife habitat are not limited to the road prism – there is a zone of influence that extends into the adjacent habitat. For example, Marsh and Blackman (2004) found that some terrestrial salamanders decreased in abundance up to 80 meters from the edge of a forest road due to soil desiccation for the edge effects. Ortega and Capen (1999) found that ovenbird (a forest-interior species) nesting density was reduced within 150 meters of forest roads. This study suggests that even narrow forest roads fragment habitat and exert negative effects on the quality of habitat for forest-interior species.” (6)

**Discussion**: The article by Stephen C. Trombulak and Christopher A. Frissell (2000), “Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities” is a general accounting of how road construction and maintenance can impact terrestrial and aquatic organisms through habitat fragmentation, compaction of soils, collision/construction related mortality, invasive species introduction/spread and chemical contamination.

The project will not construct new permanent roads. To avoid new disturbance, unauthorized routes (existing routes) will be utilized when available (about 5.7 miles for Alternative 1). New temporary road construction is limited (about 2.9 miles for Alternative 1). All temporary roads would decommissioned post project. The proposed temporary roads will allow access for necessary equipment to accomplish the prescribed treatment of the units and will also alleviate the need for long skid trails that could impact soils resources and existing vegetation. Best Management Practices will be used to minimize or eliminate soil or hydrologic impacts. The assessment of the anticipated effect of the proposed roads on air quality, noxious weed spread, fisheries, wildlife and hydrology has been completed and is found in each respective section of Chapter 3.

**Watershed**

**Comment-86** - The Forest Service is proposing temporary road and landing construction; gap creation and regeneration logging; ground-based yarding and machine piling, which will increase the hydrological and terrestrial impacts of the equivalent roaded acres in the planning area. (6)

**Discussion**: The DEIS (Chapter 3) discloses the effects of the proposed activities relative to hydrology including ERA at the project scale.

**Comment-87** - Timber harvest and road building can cause sediment and turbidity problems even when these activities take place outside of the reserves. (6, 7)

**Discussion**: The DEIS (Chapter 3) discloses the effects of the proposed activities relative to hydrology inside and outside of the Riparian Reserves.
Comment-88 - Proposed riparian reserve thinning would not achieve aquatic conservation strategy objectives. (6)

There are already impacts to soils, water quality, and RR in Ash Creek from previous logging. We don’t believe this project will meet ACS objectives. Again, we would expect substantive analyses of these issues that meet the requirements of NEPA. (7)

Discussion: The DEIS discloses the effects of the proposed activities relative to the aquatic conservation strategy. The Forest Plan Standards and Guidelines for timber management in Riparian Reserves allow for the application of silvicultural practices and salvage in Riparian Reserves when they are needed to control catastrophic events, control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives (Forest Plan p. 4.54).

Comment-89 - With regard to “large wood” (EA p. 50), NMFS 2010:9 states that “[a]lthough NMFS included this [24 inch diameter] value in NMFS (1996), and did not advocate changing the value during negotiations on the AP document, we recognize now that (1) it does not provide a target that is based on reference conditions for Westside forests, (2) this target is not sensitive to site-specific conditions (e.g., stream size and power), and (3) use of this target exclusively results in analyses that do not adequately address other sizes of wood that provide important ecological functions in streams” Thus the size standards used for the desired condition are not appropriate because all sizes wood entering small streams would improve channel function. NMFS 2010 p.6 states: “[a]ll wood and other organic material, whether large or small, is important to the proper functioning of streams; none of it is unimportant.” NMFS further states that “[o]f particular note is that large wood that cannot singly form pools will form pools in combination with other pieces of wood and other obstructions by forming “wood jams.” The NMFS 2010:4 state: “[w]hile thinning increases tree diameters, it does not increase tree heights; thus, it will not increase the length of tree boles entering streams.” (6)

Discussion: The Forest Service recognizes the need for and benefits of large woody debris within riparian systems. The project would retain an average of 6 to 10 large down logs per acre as described on page 91. Retained logs are to be in a variety of decay classes with a preference for 20-inch diameter logs, or the largest size class available. Within all Riparian Reserves, embedded downed logs, stumps and riparian plants and root systems will be retained during burning operations with minimal (up to 5%) damage. The project area does not contain anadromous fisheries that NMFS is the regulatory and resource agency for. It is not located within an anadromous watershed. While the comments included from NMFS (2010) are valuable in terms of overall LWD benefits in stream systems, these comments are also out of context. The comments are clearly addressing the AP document (which is the 2004 Analysis Process for assessing impacts to anadromous fish and habitats within the NWFP area).

Comment-90 - The USFS and BLM should leave more thinned trees on the ground in riparian areas, particularly close to streams, on floodplains, and on steep sideslopes where some trees are likely to slide down into streams, than are required to meet wildlife needs.(6)

Discussion: The Forest Service does recognize the need for and benefits of large woody debris within riparian systems. Currently within the project area there are places (along Ash Creek) where large amounts of woody debris have caused debris dams and channel widening. This has resulted in an increased rate of bank erosion as water moves around the log jams (see existing condition for a description and photo). After treatment, the Forest Service expects the rate of woody debris input would change from the undesirable current state of whole tree failure, causing bank erosion and debris dams, to incremental input of woody debris as riparian vegetation stabilizes banks and forest stands increase in health and vigor.

Comment-91 - In order to better portray environmental baseline conditions and to understand the likely effects of thinning proposals, the USFS and BLM should develop stand data separately for riparian and upland forests.(6)

Discussion: The comment is noted and the Silviculture and Forest Health section and specialist report describe the stand inventory methods. Data was collected based on stands – areas with similar tree species, density, seral stage, canopy cover, overstory tree diameter and stand development characteristics. However, the project hydrologist, wildlife biologist and silviculturist conducted field reviews in the Riparian Reserves to better describe the existing conditions and develop treatments and resource protection measures. There was
not a sole reliance on the 2007 Common Stand Exam data and inventory plots for describing the baseline conditions in the Riparian Reserves.

Comment-92 - The document states the No Action alternative would result in continued impacts to water quality and stream channel floodplain function and Elk Flat meadow from existing unauthorized routes. This statement is telling because it demonstrates that past mitigation from past projects has failed causing water quality problems; past activities have likely altered the stream channel floodplain; and illegal OHV use is occurring and the Forest has not acted to stop it. The Forest uses this project as a red herring to “fix” these problems. The Forest could correct these problems without a timber sale. (7)

Discussion: The Purpose and Need for Action and Proposed Actions recognizes the needs in this Project. Currently, there are no other proposals that would also address the identified needs; therefore, No Action does not address them.

Comment-93 - “A copy of the National Marine Fisheries Service 84 page memo (NMFS 2010) supports our contention that commercial thinning the riparian reserve is not appropriate and is likely harmful for achieving aquatic conservation objectives. NMFS 2010 p. 8 states that “In examining forest thinning proposals designed to accelerate the development of late-successional forest conditions and restore instream fish habitat, NMFS is finding that, in many cases, they are likely to do neither. NMFS 2010: 31 states “our results suggest that the thinning regimes proposed by the Siuslaw National Forest will delay the development of key structural elements of forest and stream habitat by more than a century. The delay in stream habitat recovery can be minimized by creating a no cut buffer of 150 feet or more in width between streams and any forest thinning operations.” The NMFS 2010: 4 states that “[t]he tradeoff of getting a few more large standing live trees sooner at the expense of a continuous supply of both large and small trees over the long term period always needs to be considered.”” (6)

Discussion: The DEIS describes the specific thinning treatments proposed for the Riparian Reserves. The treatments are designed to address site-specific variation within the Riparian Reserves. Thinning would be implemented to both retain current stand densities for shade and thermal regulation on terraces, and reduce shade to promote riparian vegetation development for near-stream shade, water temperature, thermal regulation, stream bank strength, and stream bank stabilizing vegetation such as willow (Simon, et al., 2002). Resource protection measures are included in chapter 2 of the DEIS to ensure that the activities are consistent with the ACS objectives and Riparian Reserve function. See also Comment-89 regarding NMFS. Again, while the comments included from NMFS (2010) are relative to the ACS objectives and late-successional reserves, they are also placed out of context. The Elk project will have site-specific protection measures and treatments for the Riparian Reserves associated with Elk Flat, along Ash Creek and other portions of the project area (see in Chapter 1).

Comment-94 - The forthcoming NEPA document must analyze and disclose the impacts of road construction, landing construction, timber haul and soil compaction on peak flows, flow timing, and sediment loading. (6)

It appears the Forest Service is proposing logging activities within designated riparian reserves. Aquatic conservation is therefore a significant issue for this action. Direct, indirect, and cumulative effects of proposed activities on hydrologic function, sediment regimes, stream temperatures, nutrient cycling, pH, and habitat connectivity should be evaluated in detail. Consider both positive and negative impacts. Implement the ACS at the site scale and meet its objectives immediately after the project’s implementation, not in the “long-term” several years out. (6)

Discussion: The purpose and need recognizes old landings and unauthorized routes exist on Ash Cr floodplains and recontouring floodplains is needed to promote the Aquatic Conservation Strategy. The DEIS (Chapter 3, Hydrology section) discloses the effects of the proposed activities relative to hydrology.

Comment-95 - The USFS and BLM should include all sizes of wood in describing environmental baseline conditions and in analyzing the effects of its proposed actions, not just pieces of wood that are greater than 24 inches in diameter and greater than 50 ft. in length.D137(6)

Discussion: In the DEIS, Chapter 3, Methodology for fire and fuels, as well as the fuels specialist report, the inventory is described. Surface fuel data collection was completed using the Brown’s method. This inventory accounts for all down wood from less than ¼” to the largest log. The 2007 Common Stand Exams, and follow up field reviews in 2011-2015, documented the coarse wood size classes. As fuel accumulations have increased since 2007, the data collected at that time should only be seen as a general representation of size classes. The majority of additional CWD recruitment has occurred in the ponderosa pine-dominated stands located in the eastern and southeastern portions of the project area. However, additional pockets of mortality scattered across all natural stands and older plantations, and diseased white fir, have also contributed.
Comment-96 - The USFS and BLM should adjust their tree diameter targets based on stream size. Database curves are available for both functional-sized and key pieces of wood (e.g., Fox and Bolton 2007).134(6)

Discussion: See the discussion for Comment-93 for the thinning prescriptions developed near streams.

Comment-97 - We urge the Forest Service to propose and implement a vegetation management project that implements the ACS of the Northwest Forest Plan and the findings and recommendations of the Watershed Analysis by:

- Avoiding and deferring new road construction;
- Minimizing new landing construction; and
- Decommissioning unneeded roads.(6)

Discussion: No new permanent roads are proposed for construction. Limited temporary road construction is proposed (with decommissioning post-project). Existing landings will be used where feasible and if in compliance with all RPM’s (legacy landings in Riparian Reserves will not be utilized and all new landings will be constructed outside of Riparian Reserves), minimizing new landing construction. Decommissioning existing unauthorized routes, new temporary roads, landings and skid trails is included in the action alternatives considered in detail.

Comment-98 - Please analyze and disclose the cumulative effects from past, current and future logging, cattle grazing and other land management activities and their effect on Riparian Reserves and riparian dependent species.(9)

Discussion: Please refer to Comment-62. The hydrology analysis in the DEIS discloses cumulative effects.

Wildlife

Comment-99 - Reducing basal area down to 150 square/feet acre does not maintain high quality foraging habitat or nesting/roosting habitat. (7)

Thinning to 50-70 foot spacing with a basal area of 60 square/foot per acre would not retain foraging habitat for the owl. The proposed action will destroy the entire function of the LSR and the CHU. (7)

Discussion: The wildlife Biological Assessment will address the predicted effects of the variable density thinning treatments and prescribed basal areas, prescribed fire, and other treatments on NSO habitat (including critical habitat) in the short and long term. This information will be summarized in Chapter 3 of the EIS. The analysis will also discuss the proposed activities effects and compliance with LSR direction and the Final Rule for NSO critical habitat (December 2012).

Comment-100 - Logging for fuel reduction impacts owl and prey habitat, e.g. reduction of complex woody structure, and the long-term reduction in recruitment of large snags and dead wood. Fuel reduction logging also has complex effects on fire hazard with potential to increase fire hazard, especially when fuel reduction efforts involve removal of canopy trees. (6)

Discussion: The predicted effects of the proposed activities, such as fuel reduction, on the northern spotted owl and its prey will be described in the wildlife Biological Assessment. This information will be summarized in Chapter 3 of the EIS. The project-level fuels report and EIS will also asses and summarize the expected effects of fuel reduction relative to fire behavior and intensity effects.

Comment-101 - We would expect a legitimate BE be prepared for this project that discloses all direct and indirect impacts to sensitive species. We already know the Forest’s determination for all sensitive species is “may affect, not likely to adversely affect” because that is the determination made for each and every project in the SMMU. But now that we have documented at least 10 major FS projects and 40 THPs in the SMMU – that are all logging late-successional habitat, increasing fragmentation, and decreasing connectivity, we would ask that a substantive rationale be provided for MANLAA determination for each species.
**Discussion**: The Forest will prepare a Biological Evaluation that addresses the proposed project activities and their predicted direct, indirect and cumulative effects on sensitive wildlife species.

**Comment-102** - When all this evidence is put together, it becomes clear that "saving" the spotted owl by logging its habitat to reduce fuels often does not make any sense. (5)

**Discussion**: The project does not propose to ‘save the spotted owl by logging its habitat to reduce fuels’. The proposed action was designed based on direction in the NWFP, Forest Plan and Forest-wide Late-Successional Reserve Assessment (LSRA) treatment objectives. Without action, continued losses in early-, mid- and late-successional stands and existing and developing structural composition are expected to result from the combination of tree overstocking and density-related mortality, root disease, epidemic insect attacks and predicted lethal fire effects. Then “No Action” alternative and its effects on overall tree growth, stand health (approximated using Stand Density Indices based on tree species composition) and fire behavior (of unplanned/natural ignitions) will be modeled and summarized in the EIS. The expected general results of “No Action” are a continued loss of late-successional tree species (i.e., the pine component), continued stagnation of habitat development for late-successional dependent wildlife species (as well as a decline in habitat quantity and quality), and failure to maintain or meet Forest Plan and LSRA objectives for the Elk Flat LSR and surrounding stands. While NSOs can make use of some post-fire landscapes, fire also reduces the function of some habitat and likely removes important habitat (nesting/roosting) from immediate usability, particularly in areas of high-severity fire.

The proposed action includes risk reduction treatments in early-, mid- and late-successional habitat, consistent with the NWFP, Forest Plan and LSRA. The variable density thinning treatments that will thin trees to varying stand basal areas (dependent on species composition); retain unthinned patches of large and small trees, whole stands and microsite habitat elements (e.g., patches or small groups of small and large trees for roosting/resting sites); install small ~¼-acre and large (~2 acre) gaps in homogenous plantations or white fir-disease centers; and radial thin around legacy pine and black oak are also consistent with several of the dry forest restoration principles and ecological forestry approaches discussed in the Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS 2011) and the Final Rule for NSO Critical Habitat (USDI-FWS 2012). Strategic treatment of surface and ladder fuels where they exceed Forest Plan standards and guidelines and to meet wildlife habitat capability models, and reintroducing fire, are also included in the proposed action. The proposed action will not log within nesting/roosting and higher quality foraging habitat for the NSO (or important reproductive habitats for the Forest Service sensitive northern goshawk and fisher). Prescribed fire will be implemented in these areas however, with the mechanical thinning and fuels reduction treatments discussed above strategically placed to better protect these habitat areas from loss. The Forest Service expects that implementing these treatments would reduce the risk of further stand loss and increase resiliency in the treated stands so they are better able to withstand and survive disturbances like prolonged drought, root and other diseases, insect attacks and low to moderate-severity fire conditions.

**Comment-103** - We note the north side of the project area is clearcut as well as the south side. There is one THP that appears to be inside the project area. How is the FS maintaining dispersal habitat and connectivity with this significant level of current forest fragmentation? The loss of forest habitat and the dramatic increase in fragmentation is obviously impacting NSO that continue to decline by 5.5% in N CA. (7)

**Discussion**: It is not clear what the comment is referring to in terms of the north side of the project area being clearcut. There is private land immediately north and west of the project area, but not within the project area. There are planned and ongoing Timber Harvest Plans on the private lands in these areas where regeneration harvest has been used in the past, and is also planned in the future. There has been no regeneration harvest in the northern portion of the project area however. The comment’s reference to clearcuts in the south side of the project area is also not clear. A clearcut is defined as “a stand in which essentially all trees have been removed in one operation (Society of American Foresters 2010). The Pilgrim Vegetation Management Project treated three units (305, 453, 456) southeast of the project area with a regeneration harvest that retained 15% of the treatment stand and it may appear to be a ‘clearcut’. Prior salvage treatments within the south-central portion
of the project area also occurred (see EIS Appendix F that discusses cumulative effects). These treatments were deemed appropriate for those projects and the existing conditions within the ponderosa pine-dominated and white fir stands of root disease and insect attacks, though each treatment retained reserve trees that were healthier or a different species than ponderosa pine. Directly south of the project area is Coonrod Flat, and this area is a natural opening and may appear to be a ‘clearcut’.

Regardless, the habitat typing for NSO in the project area and action area (including private lands and NFS lands outside the project area) will be completed for the Elk LSR Enhancement project. From field reviews, portions of areas to the north, west and east (and all areas south and southeast) of the project area are not considered suitable or dispersal habitat for the NSO. Additionally, portions of the eastern/southeastern portion of the project area are also not considered suitable or dispersal habitat, primarily due to the ponderosa pine-dominated stands, lack of prey base and low water availability. With the Elk LSR Enhancement project, the Forest aims to maintain dispersal and connectivity where it occurs within the LSR through various treatments that will maintain adequate canopy cover, tree size classes, perching and roosting structure, large and small down wood, small trees, shrubs and prey base that support dispersing NSOs, fisher, and northern goshawk. The Riparian Reserve network along Ash Creek would also contribute to connectivity within the LSR and its varied successional habitats, in accordance with the Forest Plan (USDA-FS 1995 pp. 3.27, 4.14, 4.41). The Forest Service currently has no influence on management of surrounding private lands and maintaining connectivity, though privately managed timberlands are required to comply with the California Forest Practice Rules and often include protection measures along streamcourses and to maintain habitat elements in proximity to NSO and other federally listed and state-protected species. The wildlife Biological Assessment, Biological Evaluation and Draft and Final EIS will evaluate connectivity within and outside of the Elk Flat LSR in relation to other LSRs.

The Forest is aware of the range-wide annual population decline of NSO, which was reported as 2.8% in the 2012 meta-analysis (Forsman, et al., 2011; Forsman, et al., 2012). That meta-analysis was based on annual survey data from 1985-2008 in the 11 demographic study areas under the NWFP. In regards to the 5.5% decline noted in the comment, it is not clear what this number refers to as there are no “5.5% declines for NCA [northern California]” noted in any of the recent literature, 2011 Revised Recovery Plan, 2012 Critical Habitat Rule, the 2011/2012 meta-analysis or any other NSO study area reports for northern California. The Northwestern California demographic study area’s estimated population decline (based on annual survey results and response rates) has been less than 3% since monitoring began in 1985 (Franklin et al. Various Years). That specific demographic study area is located ~65 miles west of the project area in a much different habitat type. There are no demographic study areas on the Shasta-McCloud Management unit; however local species status information for NSO on the SMMU and the project area (extending from 1989 to current year), as well as any updated range-wide population information, will be discussed in the project’s wildlife Biological Assessment.

Comment-104 We look forward to reviewing the voodoo science the FS used to claim that Recovery Actions 10 and 32 will be met in this project. (7)

Discussion: How the Forest interprets the proposed action, project design and the project’s overall consistency with the Revised Recovery Plan, including prioritization under Recovery Action 10 and habitat conservation and enhancement under Recovery Action 32, will be addressed in an appendix to the Biological Assessment.

Comment-105 - The document states there are only 720 acres of designated critical habitat in the project area. Please break down the amount of N/R/F habitat that makes up these 720 acres. We also request the amount of N/R/F habitat in the owl AC and LSR. What are they pre project and post project? How does thinning ALL foraging habitat in the LSR/CHU benefit the owl and other late-successional species. Every project on the maps we included have logged virtually ALL remaining owl foraging habitat. We fail to see how this benefits the owl when its population continues to decline on the Forest. (7)
**Discussion:** Under the 2012 Final Rule that designated critical habitat for the NSO, there are 720 acres within the project area (wholly in the western portion). The PENDING-Wildlife section in Chapter 3 of the dEIS and the Biological Assessment (to be included as an appendix to the EIS) will address the existing conditions/ acres of nesting/roosting, foraging, dispersal, capable and non-habitats for the NSO. This baseline information for the project area (and NSO action area) will also be included for the ST-215 activity center core and home range, and any additional activity centers in the action area, critical habitat and the LSR allocation. Effects to these habitat types will also be discussed, including the beneficial, discountable, insignificant, adverse short-term, and short- and long-term beneficial effects.

**Comment-106** - The document states NSO have been detected in the project area since 2003, but in 2012 a Barred owl pair was discovered. How will this project decrease the value of habitat for NSO and increase the value of habitat for Barred owls? How will NSO prey be affected? (7)

**Discussion:** The proposed action scoping document states “The last nesting at the ST-215 activity center occurred in 1990 and no NSOs have been detected during the surveys completed over the nine years of surveys since 2003 (District NSO Survey Records).” Information was provided to the Forest on May 9, 2013 (after the scoping document was released) by a local contract biologist regarding the find of a probable NSO feather in the ST-215 activity center in June 2011 and this information will be included in the species status and survey section of the Biological Assessment. A barred owl pair was detected in 2012 and NSO survey efforts based on the most recent (January 2012) survey protocol will be continued through and after project implementation, per annual discussion and coordination with the FWS. Effects to prey that NSO may utilize in the project area, and the potential for competitive barred owl/NSO interactions will also be discussed in the project Biological Assessment. - In the map we included documenting all the owl ACs that CalFire lists in the SMMU, there is only one AC in the project area. However, the Elk LSR has at least 6 other ACs nearby that are being impacted by the other FS TS and THPs. How is the FS working to recover the NSO on the STNF when it is logging all CHUs, logging all remaining foraging habitat, and nesting/roosting habitat is below threshold levels in every AC throughout the SMMU. (7)

The Biological Assessment and EIS will address connectivity within the Elk Flat LSR (and outside of it to other LSRs which typically either had or have an NSO occupied activity center). An appendix to the Biological Assessment will also discuss the Forest’s interpretation of the project’s consistency with Recovery Plan’s recommendations for Recovery Actions 10 and 32 (see Comment-104). It is beyond the scope of this project to assess other treatments on private lands or National Forest System lands within critical habitat and those effects (unless they fall within the action area as defined under the ESA or the established cumulative effects analysis area for NEPA). Effects to the East Cascades Critical Habitat Unit, specifically Subunit 3-East Cascades South [ECS-3], will likely be addressed in the project Biological Opinion however, pending the determination for critical habitat. Treatments in other project areas in close proximity to the Elk LSR Enhancement project that affected NSO critical habitat (e.g., Mudflow, Algoma) and those that are more distant (Porcupine) were designed to maintain foraging and dispersal habitat function post-treatment while increasing overall tree and stand resilience. Those projects were also designed to not treat within nesting/roosting habitat or higher quality subsets of NRF habitat. While the Algoma project may have short-term adverse effects to critical habitat elements of foraging (PCE3), the other three projects were found to have beneficial and insignificant effects. Annual stand searches at activity centers (as time, staff and funding permit) and project-level surveys in these areas have continued and will continue, providing the SMMU with additional data on NSO occupancy and annual reproduction, though survey results may not always be conclusive given the potential presence of barred owls.

**Comment-107** - The regional decline of migratory birds is a significant issue for this project. Numerous studies have reported local and regional trends in breeding and migratory bird populations throughout North America (e.g., DeGraaf and Rappole 1995, Sauer et al. 2004). These studies suggest geographically widespread population declines that have provoked conservation concern for birds, particularly neotropical migrants (Askins 1993). (6)
Discussion: The project was designed in accordance with Forest Plan and LSRA management direction and recommendations from the Watershed Analysis. Opportunities to promote conservation of migratory birds and their habitats in the project area were considered during project and resource protection measure (RPM) development. This is in accordance with the December 2008/June 2014 Memorandum of Understanding, specifically Section C: item 1, and Section D: items 3a-3d, and 6. The migratory bird report for the project will address the bird species of management concern for the Forest. This includes those that are listed under the Endangered Species Act as threatened or endangered, those designated by the Regional Forester as sensitive, those associated with management indicator assemblages (MIAs) affected by the project, and those species of conservation concern within the Great Basin Bird Conservation Region (BCR-9; USDA-FS & USDI-FWS, 2008). The project and specific treatments were designed to help ensure that treated areas continue to provide habitat necessary to maintain a diversity of species at both the stand and landscape scale after the project is completed. This includes development and implementation of specific RPMs that limit operations in important breeding areas at critical reproductive times and that retain shrubs, trees, down logs and snags that provide habitats for migratory birds. Treatments were designed to reduce the risk of continued tree and stand loss and increase stand resilience; accelerate development of late-successional and old growth forest; restore meadow habitat at Elk Flat; retain (and enhance) black oak and aspen habitats; improve water table elevation, streamflow and water quality and vegetation conditions within riparian reserves; and decommission unauthorized routes. The RPMs and treatments are intended to reduce the potential for adverse effects to, and enhance habitats for, individuals that are part of local and regional populations. But they are not considered significant at the scale of affecting local or regional population patterns that may be more threatened in other parts of their range or the region due to climatic and weather patterns, predation, or other threats.

Comment-108 - Simply concluding that the scale of the project is small, relative to the size of the nation, hence migratory bird populations will not be affected, will not suffice. As you know, the Spotted Owl was driven into threatened status by lots of “little clearcuts” that individually were insignificant, but cumulatively resulted in extensive habitat loss. (6)

The project includes numerous RPMS aimed at reducing the potential for adverse effects to individuals that are part of local and regional populations. It is designed to enhance and protect late-successional habitat and restore riparian and meadow habitat within the project area and provide for a variety of migratory bird habitats in a variety of stages (see also Comment-107).

Comment-109 - Please consider and disclose how logging, particularly group selection and regeneration in 80-120 year old natural stands would effect cavity nesting birds. The Northwest Forest Plan Standards and Guidelines at pages C-45-47 requires specific protection buffers for certain bird species including the White-headed Woodpecker, Black-backed Woodpecker, Pygmy Nuthatch and Flammulated Owl. Three of these cavity-nesting birds, with the exception of the Black-backed Woodpecker, have home ranges within Siskiyou County. (9)

Discussion: The 2001 ROD (USDA-FS & USDI-BLM, 2001) and Forest Plan include standards and guidelines and management recommendations for white-headed woodpecker, black-backed woodpecker, pygmy nuthatch and flammulated owl. There are no ‘protection buffers’ but the standard and guideline is: “To ensure that the distribution and numbers of all four species do not decline on BLM Districts and National Forests within the range of the northern spotted owl, adequate numbers of large snags and green-tree replacements for future snags in appropriate forest types within the range of these four species will be maintained in sufficient numbers to maintain 100 percent of potential population levels of these four species” (pp. 33-34). The project area is located within the range of all four species and all species, as of the writing of this Appendix response, have been observed during the wildlife fieldwork for the project (point counts; snag and habitat quality assessments; NSO, northern goshawk and carnivore surveys; project field trips). Where safely feasible and available, the project’s design addresses the standard and guideline and subsequent management recommendations in the 2001 ROD. This is achieved by: retaining Douglas fir, sugar pine and incense cedar snags larger than 20 inches diameter; retaining groups of snags in existing mortality pockets; retaining, on average, 7 snags per acre ranging from 15 to 20+ inches diameter with a preference for snags
larger than 20” or largest size class available; within the forested portions of the meadow unit 402-maintaining 15” or larger diameter snags; retaining all predominant trees as well as the majority of the dominant and most of the codominant trees within thinning and meadow enhancement stands. The wildlife analysis will consider and disclose how the variable density thinning treatments, including planned group selections in 40+ year old ponderosa pine plantations and white fir disease infection centers in two 80-120 year old natural stands (152-1, 160), may affect cavity nesting birds. There is no regeneration logging or mechanical regeneration treatment proposed. The wildlife analysis will also disclose other project effects on these species’ habitats (underburning, hazard reduction treatments along roads/private property lines). The silviculture report and EIS will include modeling data for the variable density thinning treatments that describes the existing condition, and the expected post and 20 years post-thinning conditions for tree size classes per acre, trees larger than 24” in diameter, and snags. Modeling limitations and assumptions will be included in the silviculture, fuels and wildlife reports and the relevant EIS Chapter 3 methodology sections.

Comment-110 - Limited operating periods (LOP’s) can have significant negative impacts to implementing a proposed action. LOP’s have serious implementation economic affects. Many of these restrict operations between February 1 and September 15. This does not allow much time for harvest activities to occur prior to the wet weather period. These restrictive LOP’s will significantly increase logging costs as contractors cannot afford to utilize very expensive equipment for such a short time period. It is also more difficult to hire employees with such a short guarantee for work. These factors need to be included in your logging cost assessment. (2)

Discussion: Limited operating periods will be used as a resource protection where necessary to reduce the potential for adverse effects to breeding and rearing individuals. This includes listed, proposed listed and Forest Service sensitive species and their habitats. In the case of the NSO or goshawk, an LOP would offer a measure of protection to a known nest site that may reduce or eliminate disturbance during critical periods. For fisher or migratory birds or other species of concern, an LOP may be used to protect habitat features that may be used or removed. The Forest Plan mandates limited operating periods for listed and sensitive species, including northern goshawks (USDA-1995 p. 4.30). It should also be noted that not every LOP and RPM that may be needed is currently in the project, and in the event of a new discovery an additional or modification of an existing LOP may be required, in accordance with timber sale contract provisions.

The current proposed LOPs will also be considered during stumpage appraisal. An appraiser can account for the added cost of LOP’s in four ways: 1) Extend the length of the contract term. This would allow more time for operations; 2) increase the number of times an operation moves in and moves out to address increased number of operating seasons. This would increase the moving costs and help reduce the minimum bid for the sale; 3) Increase the amount of equipment used. Appraising for increased equipment will increase the overall logging cost; and 4) Using a cell on the R5 Log Cost Spreadsheet on the moving tab to “Input the estimated days the operation (system wide) is likely to be shut down (without a move-out) over the general operating season.” For example: Fire hazard, soil moisture, wildlife. The cost of the shut-down will be added to the sale as a whole cost. The appraiser’s experience and knowledge will help them determine the number of days that will be affected in LOP and make sure that the proper adjustments are made.

Comment-111 - We ask that owl surveys be done to protocol prior to sale advertisement in order to eliminate any unnecessary LOP’s. (2)

Discussion: The Forest’s ability to conduct annual and pre-project surveys for NSOs, and other species, is dependent on annual budgets, the approved Program of Work for the Forest and Management Unit, and staffing levels. Surveys have been ongoing and are planned for NSO and are in accordance with the January 2012 FWS survey protocol. The protocol does include provisions for flexibility and modified surveys (stand searches, spot checks, modified visits) and annual coordination with adjacent landowners and the FWS is also planned. The LOPs that are currently proposed for the project are not considered unnecessary (see Comment-110) and are a requirement under the Forest Plan or are minimization measures that were agreed to during streamlined consultation with the FWS, and technical assistance, to help the Forest Service meet its responsibilities under Section 7a(1) of the Endangered Species Act. In any given year, activities may occur
during the proposed LOPs if NSO stand searches and spot checks, or nest assessments done after June 1 for northern goshawk determine there are NSO are no breeding individuals or young.

**Comment-112** - When logging intended to benefit habitat will also reduce the quality of habitat, the NEPA analysis must include some evaluation of ecological costs and benefits — e.g., the probability that logging will degrade habitat vs. the probability that fuel reduction treatments will interact favorably with fire and thus benefit habitat. This evaluation requires an estimate of the probability of future wildfire. To assume, as many analyses do, a 100% chance of future wildfire over-estimates the likelihood of treatments will interact with fire, thus over-estimating the ecological value of fuel treatments, and under-estimating the ecological effects of logging on habitat. (5)

**Discussion:** The project proposes various silvicultural techniques intended to increase the resilience of early-, mid-, and late-successional forest stands in the Elk Flat LSR. In the case of a wildfire during the summer season, fire behavior modeling predicts rates of spread, flame lengths, and resistance to control that would lead to high acreage burned and significant post-fire adverse effects on resources. The Forest Vegetation Simulator and Fire and Fuels Extension tool are used to model No Action and what fire behavior would be with treatment. This modeling approach is based on data collected from the project area stand exams in 2007 and from the local Remote Automated Weather Station. Models are typically run under 90th and 97th percentile weather conditions and the project’s purpose and need (and the modeling) do not assume a 100% chance of future wildfire, but assess what might occur within stands in terms of fire behavior and intensity (measured by rates of spread, flame lengths, severity) under those weather conditions.

**Comment-113** - There is a strong interest among the federal land management agencies to conduct widespread logging in suitable spotted owl habitat in order to reduce the effect of fire. The agencies view fuel reduction logging as beneficial to owl habitat because modeling shows that fire behavior is moderated by fuel reduction, but proponents never seem to conduct a careful evaluation of the relative probability, and the relative harms, of logging versus wildfire. Strangely, the probabilistic aspects of this issue have been largely ignored in the owl science literature, but recently explored in the forest-carbon literature which recently showed that although thinning can modify fire behavior, logging to reduce fire effects is likely to remove more carbon by logging than will be saved by modifying fire. (5)

**Discussion:** The comment is noted. See also the responses to Comment-1 and Comment-102.

**Comment-114** - The Agency Must Quantitatively Disclose Future Snag Reductions and How this Will Impact Wildlife, Especially Woodpeckers and Cavity Nesters. Large numbers of mature trees and snags will be removed from proposed logging units. All of these trees would have died and created snags and down wood for wildlife. (6)

**Discussion:** There is no realistic method available to “quantitatively disclose” future snag reductions, as tree mortality prior to, during and after the project will contribute to snags. In regards to the project’s effects on current snags and future snag development, as described in Comment-13, the project will retain largest, oldest trees as predominant and most dominant trees would be retained, regardless of their current health/condition. The project also includes specific criteria for retaining or protecting individual snags and groups of snags as described in Comment-20, and Chapter 2 of the EIS (resource protection measures). The UTPs and roost/rest clumps will also retain snag habitat. Where safely feasible in LSR, snag retention areas (ranging from 5 to 10 acres) will be strategically located within or adjacent to existing mortality pockets. Snag retention areas will consist of a range of snag size, decay and species classes with a preference for areas that contain larger diameter snags (≥24 inches) that also have a live tree component for wind-throw protection and little to no understory regeneration in known blackstain infection areas. Retention areas will be delineated by the project wildlife biologist and trained marking crew/timber preparation staff. Units 158, 162, 175,176, 204 and 206 are known to be affected by high levels of mortality and will likely have snag retention areas. No piling, reforestation or other mechanical activities will occur in these areas under the project. In regards to “future snag reductions”, the analysis for the project is limited to the timeframe that proposed activities would be occurring and the timeframes that thinning and fuels treatments are expected to have an effect on the stand development (e.g., thinning, landing/road construction, route decommissioning, machine piling/burning piles, underburning). This timeframe typically spans 20 to 30 years, and all of these activities may remove trees, remove snags, fall trees or snags and leave in place, or create snags. The modeling of the thinning and fuels
treatments for No Action and Action is expected to show the anticipated tree growth, and snag recruitment, over this time period.

**Comment-115** - "Snags are an essential element of forest health, forest structure, and late-successional habitat. Thomas et al (1990) and the Fish and Wildlife Service (1990) defined Spotted Owl (old-growth) habitat as including "numerous large snags.” Similarly, the Shasta-Trinity National Forest FOREST PLAN directs the agency to “protect and enhance late-successional characteristics” in LSRs. Large snags are a key late-successional characteristic. Hence snags should be retained as essential habitat elements in a Late Successional Reserve.” (6)

**Discussion**: The project was designed to be compliant with the management direction, standards and guidelines and LSRA desired conditions for snags. See also the Discussion for Comment-20 and Comment-114.

**Comment-116**. The Forest must disclose how much forested habitat will be lost due to these activities. We also request that placement of landings be disclosed. Stating those decisions will be made post decision is a violation of NEPA. If the Forest has actually ground-truthed each unit as it claims it should be able to disclose where the landings will be placed. (7)

**Discussion**: Chapter 3 will disclose effects from the proposed action and alternatives considered in detail, including effects to forested habitat. Landing needs have been reviewed on the ground and estimated by alternative.

**Comment-117** - The pacific fisher, northern spotted owl, long-legged myotis, fringed myotis, Yuma myotis (all bats),western bluebird and pileated woodpecker may all be affected by reduction of forest stand structure, canopy closure and/or snag density in planning area. Please address and disclose the cumulative impacts of your activities on these species. (6)

**Discussion**: See also the response to Comment-62. In accordance with the NFMA and Forest Service Manual direction, the project’ Biological Evaluation will assess direct, indirect and cumulative effects to Forest Service sensitive species (this includes, but is not limited to the fisher, northern goshawk, fringed myotis). In accordance with the ESA, the project’s Biological Assessment will assess direct, indirect and cumulative effects under the ESA for the northern spotted owl. A separate cumulative effects analysis under NEPA will be completed for this subspecies. The information from these analyses that is relevant to the Issue Indicators and Purpose and Need for the project will be summarized in Chapter 3 of the EIS. The other species listed in the comment are not federally listed or designated by the Regional Forester as sensitive, nor are they special status species under the NWFP. The project-level management indicator assemblage and migratory bird compliance reports will address representative species for the assemblages (as guided by Forest Plan direction); and birds of conservation concern within the Great Basin Bird Conservation Region (BCR-9; USDI-FWS 2008). See also the responses to Comments 108, 109, 120 and 121.

**Comment-118** - The forthcoming NEPA document should also address the impacts of the proposed logging and road construction on Goshawks. A peer-reviewed survey of Goshawk habitat use suggests that current management of the bird’s habitat may be inadequate to provide for its persistence in viable populations. Greenwald et al. A review of northern goshawk habitat selection in the home range and implications for forest management in the western United States. Wildlife Society Bulletin 2005, 33(1): 120-129. (6)

**Discussion**: The Forest has prepared a wildlife Biological Evaluation according to NFMA and Forest Service Manual regulations, which includes the project’s predicted effects to northern goshawks (direct, indirect and cumulative effects). A summary of the effects relevant to any Issue Indicators and the project’s purpose and need will be disclosed in Chapter 3 of the EIS.

**Comment-119** - "The forthcoming NEPA document for this project should analyze and disclose the potential impacts of conifer thinning operations and brush removal on neotropical bird population trends." (6)

**Discussion**: Please also see Comment-107 and Comment-119. The compliance section in the EIS will summarize the project’s compliance with current direction for migratory birds.
Comment-120 Comment 121 "The cumulative effects analysis on migratory birds should not rely exclusively on Wilderness, Riparian Reserves and LSRs to provide for species viability into the future, because many Forest Service and BLM Districts are actively logging those land use allocations, regardless of the effects on migratory birds, despite their reserve status. We refer you to this very timber sale as one of many examples." (6)

Discussion: Cumulative effects for migratory birds are not assessed under NEPA. Please also see Comment-107 and Comment-108 that discuss migratory bird compliance. The project will include a Migratory Bird report that discloses the Forest’s compliance with the diversity requirements and direction under NFMA, and the December 2008/June 2014 Memorandum of Understanding between the Forest Service and FWS to promote the conservation and reduce take of migratory birds.

Comment-121 - Please develop and implement seasonal operational restrictions to avoid project impacts while land birds are nesting in the project area. (6)

Discussion: The project includes protection measures for NSO and northern goshawk during critical breeding periods. The project also includes protection measures designed to limit the potential for adverse effects to ground-nesting and riparian-obligate migratory bird species in Elk Flat meadow and along the Ash Creek Riparian Reserve when underburning. These protection measures will be implemented through use of LOPs, managing smoke dispersal, and varying ignition patterns.

Comment-122 - Both carbon and spotted owl habitat tend to accumulate in relatively dense forests with intermediate or longer fire return intervals. Thus, we can likely read these studies and replace the word "carbon" with the word "spotted owl habitat" and the results will likely hold. (5)

Discussion: The comment is noted. Spotted owl habitat develops over time, and is typically based on tree and shrub species composition, tree and snag size classes and conditions, down wood (large, decaying), and soil types that support these conditions. Prey base is also required. It is not disputed that NSO habitat can be shaped by fire, and low to moderate intensity fires can be beneficial due to increases in prey base. But as evidenced in recent fires on and near the Shasta-Trinity National Forest (2008 Complexes, 2012 Bagley Fire, 2014 Complexes), high severity fire removes habitat that is suitable for nesting and roosting NSOs, which is a required habitat element for NSO survival and population growth. Abiotic factors such as aspect, elevation and slope position also all contribute to habitat development (as well as predicted NSO use). While dense forests can provide spotted owl habitat, fires have been more severe in the past decade (see also the response to Comment-1). The 2011 Revised Recovery Plan for the NSO describes that while thinning activity removes carbon from the forest system in the short-term, it may reduce risk of subsequent carbon release through fire or disease outbreak. It states that “Thinning can also encourage carbon being concentrated in fewer, larger trees that approximate old-growth structure of pre-fire suppression forests (Hurteau et al. 2008)” though also concedes that where, when and how such treatments occur needs to be carefully examined (USDI-FWS, 2011 pp. III-11).

The 20-year monitoring report summary for the ‘Status and Trend of Late-successional and Old-growth Forests’ states: “some portions of the NWFP area have been setback by decades from achieving those outcomes [expectations for older forest abundance, diversity, and connectivity] particularly resulting from large wildfires in the fire-prone portions of the NWFP area” (Davis, et al., 2015). Also, the summary report for the 20-year monitoring of the ‘Status and Trend of Northern Spotted Owl Habitat’ states: “large wildfires continue to be the leading cause for loss of NSO habitats on federal lands. Most of these fire-related losses have occurred within the network of large reserves that were designed for the protection and restoration of habitat for long-term northern spotted owl conservation” (Davis, et al., 2015). This summary report further notes that the loss rates in fire prone portions of the NSOs range exceeded the expected 2.5% rate for the 20-year period at rates of 3.9-7.4% per decade. Climate change is expected to expand the area of fire-prone landscapes and an increased frequency of large wildfires this century has already been observed. Most large wildfires and resulting habitat losses have occurred in the federally reserved land use allocations. Monitoring future trends of both wildfire and habitat will be important.
The 2011 Revised Recovery Plan for the NSO also states habitat loss from wildfire as one of the three main threats to its recovery (USDI-FWS, 2011 pp. vii, II-2). It also discusses regional warming and consequent drought stress as the most likely drivers of increased mortality rates of trees in recent decades in the western United States, noting the increase was evident across the Pacific Northwest and California regions, elevations (i.e., topography), tree size, type of trees, and fire-return-intervals (USDI-FWS, 2011 pp. III-9).

Comment-123 - To justify such fuel reduction logging in suitable owl habitat on ecological grounds requires several findings: (1) that wildfire is highly likely to occur at the site of the treatment, (2) that if fire does occur it is likely to be a severe stand-replacing event, and (3) that spotted owls are more likely to be harmed and imperiled by wildfire than by logging at a scale necessary to reduce fire hazard. Available evidence does not support any of these findings, which raises serious questions about the need for and efficacy of logging to reduce fuels in western Oregon and other forests lacking frequent fire return intervals. (5)

Discussion: Please see the responses to Comment-4, Comment-5, Comment-100, Comment-102, Comment-112 and Comment-122 regarding fire and NSOs and NSO habitat.

Other

Comment-124 - Are there grazing allotments that overlap the proposed aspen treatments? (6)

Discussion: The Bartle grazing allotment overlaps the project area.

Comment-125 - "Coarse woody material densities should support the natural range of biota for the site. Snags and down logs build soil and provide habitat for a variety of organisms critical to ecosystem recovery after natural disturbance. The adaptive management direction of the NFP encourages site-specific research and planning for CWM retention." (6)

Discussion: See Comment-23 and Comment-51.

Comment-126 - Economic consideration is very important for successful implementation of this project. It will be very important to assess the feasibility of each logging system in relation to volumes per acre, size of trees being removed, distance to landing, species of tree being removed, current delivered log prices, etc. (2)

We ask that you do an in-depth economic analysis in order to make sure your proposal is economically viable. Logging costs, fuel costs, and haul costs have all increased dramatically over the last few years. We ask that you take these recent increases into consideration in your economic analysis. (2)

Carefully assess and review proposed restrictions and mitigation items. It must be clearly documented they are needed. Additional mitigation items will require contractors to incur additional costs for a project that may have marginal economics.

Discussion: See Comment-23. Effects relative to economics have been assessed for the project (DEIS Chapter 3, Socio-Economics). Although the project objectives are large scale disturbance risk reduction, commercial timber sales and stewardship are recognized as a primary mechanism for moving the project area toward the desired condition. The project may use a variety of methods including commercial timber harvest, service contacts and mechanical fuel treatment to fulfill the purpose and need. A commercial timber sale is one implementation mechanism planned for a portion of the project. Depending on the market conditions at the time of implementation, biomass material that is 4 to 6.9 inches DBH may not be mechanically thinned and removed, but instead would be treated on site with a combination of mechanical treatments, hand thinning or thinned with prescribed fire during the underburning operations. The impact of requirements and restrictions on timber sale operations is recognized by the Agency. That said, requirements and restrictions are a cost of doing integrated resource management on National Forest System lands. This was considered during the development of the project actions and alternatives. Economic viability of timber offerings is considered during appraisal and contract preparation processes.

Regardless of the implementation method or funding source, project actions were designed to address and enhance environmental conditions that are not monetary to meet the purpose and need. The effects analysis in Chapter 3 provides environmental effects of the proposed actions.
Comment-127 - The current industry infrastructure is very important in terms of implementing your projects. This needs to be a consideration when assessing economics and project design. As project size and volumes shrink during the NEPA analysis it may not individually seem to have any impact on industries ability to implement. But cumulatively, as all projects shrink, it has a major impact on the ability to maintain adequate infrastructure to accomplish your land management activities. (2)

Discussion: While the Forest Service does recognize industry infrastructure is an important factor in project implementation, it is beyond the scope of this analysis to consider the cumulative effect of individual project sizes across a wide region on industry infrastructure.

Comment-128 - The use of Stewardship or even Service Contracts may be necessary to complete the objectives outlined for the mortality issues in/around Elk Flat. Please look closely at the economics of the entire project area to determine if a commercial timber sale could possibly achieve your purpose & need. A Stewardship will not generate receipts for Siskiyou County. We encourage projects that generate a positive cash flow for the Agency when possible. (4)

Discussion: A stewardship sale is a method of achieving the ecological objectives of the project, from which renewable forest byproducts are expected. A stewardship sale will not be the sole method used to implement project actions, however.

Comment-129 - Please disclose and analyze the effects from the proposed activities on heritage resources. (9)

Discussion: A Cultural Resources Report (Johnson, 2015) was completed for this project. The EIS Chapter 3 summarizes the effects relative to heritage resources.

Comment-130 - Please disclose how all treatment activities would increase the potential for the spread of non-native invasive species. (9)

Discussion: Executive Order 13112 addresses preventing the introducing invasive species, their control, and minimizing the economic, ecological, and human health impacts of the invasive species. The required compliance with this order is discussed in Appendix H.

Comment-131 - If whole tree yarding/top yarding is proposed make sure landings can accommodate the merchantable and unmerchantable material. (2)

Discussion: The proposed mechanical treatment areas were reviewed for implementation viability using existing roads, routes, corridors and landings. Landings ranging from 0.5 to 0.75 acres each would be utilized as available or constructed if needed to facilitate transfer of forest products to haul trucks. Actual existing landing use and new locations of landings would be approved on an individual basis based on the operator’s requests at the time of implementation and consistency with RPMs (e.g., some existing landings in the project’s Riparian Reserves would not be used).

Comment-132 - We strongly encourage the Forest to choose the No Action alternative. It can and should also develop action alternatives that would actually improve late-successional habitat and decrease fire risk by taking only the trees 10" dbh and below, and closing roads. While this may not make an economic timber sale, it isn’t supposed to. Timber production for the sake of timber production is not permitted in LSR and CHU. (7)

Discussion: The No Action alternative is evaluated in the EIS (Chapter 3). Two alternatives are responsive to this issue: Alternative 6-Limit Harvest to Trees Less than 10 Inches in Diameter, and Alternative 8-Limit Harvest to Trees Less Than 20 Inches in Diameter within the Elk Flat Late-Successional Reserve. See also Comment-68. The project does not propose timber production in LSR and CHU for the sake of timber production. The project’s purpose and need are clearly outlined in Chapter 1 of the EIS, along with how the project aims to meet the direction set forth under the NWFP, Forest Plan, and LSRA. The Forest expects the
network of land allocations that are withdrawn from active timber management119 (e.g., wilderness, administratively withdrawn areas, wild and scenic rivers, others) to provide habitat adequate to maintain viable, well-distributed populations of federally listed or proposed and Forest Service sensitive species (USDA-FS 1995 p. 3-27). Where active management occurs in Late-Successional Reserves and Riparian Reserves, standards and guidelines and project design features for snags, logs, hardwoods, biodiversity, and protection and enhancement of habitats also contribute towards this goal. The use of best available science, recommendations form the 2011 Revised Recovery Plan for the NSO, and information from the Final Critical Habitat Rule for the NSO regarding active management and special management considerations in the East Cascades Critical Habitat unit (and East Cascades South subunit) will be addressed. These recommendations and considerations will be summarized in the project’s wildlife Biological Assessment, and relevant portions of the EIS.

Comment-133 - Please keep us on the mailing list for this project and forward the DEIS to our office immediately upon release. We request that all specialist reports, including the FWS consultation, be posted on the Forest's website. (7)

Discussion: Your name is on the project mailing list. Specialist reports are often posted to the project’s website, though those with sensitive information may not be posted, or would be posted with information redacted in accordance with the relevant law, regulation or policy.

119 Including those land allocations such as Late-Successional Reserves or Riparian Reserves that may be treated to reduce the risk of losing habitat, to enhance habitat, and to contribute to Aquatic Conservation Strategy objectives but that do not regularly contribute to allowable sale quantity.
Appendix C - Standard Operating Procedures and Best Management Practices

While not meant to be all inclusive, the following practices listed by resource are some of the most pertinent compliance items, standard operating procedures (starting page C-1) and Best Management Practices (starting page C-3) apply to all similar activities as those proposed in the Elk Project. Site specific Resource Protection Measures Common to All Action Alternatives are listed in Chapter 2 (starting p. 84).

Standard Operating Procedures

The following practices are commonly implemented in similar projects to comply with Forest Plan standards and guidelines, Forest Service Policy, Regulation or law. These practices do not represent all standard operating or routine compliance procedures. In particular, timber harvest implemented through timber sale contracts or stewardship contracts have standard provisions beyond those listed here to protect the environment.

**Air Quality**

1. All prescribed burning will be consistent with the provisions of the Siskiyou County Air Pollution Control District (APCD) rules and regulations through the permit process. The smoke management plan would adhere to air quality regulations, and restrictions set forth and approved by the North East Air Alliance. A Smoke Management Plan will be completed and submitted to the Siskiyou County Air Pollution Control District with the project burn plan. The county would issue a burn permit upon approval of the smoke management plan.

2. During harvest activities, dust will be abated in accordance with Road Maintenance Contract requirements. If surface water drafting is utilized for watering roads and landings, BMPs (starting p. C-3) will be required to maintain water quality and prevent the loss of road and landing surface material.

**Cultural Resources**

3. If new cultural resources are discovered during project activities, all work in the vicinity will cease until the Heritage Program Manager or a delegated archaeologist examines and assesses the resource. Appropriate measures will be undertaken to protect the new resource as activities resume.

4. If ground disturbance is proposed outside of treatment units, a management unit archaeologist will be contacted to ensure that no historic properties will be affected.

**Hydrology and Soils**

5. Maintain ground cover (duff and or fine woody debris less than 3 inches) across at least 50 percent of all activity areas to maintain soil productivity.

6. Prior to entering the harvest units with equipment, the sale administrator will verify ground conditions are such that operations will not cause resource damage, using the current standard for soil conditions and operability (e.g. “Wet Weather Operation” guide and “Field Guide to Soil Moisture Conditions Relative to Operability”). The timber sale administrator will consult with the unit soil scientist and hydrologist if there is any doubt as to whether ground conditions are
satisfactory for operation. An earth scientist or hydrologist may be requested by the sale administrator to review ground conditions prior to operations in seasonally wet areas.

7. Implement Best Management Practices (BMPs) and Forest soil quality standards for all activities. Best Management Practices will be used to prevent or mitigate project-associated effects related to soil erosion, compaction, and productivity and to prevent or mitigate any project-associated effects related to water quality. The complete list of BMPs is found in a Water Quality Management for Forest System Lands in California (USDA-FS, 2000). Follow all BMPs listed (starting on page C-3). These BMPs are incorporated into the project design to ensure that potential impacts to soils and water quality would be prevented or effectively mitigated and include general and wet weather operation schedule information.

8. Standard timber sale contract provisions for landing location would apply to all units containing seasonally wet areas and intermittent streams.

9. Use standard timber sale contract provisions to ensure appropriate equipment cleaning, which addresses cleaning of ground-disturbing equipment, in the contracts to help prevent the introduction and spread of weed species into and out of the project area. Similar requirements would apply to Forest Service operations.

10. Prior to implementation, exclusion areas (high priority weeds) will be flagged with orange and black “noxious weed” flagging and will be included on contractors' maps. Staging of equipment will be done in weed free areas.

11. Equipment operating in areas known to be infested with noxious weeds will be washed prior to leaving the infested area. If new occurrences of noxious weeds are identified during treatment implementation, equipment used will be washed prior to leaving an infested area.

12. If project implementation calls for mulches, gravel, or fill, they would be certified weed free as these products become available.

13. Forest Service personnel or contractors will report any new invasive weed populations by calling the range department at (530) 226-2432 or the district botanist at (530) 926-9665.

Landings and Skid Trails

14. All skid trails and landings will be flagged and approved by the sale administrator in advance of skidding operations. If it is determined that landings or skid trails need to be constructed outside

---

120 The extent of the wet weather and snowmelt season in Northern California can be very unpredictable, therefore a fixed LOP for wet weather conditions will not be set for any of the proposed actions. Standard timber sale contract provisions can be used to close down operations because of wet weather, high water, or other considerations in order to protect resources.


122 Per Forest routine practice, if new populations of noxious weeds are found, treatment (will be implemented in accordance with priorities set by the Shasta-Trinity National Forest noxious weed program. Other weed infestations will be treated by according to District and Forest priorities.

123 Invasive species are rated by the Shasta-Trinity National Forest and may not be listed by the State of California or Cal-IPC. High priority depends on the species and its location.
of a thinning treatment unit boundary, the appropriate agency resource specialists will be consulted prior to construction.

15. Limit no more than 15 percent of a treatment unit to non-productive purposes such as roads, skid trails and landings (Forest Plan pp. 4.25, O-2). The objective is to design a skidding pattern that best fits the terrain and limits soil impact and pre-designated skid trails, felling to the lead and end lining are methods that achieve the objective. Re-use previously created skid trails, yarding corridors, temporary roads and landings to the extent feasible to avoid new ground disturbance, minimizing soil displacement and concentrated surface flow.

Sensitive Vascular and Non-Vascular Plants

16. If new populations of any plant species needing special protection are discovered during project implementation, an agency botanist will be notified to develop protection measures to maintain population viability, such as altering or dropping proposed units from activity; modifying the proposed activity; flagging and avoiding plant occurrences, or restricting the operating period in a specific area. A limited operating period would depend on the species and phenology at the time of discovery, and could last four to six months to allow for seed to set. Sensitive species are usually protected by flagging and avoiding the plant occurrences.

Silviculture and Fuels

17. All prescribed burning would follow the guidelines set forth in a prescribed burn plan developed specifically for this project. Prescribed burning will only be initiated when relative humidity, temperature and soil moisture conditions are optimal for meeting treatment unit fuel objectives. The prescribed burn plan will address parameters for weather, air quality, contingency resources, potential escapes, and personnel and public safety. See also RPMs 24 on page 88, 25 (p. 89), 27(p. 89), 28 (p. 89), 34 (p. 90), 37 (p. 91), 42 (p. 92), and 43 (p. 92).

Road Management

18. All System roads used for the project would be maintained, including installation of rolling dips where appropriate, to provide adequate drainage and minimize runoff concentrations.

19. BMP 2.21 Water Source Development, maintenance activities associated with drafting surface water for dust abatement includes implementing water quality protection measures such as “drainage or surfacing measures, limits on location or size, etc.”

Wildlife

20. Standard contract provisions will be included in all implementation contracts for project implementation to extend protection to any federally threatened or endangered or sensitive wildlife and plant species listed on the Regional Forester’s sensitive species list. Provisions will provide for halting operations in the vicinity of newly listed or discovered individuals or populations after completion of the biological assessment or evaluation, NEPA document or Issuance of Decision.

Best Management Practices

Best Management Practices (BMPs) are incorporated into this analysis for application during implementation. BMOPs are compiled from Forest Service manuals, handbooks, contract and permit provisions, and policy

124 System roads and other dedicated areas are not included in the percentage.

125 At the present time there are no known sites for any sensitive plant species in the Elk project area.
statements to directly or indirectly maintain or improve resource qualities or to abate or mitigate impacts while meeting other resource goals and objectives (USDA-FS, 2000 pp. 21-22). The IDT selects BMPs necessary to protect or improve the covered resources for specific sites and identifies the appropriate methods and techniques for their implementation. While all or portions of individual BMPs may not specifically apply to all or portions of the Elk Project, they would be implemented as applicable and per the project design and resource protection measures. The following BMPs are particularly applicable to the Elk Flat LSR Enhancement Project (USDA-FS, 2000):  

**Practice 1.4 – Use of Sale Area Map for Designating Water Quality Protection Needs**
The Contract would delineate the location of protection areas and insure their recognition and proper protection. Protection areas include, but are not limited to; stream courses, meadows, harvest unit boundaries, available water sources, Riparian Reserves and roads where hauling is restricted.

**Practice 1.10 – Tractor Skidding Design**
Skid trails would be designed to fit the terrain, minimize erosion, and keep water from concentrating. The Forest Service prior to use by the Purchaser would approve all skid trails. On-site evaluations would be documented during implementation.

**Practice 1.12 – Log Landing Location**
To locate new landings or reuse old landings in such a way as to avoid watershed impacts. The Purchaser and the Sale Administer must mutually agree upon landing locations.

**Practice 1.13 – Erosion Prevention and Control Measures During Timber Sale Operations**
To ensure that the purchasers’ operations will be conducted reasonably to minimize soil erosion.

**Practice 1.16 – Log Landing Erosion Control**
Contract specifications require the Purchaser to install erosion control measures on landings. Erosion prevention and control measures would be designed to insure that landings have proper drainage. This may include ditching, outsloping, water barring, and ripping.

**Practice 1.17 – Erosion Control on Skid Trails**
Contract specifications require the timber sale operator to install erosion control measures on skid trails. Closure work may include mulching, outsloping, water barring, ripping, removal of berms and road barrier construction.

**Practice 1.18 – Meadow Protection during Timber Harvesting**
As a minimum, meadow protection requirements specified in the Forest Plan would be implemented. The Timber Sale Contract prohibits unauthorized operation of vehicular or skidding equipment in meadows or in protection zones designated on the sale area map and marked on the ground.

**Practice 1.20 – Erosion Control Structure Maintenance**
During the period of the Timber Sale Contract, the Purchaser would provide maintenance of soil erosion control structures constructed by the Purchaser until they become stabilized, but not more than one year after their construction.

---

126 USDA Forest Service, Pacific Southwest Region, September 2000 lists all BMPs and is available at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5362512.pdf
Practice 1.21 – Acceptance of Timber Sale Erosion Control Measures before Sale Closure
Onsite evaluations during operations would be monitored and documented (BMEP AE-1: Timber Sales and Roads) and the first winter after the completion of the project (BMPEP T05-Timber Sale Administration). Incorporation of this BMP into Timber Sale Contract Provisions is as follows: C6.6, B6.6, B6.63, B6.64, B6.65, and B6.66.

Practice 1.25 – Modification of the Timber Sale Contract
The Timber Sale Contract can be modified or terminated if new circumstances or conditions indicate that the timber sale would damage soil, water, or watershed values.

Practice 2.2 – Erosion Control Plan
The Timber Sale Contract requires that a general plan of operations, including planned periods and methods of erosion control be developed by the purchaser and presented to the Forest Service. This plan would set forth erosion control measures and discuss mitigation required by the Timber Sale Contract. Operations cannot begin until the Forest Service has given written approval of the plan.

Practice 2.12 – Servicing and Refueling of Equipment
Purchasers are required to take all reasonable precautions to prevent pollution of air, soil, and water. Purchaser shall furnish oil absorbing mats for use under all stationary equipment or equipment being serviced. A Spill Prevention, Containment and Counter Measures Plan is required if the volume of oil or oil products fuel exceeds 1,320 gallons in containers of 55 gallons or greater.

Practice 2.21 – Water Source Development Consistent with Water Quality Protection
Water source development is normally needed to supply water for road construction and maintenance, dust control, and fire control. At no time would downstream water flow be reduced to a field that would be detrimental to aquatic resources, fish passage, or other established uses.

Practice 2.22 – Maintenance of Roads
Roads would be maintained in a manner that provides for water quality protection by minimizing rutting, failures, side casting, and blockage of drainage facilities. The purchaser and the Forest Service would agree to an Annual Road Maintenance Plan that outlines responsibilities and timing of maintenance. This would be done before the beginning of the operating season.

Practice 2.24 – Traffic Control during Wet Periods
Roads that must be used during wet periods should have a stable surface and sufficient drainage provided to allow such use while at the same time maintaining water quality. Where wet season field operations are planned, roads may need to be upgraded or use restricted.

Practice 2.25 – Snow Removal Controls to Avoid Resource Damage
When roads are used in the winter, snow removal would be done in a manner to protect roads and adjacent resources. Snow berms would be removed where they result in concentration of snowmelt runoff on the road. The Purchaser and the Forest Service would agree to measures prior to snow removal activities.
Practice 2.26 – Obliteration or Decommissioning of Temporary Roads
Contract specifications would include language that requires all temporary roads and landings to be decommissioned as soon as the purchaser has completed work and before the seasonal rain begins. Closure work may include mulching, outsloping, water barring, scarifying, removal of berms and road barrier construction.

Practice 5.6 – Soil Moisture Limitations for Mechanical Equipment Operations
The Contract shall require winter shutdown whenever the Forest Service determines that the soil moisture or physical conditions have become unsuitable for equipment operation on any area.

Practice 6.1 – Fire and Fuel Management Activities
Fuel management projects would have management requirements, mitigation measures, and multiple resource protection prescriptions documented in the project planning and decision documents.

Practice 8.2 - Rangeland Permit Administration
Manage rangeland vegetation and grazing to protect water and aquatic and riparian resources through administration and monitoring of grazing permits and annual operating instructions.
Appendix D – Maps
Figure Appendix D-1. Alternative 1 Modified Proposed Action Map with LSR Boundary
Figure Appendix D-2. Alternative 1 Fuels Map Showing Fireline Locations
Figure Appendix D-3. Alternative 2 Map
Figure Appendix D-4. Alternative 2 Fuels Map
Elk LSR Enhancement Project

Figure Appendix D-5. Alternative 3 Map
Figure Appendix D-6. Alternative 3 Fuels Map
Figure Appendix D-7. Alternative 1 Aerial Imagery Map
Figure Appendix D-8. Wildland Urban Interface Map
Figure Appendix D-9. Northern Spotted Owl Habitat with Alternative 1 Silvicultural Actions
Figure Appendix D-10. Northern Spotted Owl Critical Habitat
Appendix E – Threatened and Endangered Species Biological Assessment and Consultation Record

Appendix E is the Biological Assessment including the Consultation Record.
Biological Assessment
for Threatened and Endangered Wildlife Species

Elk Late-Successional Reserve Enhancement Project

Shasta-Trinity National Forest
Shasta-McCloud Management Unit

T 40N R 1W Sections 4 and 5; T 41N R 1W Sections 27-34
Mt. Diablo Meridian

Prepared by: /s/ Christine J. Jordan
Christine J. Jordan
Wildlife Biologist
Shasta-McCloud Management Unit
Shasta-Trinity National Forest
(530) 964-3771
cjordan02@fs.fed.us

Date: January 18, 2016

Finalized on: ________________________  Date: April 1, 2016
# Table of Contents

Executive Summary................................................................................................................................. i

I. Introduction ................................................................................................................................................................. 1

   Species Dropped from Further Consideration .................................................................................. 2

   Critical Habitat........................................................................................................................................ 2

II. Consistency with Resource Plans and Other Guidance .................................................................................... 4

   Northwest Forest Plan and Shasta-Trinity National Forest Land and Resource Management Plan ....... 4

   Late-Successional Reserve Assessment ................................................................................................. 5

   Other Forest Plan Land Allocations, Forest Plan Direction and Guidance ........................................... 5

   National Fire Plan ........................................................................................................................................ 7

   Shasta-Trinity National Forest Fire Management Plan ...................................................................... 7

   Recovery Plans ........................................................................................................................................ 8

   Revised Recovery Plan for the Northern Spotted Owl ...................................................................... 8

   Recovery Plans for Other Species ........................................................................................................ 10

   State Plan for Gray Wolf ........................................................................................................................ 10

III. Consultation to Date ............................................................................................................................................. 10

IV. Purpose and Need, Existing Condition Summary, Bounding, Methodology, Preferred Alternative and Project Design Features ......................................................................................................... 11

   Location .................................................................................................................................................. 11

   Purpose and Need ........................................................................................................................................ 12

   Existing Condition Summary ............................................................................................................... 13

   Timing of the Project .......................................................................................................................... 17

   Bounding and Analysis Methodology .................................................................................................. 17

   Spatial and Temporal Bounding ........................................................................................................ 17

   Spatial Bounding .................................................................................................................................. 17

   Temporal Bounding ................................................................................................................................ 20

   Methodology ......................................................................................................................................... 20

   *Approximately 140 acres of this unit is in meadow / non-forested opening and underburning is the only treatment in this area ........................................................................................................... 26

   Incomplete and Unavailable Information ........................................................................................... 26

   Analysis Assumptions .......................................................................................................................... 27

   Alternative 1 (Preferred Alternative) .................................................................................................... 28

   Transportation Management .............................................................................................................. 29

   Hazard Trees and Snags ....................................................................................................................... 29

   Interrelated and Interdependent Project Elements ............................................................................. 29

   Project Design Features ....................................................................................................................... 30

   Unthinned Patches .................................................................................................................................. 31

   Thermoregulation Sites ....................................................................................................................... 31

   General Project Design in High Value NSO Habitat, and ST-215 Core and Home Range .................. 32

V. Species Status, Surveys, Existing Environment and Past Influences on Existing Conditions .................. 39

VI. Effects of Alternative 1 on NSO ................................................................................................................ 39

   NSO Indicators ...................................................................................................................................... 40

   Direct Effects to NSO .......................................................................................................................... 41

   Limited Operating Periods .................................................................................................................. 42

   Barred Owls ......................................................................................................................................... 43

   Direct and Indirect Effects to NSO Habitat ........................................................................................ 45

   Effects to Nesting/Roosting and High Quality Foraging Habitat ....................................................... 47

   Effects to Foraging Habitat ................................................................................................................ 48
### Tables

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Forest Plan land allocations and management areas within the Elk LSR Enhancement project area</td>
<td>7</td>
</tr>
<tr>
<td>Table 2</td>
<td>General Purpose and Need Statements for the Elk LSR Enhancement Project</td>
<td>12</td>
</tr>
<tr>
<td>Table 3</td>
<td>Action Areas for NSO and Gray Wolf</td>
<td>18</td>
</tr>
<tr>
<td>Table 4</td>
<td>Summary of Alternative 1 proposed actions based on treatment acres</td>
<td>28</td>
</tr>
<tr>
<td>Table 5</td>
<td>General tree selection standards and criteria</td>
<td>31</td>
</tr>
<tr>
<td>Table 6</td>
<td>Project design features for NSO and gray wolf</td>
<td>33</td>
</tr>
<tr>
<td>Table 7</td>
<td>Other design features addressing wildlife habitat elements or suitable habitat areas</td>
<td>36</td>
</tr>
<tr>
<td>Table 8</td>
<td>Levels of acceptable mortality when underburning natural stands - underburn only</td>
<td>38</td>
</tr>
<tr>
<td>Table 9</td>
<td>Levels of acceptable mortality when underburning natural stands after thinning</td>
<td>38</td>
</tr>
<tr>
<td>Table 10</td>
<td>Summary of suitable, dispersal, capable, non-habitat and NSO critical habitat for all spatial scales</td>
<td>39</td>
</tr>
<tr>
<td>Table 11</td>
<td>NSO activity center information for the action area</td>
<td>41</td>
</tr>
<tr>
<td>Table 12</td>
<td>Summary of general treatments in NSO habitat at project, home range and core scales</td>
<td>45</td>
</tr>
<tr>
<td>Table 13</td>
<td>Summary of NSO habitat effects from prescribed fire, thinning and other subtreatments</td>
<td>48</td>
</tr>
<tr>
<td>Table 14</td>
<td>Forest Plan seral stage definitions used for FVS modeling results and project conditions</td>
<td>56</td>
</tr>
<tr>
<td>Table 15</td>
<td>FVS modeling results of thinned stands and average diameter of overstory trees compared to no action</td>
<td>56</td>
</tr>
<tr>
<td>Table 16</td>
<td>FVS modeling results of thinned stands and trees per acre &gt; 24” DBH compared to no action</td>
<td>57</td>
</tr>
<tr>
<td>Table 17</td>
<td>FVS modeling results of thinned stands and total trees per acre compared to no action</td>
<td>57</td>
</tr>
<tr>
<td>Table 18</td>
<td>Average snags per acre over 20 inches diameter in thinned units pre and post-thinning</td>
<td>58</td>
</tr>
<tr>
<td>Table 19</td>
<td>Acres of habitat in the ST-215 activity center at the core scale by treatment area</td>
<td>73</td>
</tr>
<tr>
<td>Table 20</td>
<td>Road actions in ST-215 core by habitat type reported in miles</td>
<td>74</td>
</tr>
<tr>
<td>Table 21</td>
<td>Acres of habitat in the ST-215 activity center at the home range scale by treatment area (incl. core)</td>
<td>76</td>
</tr>
<tr>
<td>Table 22</td>
<td>Road actions in outer ring of ST-215 home range by habitat type reported in miles</td>
<td>78</td>
</tr>
<tr>
<td>Table 23</td>
<td>Summary of suitable habitat pre- and post-thinning and fuels treatments in home range</td>
<td>78</td>
</tr>
<tr>
<td>Table 24</td>
<td>Summary of dispersal and capable habitat pre- and post-thinning and fuels treatments in home range</td>
<td>78</td>
</tr>
<tr>
<td>Table 25</td>
<td>Acres of treatment proposed in PCEs of critical habitat</td>
<td>81</td>
</tr>
<tr>
<td>Table 26</td>
<td>Summary of treatment effects in critical habitat</td>
<td>83</td>
</tr>
<tr>
<td>Table 27</td>
<td>Critical habitat acres by PCE type pre- and post-project at the project area, home range and core scales</td>
<td>85</td>
</tr>
<tr>
<td>Table 28</td>
<td>New landing needs in critical habitat at the ST-215 home range and core scales</td>
<td>86</td>
</tr>
<tr>
<td>Table 29</td>
<td>Road actions in critical habitat at the ST-215 home range and core scales reported in miles</td>
<td>87</td>
</tr>
<tr>
<td>Table 30</td>
<td>Summary of effects to NSO habitat at all project scales from vegetation and fuels treatments</td>
<td>93</td>
</tr>
<tr>
<td>Table 31</td>
<td>New landing needs and habitat potentially affected in the project area, home range and core</td>
<td>100</td>
</tr>
<tr>
<td>Table 32</td>
<td>Survey status and results of the NSO activity centers in the action area</td>
<td>11</td>
</tr>
<tr>
<td>Table 33</td>
<td>Habitat types in the NSO action area by landowner</td>
<td>21</td>
</tr>
<tr>
<td>Table 34</td>
<td>NSO habitat types in the project area</td>
<td>21</td>
</tr>
<tr>
<td>Table 35</td>
<td>Acres of suitable NSO habitat in the ST-215 core and home range</td>
<td>22</td>
</tr>
<tr>
<td>Table 36</td>
<td>Acres of NSO capable, dispersal and non-habitat in the ST-215 core and home range</td>
<td>22</td>
</tr>
<tr>
<td>Table 37</td>
<td>Acres of NSO suitable, dispersal, capable and non-habitat in the treatment area</td>
<td>23</td>
</tr>
<tr>
<td>Table 38</td>
<td>NSO critical habitat acres in the action area, project area, home range and treatment area</td>
<td>23</td>
</tr>
<tr>
<td>Table 39</td>
<td>Summary of suitable, dispersal, capable, non-habitat and NSO critical habitat for all spatial scales</td>
<td>24</td>
</tr>
<tr>
<td>Table 40</td>
<td>Pre- and Post-Treatment Stand Condition Averages for FVS-Modeled Thinning Treatments</td>
<td>E1</td>
</tr>
<tr>
<td>Table 41</td>
<td>Pre- and Post-Treatment Stand Condition Data for Modeled Thinning Treatments</td>
<td>E2</td>
</tr>
</tbody>
</table>
Executive Summary

Through the analysis of the best available scientific information at the time of preparation, and in accordance with Endangered Species Act procedures, it is my determination that implementing the preferred alternative (Alternative 1) of the Elk Late-Successional Reserve Enhancement Project:

- May affect, but is not likely to adversely affect, the threatened northern spotted owl;
- Will adversely affect designated Critical Habitat for the threatened northern spotted owl.

This determination is based on the following general rationale:

- Per protocol surveys and stand searches to date, territorial or nesting NSOs have not been detected or verified in the ST-215 home range, core or established action area in 25 years. A resident single NSO was observed and verified in the core 12 years ago. There have been no other verified detections of NSO in the project area or action area to date.
- An individual barred owl was detected in 2004, and a barred owl pair occupied portions of the project area from 2012 through October 2014, when the pair was removed. It is possible that barred owl(s) may disperse through or recolonize the project area regardless of implementation.
- Regardless of removing barred owl(s), or project implementation, it is possible that juvenile, subadult or non-territorial NSO(s) may disperse through the project or action area; recolonize the ST-215 activity center or other portions of quality habitat in the project area; or be present in the project area or action area but be non-responsive during survey efforts.
- The Project includes provisions for continuing surveys, spot checks and stand searches and the use of Limited Operating Periods to minimize the potential for direct effects to any nesting or single NSOs that may recolonize the ST-215 activity center or project area.
- 629 acres of Primary Constituent Elements of critical habitat (nesting/roosting (PCE2), foraging (PCE3), dispersal (PCE4) and forest types in early and mid-seral stages that support NSO across its geographical range (PCE1)) in Unit 8, Subunit 3 (East Cascades South [ECS-3]) will be treated. Elements of PCE3 would be adversely affected in the short term timeframe established for this analysis, with long term benefits to all PCEs.
- The proposed action was designed to meet several of the dry forest restoration principles from the Revised Recovery Plan for the Northern Spotted Owl, and special management considerations in the Final Critical Habitat Rule for the East Cascades (Unit 8).
- Treatments in the ST-215 home range follow recommendations for prioritization under Recovery Action 10. To meet the intent and recommendations under Recovery Action 32, high value habitat areas were identified and excluded from mechanical treatment.
- At the landscape scale of the Elk Flat LSR, the Project is designed to increase resiliency to ongoing and epidemic natural disturbances and stressors of drought, root disease, insects and potential wildfire; improve individual tree health and vigor; increase tree, shrub and hardwood species diversity and forest stand complexity; enhance and protect existing mid- and late-successional habitat and higher value habitats for the northern spotted owl; and establish vegetation conditions that allow for a low-intensity, frequent fire return interval on the landscape.
It is also my determination that implementing the preferred alternative of this Project:

- May affect, but is not likely to adversely affect, the endangered gray wolf
- Will have no effect on designated Critical Habitat for the gray wolf.

This determination is based on the following general rationale:

- Available information provided to the Forest Service (to date) by the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife shows that wolves from the Shasta Pack were detected in close proximity to the project area.
- The same information shared by these agencies shows there are no wolf den or rendezvous sites in or within one mile of the project area.
- Surveys conducted by the Forest Service on National Forest System lands have not detected any wolves in or near the project area. Surveys and monitoring will continue prior to and throughout project implementation.
- The project includes a disturbance Limited Operating Period that will go into effect if a den site or active rendezvous site(s) is detected within one mile of project activities. This measure is expected to minimize the potential for direct and indirect effects to wolf reproductive behaviors and pup rearing success to a discountable level.
- Individuals may be temporarily displaced by project activities or may exhibit avoidance behavior near the project due to noise disturbances or increases in human activity. This effect is not considered to be meaningfully measureable, detectable or traceable to the project in and of itself, due to wolves’ generalist behaviors and wide-ranging habits. This potential effect is considered insignificant.
- There will be no meaningful increase or decrease in wolf security habitat in the project area or gray wolf action area as a result of the project.
- There is no critical habitat designated for gray wolf in California at this time.
I. Introduction

The purpose of this Biological Assessment (BA) is to analyze the potential effects of the Elk Late-Successional Reserve Enhancement Project on threatened or endangered wildlife species, or their designated critical habitat, known or assumed to occur in the project area. This BA provides the analysis of effects that would occur from implementing the preferred alternative (Alternative 1). It has been prepared in accordance with the legal requirements set forth under Section 7 of the Endangered Species Act (ESA) of 1973, as amended [16 U.S.C. 1536 (c) et seq. 50CFR 402] (ESA), and its implementing regulations and follows the standards established in the Forest Service Manual direction (FSM 2672.42; USDA-FS 1991) and the guidance provided in the Consultation Handbook (USDI-FWS and National Marine Fisheries Service 1998).

The Shasta-Trinity National Forest (Forest) obtained a list of threatened, endangered, proposed and candidate species for the 7.5-minute USGS quadrangles that comprise the project’s action area\(^1\) from the United States Fish and Wildlife Service (FWS) Arcata Field Office species portal on February 10, 2015 (http://arcata.fws.gov). The Forest Service was notified about the FWS’ planned transition to utilizing the IPaC system for obtaining official species lists in March 2015 (Fitzgerald 2015) and the Forest Service and FWS began providing trainings for the IPaC system in June 2015 (Krueger and Nicolaysen 2015).

Based on the revised methods for obtaining official species lists and new information regarding listed species that may be near the Project, a subsequent list for the action area\(^2\) was obtained December 22, 2015 from the Yreka Fish and Wildlife Service field office through IPaC\(^3\) at https://ecos.fws.gov/ipac/gettingStarted/index. This official list is included as Appendix A.

It is important to understand that the IPaC system allows project proponents to input a proposed project's location (including estimated or exact boundaries) or an action area so they may instantly receive a list of FWS trust resources that may occur within the boundary identified. The list identifies potential trust resources that may occur or that may be affected by the project and is not, and should not be confused with, a list of species that ‘may be affected’ in terms of an ESA effect determination. An ESA effect determination is made through site-specific analysis of a project’s activities in combination with the particular species’ known range and habitat requirements, its biology, and the timing, magnitude, duration and proximity of project activities. It is also important to understand that many of the FWS field offices generate species lists within the IPaC system based on County-level lists; not specific species or habitat polygons. The FWS has been further refining this information and as time, data and field office capabilities allow, the IPaC system will move from including species that may be within a County to using more specific species and habitat polygons (USDI-FWS 2015).

\(^1\) For the northern spotted owl, the action area is based on a 1.3-mile radius of proposed activities. It is 15,960 acres; 52% on National Forest System lands and 48% on private lands managed for timber production.

\(^2\) For the gray wolf, the action area is based on a 5-mile radius of proposed activities. It is 86,759 acres; 48% on National Forest System lands and 52% on rural residential lands and lands managed for timber production.

\(^3\) IPaC refers to the USDI Fish and Wildlife Service’s Information for Planning and Conservation. It is a tool meant to assist project proponents in increasing the compatibility of activities with the conservation of FWS trust resources. It is meant to assist in implementation of all activities proposed under section 7 or 10 of the ESA.
In accordance with the ESA and regulatory guidance, only those organisms and critical habitat listed on the official species list in Appendix A are considered. The listed species and designated critical habitat considered in detail in this document (and proposed species considered in the project-level Biological Evaluation) are:

**Endangered**

- Gray wolf (*Canis lupus*)
- Critical Habitat is not designated in California at this time (USDI-FWS 1978)

**Threatened**

- Northern spotted owl (*Strix occidentalis caurina*)
- Critical Habitat Unit 8, Subunit 3 East Cascades South [ECS-3]

**Proposed for Listing as Threatened (considered in project-level Biological Evaluation)**

- West Coast Distinct Population of fisher (*Pekania pennanti*)
- Critical habitat is not proposed at this time

**Species Dropped from Further Consideration**

There are 16 threatened, endangered, proposed or candidate species\(^4\) on the official species list in Appendix A. Based on a review of this list, it is my determination that the project will have no effect on the federally listed California red-legged frog, Oregon Spotted frog, yellow-billed cuckoo (Western U.S. Distinct Population Segment or DPS), conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, delta smelt or valley elderberry longhorn beetle. This is because there is no suitable or potential habitat in the project area, or the project area is wholly outside the species’ known or expected range. A detailed consideration for these species is included in the project record and they are not discussed further in this document. The remaining six species are also dropped from detailed consideration in this document as they are either: listed plants that are addressed in the botanical Biological Assessment (Posey 2015), candidate species that do not require analysis (USDI-FWS and NMFS 1998 pp. 1-5 to 1-6) or proposed listed species addressed in the project wildlife Biological Evaluation (Jordan 2015) because they are also a designated sensitive species (FSM 2670.5).

**Critical Habitat**

The FWS revised critical habitat for the northern spotted owl (NSO) on December 4, 2012 and the Rule became final January 3, 2013 (USDI-FWS 2012). The action area for the NSO contains approximately 797 acres of critical habitat within Unit 8, Subunit 3 (East Cascades South [ECS-3]). There are 720 acres in the project area, wholly in the western portion of the Elk Flat Late-Successional Reserve. Critical habitat is not designated on surrounding private lands or in the project area’s ponderosa pine-dominated stands and meadow at Elk Flat. The remaining 77 acres are located approximately four miles east of the project area’s critical habitat, along the base of Black Fox Mountain (see Map 4 in Appendix B).

\(^4\) Terrestrial wildlife, amphibians, aquatic invertebrates, fish and plant species.
In the Final Rule, the FWS describes that in the drier, more fire-prone regions of the owl’s range, habitat conditions will likely be more dynamic, and active management may be required to reduce the risk to essential physical or biological features of critical habitat from fire, insects, disease and climate change. While the Rule recommends conserving high-quality and occupied habitat in accordance with recommendations in the Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS 2011), it also describes that long-term recovery for the owl could benefit from forest management actions that restore or maintain ecological processes and resilience (USDI-FWS 2012 p. 71908). The Rule’s discussion of active management in the East Cascades Unit, and balancing short term adverse effects with long term beneficial effects in dry forests, relies heavily on recommendations from the Revised Recovery Plan.

The dry forest restoration principles are highlighted as management options in the Final Rule, and federal land managers are encouraged to consider the range of management flexibility contained in the Northwest Forest Plan (NWFP) (USDI-FWS 2012 pp. 71910, 71889). The FWS also supports vegetation and fuels management in dry and mixed-dry forests where treatment goals are to conserve or restore natural ecological processes, including fire, where they have been modified or suppressed (USDI-FWS 2012 pp. 71882). While the Rule recommends active management, it also describes that treatment activities should be focused on lower quality habitat with lower relative habitat sustainability and based on ecological restoration and application of ecological forestry principles; or be focused where ecological conditions are most departed from the natural or desired range of variability.

The Rule recommends following the NWFP guidelines and focusing on lands in or outside Late-Successional Reserves where uncharacteristic disturbance has occurred, or where the landscape management goal is to restore more natural or resilient forest ecosystems. It also recommends avoiding or minimizing activities in active NSO territories (or high-quality habitat in those territories) and using an active adaptive forest management framework to assess effects of activities on NSOs and their prey (USDI-FWS 2012 pp. 71882-71883).

The East Cascades Critical Habitat Unit is described in the Final Rule (pp. 71930-71931). The ECS-3 subunit consists of approximately 112,179 acres of land managed by the Forest Service under the NWFP, and respective National Forests that overlay the subunit (Shasta-Trinity, Klamath and Modoc). The subunit’s function is to provide demographic support in an area of sparsely distributed, high-quality habitat and Federal land and to provide population connectivity between subunits to the north and south. Special management considerations in the subunit are “required to address threats to the essential physical or biological features of critical habitat from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls” (USDI-FWS 2012 p. 71931). The Final Rule states that “the increase and enhancement of northern spotted owl habitat in this subunit is especially important for providing essential connectivity between currently occupied areas to support the successful dispersal of northern spotted owls, and may also help to buffer northern spotted owls from competition with the barred owl” (USDI-FWS 2012 p. 71931). The Forest’s interpretation of how the project treatments meet the intent of the Final Rule, and special management considerations for ECS-3, is addressed in the NSO Critical Habitat section of this document.

There is no designated critical habitat for the gray wolf in California (USDI-FWS 1978). Therefore, effects to critical habitat for the listed gray wolf are not discussed further in this document.

There is no proposed critical habitat for the West Coast DPS of fisher at this time. The FWS has “found the designation of critical habitat to be ‘not determinable’ for the West Coast DPS of fisher” (USDI-FWS 2014 p.
effects to critical habitat for the proposed listed fisher are not discussed further in this document, or the project Biological Evaluation.

II. Consistency with Resource Plans and Other Guidance

The content of this BA complies with the legal requirements set forth under Section 7 of the ESA [19 U.S.C. 1536 (c), 50 CFR 402] and standards established in Forest Service Manual direction (FSM 2672.42). It uses the best scientific and commercial information available at the time of preparation to determine the likely effects of the preferred alternative on federally listed species and designated critical habitat. This Project is guided by management direction found in the Shasta-Trinity National Forest’s Land and Resource Management Plan, which incorporated the Northwest Forest Plan (NWFP), as amended.

Northwest Forest Plan and Shasta-Trinity National Forest Land and Resource Management Plan

The Forest is operating in full compliance with the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (NWFP ROD; USDA-FS and USDA-BLM 1994). The Regional Forester approved the Forest’s Land and Resource Management Plan (Forest Plan) on April 28, 1995 and it became effective June 5, 1995 (USDA-FS 1995). The Forest integrated direction from the NWFP ROD into its Forest Plan through reproduction of its Standards and Guidelines. The NWFP standards and guidelines were subsequently updated in 2001 (USDI-FS and USDI-BLM 2001). The Forest Plan adopts the NWFP as the Federal contribution to the recovery of the northern spotted owl and this Project has been designed to be consistent with all applicable Forest Plan and NWFP guidance. The Forest expects the network of land allocations that are withdrawn from active timber management5 (e.g. wilderness, administratively withdrawn areas, wild and scenic rivers, others) to provide habitat adequate to maintain viable, well-distributed populations of federally listed or proposed and Forest Service sensitive species (USDA-FS 1995 p. 3-27). Where active management occurs in Late-Successional Reserves and Riparian Reserves, standards and guidelines and project design features for snags, logs, hardwoods, biodiversity and protection and enhancement of habitats also contribute toward this goal.

Forest-wide direction, which applies to all management areas, is described on pages 4-11 through 4-30 of the Forest Plan. Management Prescriptions are described on pages 4-33 to 4-71 and Management Area direction is on pages 4-80 through 4-85. Project activities will occur in Late-Successional Reserve and matrix, including Riparian Reserves that overlap these allocations. Land allocations, management areas and matrix prescriptions in the project area are displayed in Table 1 below. Refer to the Project Environmental Impact Statement (EIS) for additional details regarding specific Forest Plan land allocations and direction for the proposed actions, including maps (USDA-FS 2016).

5 Including those land allocations such as Late-Successional Reserves or Riparian Reserves that may be treated to reduce the risk of losing habitat, to enhance habitat, and to contribute to Aquatic Conservation Strategy objectives but that do not regularly contribute to allowable sale quantity.
Late-Successional Reserve Assessment

Late-Successional Reserves (LSRs) were established under the NWFP and are intended to provide old-growth forest habitat, provide for populations of species that are associated with late-successional forests, and to help ensure that late-successional species diversity will be conserved. The management objective within LSRs is to protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late-successional and old-growth related species, including the northern spotted owl (USDA-FS and USDI-BLM 1994; USDA-FS 1995 pp. 4-37 to 4-43; USDA-FS 1999 p. 1). Forest Plan goals describe that the network of LSRs are designated to provide for a viable population of northern spotted owls throughout their historic range (USDA-FS 1995 p. 3-27). Protection of LSRs includes reducing the risk of large-scale disturbance, including stand-replacing fire, insect and disease epidemics, and major human-caused impacts (USDA-FS 1999 p. 1). Both protection and enhancement can include application of silviculture and other treatments designed to reduce the risk of loss and/or accelerate development of late-successional stand characteristics (USDA-FS 1995 pp. 4-37 to 4-39; USDA-FS 1999 pp. 174-203).

In accordance with NWFP Standards and Guidelines (C-11), the Forest prepared a Late-Successional Reserve Assessment or LSRA (USDA-FS 1999). The purpose of the LSRA was to develop management strategies for the LSRs, determine their sustainability, and provide information to decision makers for managing LSRs to meet Forest Plan goals and objectives. Approximately 87 percent of the project area is in the Elk Flat Late-Successional Reserve, designated as RC-360 in the LSRA (pp. 124-129). The LSRA describes four objectives that guide the development and application of treatments in LSRs. The Elk Flat LSR is described as a priority for treatment objective II, which is to “promote the continued development of late-successional forests/characteristics” (p. 178). The Project is also designed to meet the other three treatment objectives (p. 175):

I. Protect existing late-successional habitat from threats (of habitat loss) that occur inside and outside LSRs.

III. Protect mid and early-successional vegetation from loss to large-scale disturbance events.

IV. Promote connectivity of late-successional habitat within LSRs.

As described in the LSRA and NWFP, where levels of risk in LSRs are particularly high (East of the Cascades and in the Oregon and California Klamath Provinces), they may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those LSRs even if a portion of the activities must take place in current late-successional habitat. While risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if the proposed management activities: 1) will clearly result in greater assurance of long-term maintenance of habitat, 2) are clearly needed to reduce risks, and 3) will not prevent the LSR from playing an effective role in the objectives for which it was established (USDA-FS and USDI-BLM 1994; USDA-FS 1999 p. 174).

Other Forest Plan Land Allocations, Forest Plan Direction and Guidance

Approximately 445 acres of the project area are classified as matrix with a commercial wood products emphasis. These lands are situated along the eastern edge of the project area and include a portion of the meadow at Elk Flat (units 177, 317, 318, 401 and a portion of unit 402). These lands are managed to obtain an optimum timber yield of wood fiber within the context of ecosystem management. Investments will be made in road construction, fuels management, reforestation, vegetation management and timber stand improvement and timber stands are managed.
to obtain optimum growth and yields using cultural practices (USDA-FS 1995 p. 4-67). The majority of matrix lands are considered non-suitable, or dispersal habitat for NSO based on species composition of primarily pine (>90 percent) or open meadow conditions. Suitable habitat for the NSO is defined as nesting, roosting and foraging habitat.

Riparian Reserves associated with Ash and Swamp Creeks, and their tributaries, comprise approximately 240 acres in the project area. Ash Creek bisects the Elk Flat LSR, flowing intermittently from late spring through early fall, depending on Water Year\(^6\) conditions. The ephemeral channel of Swamp Creek cuts across the eastern section of the project area in and along the meadow. Riparian Reserves are managed to maintain or enhance riparian areas, wildlife and fisheries habitat, and water quality by emphasizing streamside and wetland management and their Standards and Guidelines supersede underlying land allocations. The riparian management prescription also emphasizes retention or enhancement of old-growth vegetation, and the retention or enhancement of habitat for listed and sensitive wildlife species, as these corridors provide connective habitat for migration, dispersal and foraging for several wildlife species (USDA-FS 1995 p. 4-59). All management activities in Riparian Reserves must meet, or not prevent attainment of, the Aquatic Conservation Strategy Objectives (USDA-FS and USDI-BLM 1994 pp. B-9 to B-17; USDA-FS 1995 p. 4-53). Forest Plan Standards and Guidelines for timber management in Riparian Reserves allow for salvage and silvicultural practices when needed to control catastrophic events, control stocking, reestablish and manage stands, or acquire desired vegetation characteristics to attain ACS Objectives (USDA-FS 1995 p. 4-54). Watershed Analyses (WA) for the project area include the Mount Shasta WA (USDA-FS 2012) and Edson WA (USDA-FS 2011). In the project area, information in the Edson WA replaces information from the McCloud Flats Ecosystem Analysis (USDA-FS 1998, 2004).\(^7\) More critically, the initial LSR assessment in the 1998 McCloud Flats Ecosystem Analysis is superseded by the 1999 Forest wide LSRA and it is not valid in terms of describing existing conditions or treatment recommendations for the Elk Flat LSR. As described in the EIS and hydrology report, management activities proposed in Riparian Reserves are consistent with the recommendations in the 2012 and 2011 Watershed Analyses for the project area (USDA-FS 2016; George 2015).

The Project also incorporates supplemental management direction from the Forest Plan for the McCloud Flats and Mount Shasta Management Areas. This includes managing the non-timbered portion of Elk Flat primarily for earlier seral stage vegetation (USDA-FS 1995 p. 4-81) and managing existing hardwoods as a stand component to maintain or improve stand health and wildlife habitat (pp. 4-82, 4-86).

---

\(^6\) A Water Year is the time period of 12 months for which precipitation totals are measured between October 1 of one year and September 30 of the following year to account for spring/summer runoff of the winter’s snowpack (USGS).

\(^7\) The 2012 Edson WA covers a portion of the entire area addressed in the McCloud Flats Ecosystem Analysis, including all portions of the project area. Therefore, the 2012 Edson WA replaces the McCloud Flats Ecosystem Analysis in the project area. Portions of the Ecosystem Analysis are referenced in the Edson WA (specific information on grazing, etc.), but the Edson WA does not incorporate the entire Ecosystem Analysis by reference.
Table 1. Forest Plan land allocations and management areas within the Elk LSR Enhancement project area

<table>
<thead>
<tr>
<th>Forest Plan Land Allocation</th>
<th>Project Area 3,519 acres</th>
<th>Forest Plan Management Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSR</td>
<td>3,074 Acres 87%</td>
<td>McCloud Flats (MA2) (2,208 acres; 63%)</td>
</tr>
<tr>
<td>Matrix</td>
<td>445 Acres 13%</td>
<td>Mount Shasta (MA3) (1,310 acres; 37%)</td>
</tr>
<tr>
<td>Riparian Reserves</td>
<td>204 Acres 6%</td>
<td></td>
</tr>
<tr>
<td>Overlaps LSR allocation</td>
<td>36 Acres 1%</td>
<td></td>
</tr>
<tr>
<td>Riparian Reserves</td>
<td>36 Acres 8%</td>
<td></td>
</tr>
<tr>
<td>Overlaps matrix allocation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,519 Acres</td>
<td>2,208 Acres</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,310 Acres</td>
</tr>
</tbody>
</table>

**National Fire Plan**

Under the National Fire Plan (USDA and USDI 2000) Federal agencies, working with their State, Tribal, and local partners, must accurately assess the level of wildfire risk and types and extent of treatments required to mitigate this risk. One approach is to conduct fuels reduction in and around the Wildland Urban Interface (WUI) to reduce the risk of stand-replacing wildfire to people, communities and natural resources while restoring forest ecosystems to more closely match their historical characteristics. The National Fire Plan prioritizes fuel treatments near Communities at Risk (CAR) that are listed in the Federal Register as urban interface communities within the vicinity of Federal lands that are at high risk from wildfire (USDA and USDI 2001). The nearest listed CAR is the town of McCloud; nine miles southwest of the project area. While the project area is not in the designated McCloud CAR, it is bounded on the east and west by private lands and is approximately 1.25 miles east of the Mt. Shasta Forest subdivision. This distance, combined with the Forest’s additional designations of WUI, results in 1,135 acres of Forest-designated WUI in the project area (see below).

**Shasta-Trinity National Forest Fire Management Plan**

The Forest is operating under the “Guidance for Implementation of Federal Wildland Fire Management Policy” (USDA-FS 2009), which defines WUI as “the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetation fuels”. Generally, the Forest-designated WUI is comprised of concentric rings around structures, or groups of structures, up to 1.5 miles. In the project area, the 1,135 acres of Forest-designated WUI is associated with private lands and infrastructure south of the project boundary (see EIS-Figure Appendix D-8). While not considered direction, the Forest’s April 2014 Fire Management Plan (USDA-FS 2014) outlines fuels treatment goals for four WUI Zones. The 1,135 acres is within Zone 4-the Threat Zone (USDA-FS 2014 p. 35). This is the area beyond the ¼-mile defense zone (which surrounds structures) out to an approximate distance of 1.5 miles. The goal within Zone 4 is to achieve an environment where crown fires that are headed toward a community become surface fires before encountering the defense zone. The wildfire behavior goal in Zone 4 is to develop a fuels profile that will have moderate wildfire intensities determined by flame lengths (a measure of fire intensity) of four to eight feet or less on a 90th percentile (mid to late summer or
hotter) fire weather day over most of the land base. The mechanical thinning and fuels treatments, combined with follow-up prescribed fire, are intended to create stand and fuel loading conditions that would allow a natural ignition to be managed for multiple objectives. While a fire directly adjacent private property near the project area may be suppressed, a natural ignition within the interior of the project area would be a prime candidate for managed fire under the right conditions.

Recovery Plans

Recovery plans often identify tasks that will benefit listed species which may be carried out on or near a project site. While listed species’ recovery plans are not considered regulatory documents (USDI-FWS 2015, 2011 pp. I-3 to I-4) and are not required to be addressed as a part of Section 7 consultation under the ESA, the Forest Plan states that “T[threatened] &E[ndangered] species will continue to be managed under existing recovery goals identified in individual species recovery plans” (USDA-FS 1995 p. 3-28) and the Standards and Guidelines require the Forest to “[M]aintain and/or enhance habitat for TE&S[ensitive] species consistent with individual species recovery plans” (p. 4-30). The only recovery plan currently published and in effect for a listed species in the project area is the Revised Recovery Plan for the Northern Spotted Owl (see below). To provide decision makers with relevant information, and to address general requirements listed under Section 7(a)(1) of the ESA, the Forest has prepared a separate consistency analysis for the Project to discuss how it is meeting this Forest Plan standard and guideline (available in the project record).

Revised Recovery Plan for the Northern Spotted Owl

In June 2011, the FWS released the Revised Recovery Plan (Recovery Plan) for the Northern Spotted Owl (USDI-FWS 2011). It replaced the 1992 Draft Recovery Plan which had been used as a foundation, in part, for the NWFP. The Recovery Plan is an important reference for the biology and management of the NSO, providing the best overall guidance currently available in regards to the survival and recovery of the subspecies. It identifies the primary range-wide threats to the NSO as competition with barred owls; ongoing loss of spotted owl habitat as a result of timber harvest, habitat loss or degradation from stand-replacing wildfire and other disturbances; and the loss and reduced distribution of spotted owl habitat due to past activities (p. vii). It describes a Recovery Strategy which includes habitat conservation and active forest management as necessary steps to address these threats, including: conserving more occupied habitat and unoccupied high-value habitat; and encouraging and initiating active management actions that restore, enhance and promote development of high value habitat, consistent with broader ecological restoration goals (pp. III-4 to III-5).

Specific to the dynamic, disturbance-prone, drier forests of the California Cascades physiographic province where the Project is located, the Recovery Plan recommends active management “in a way that reconciles overlapping goals of spotted owl conservation, responding to climate change and restoring dry forest ecological structure, composition and processes, including wildfire and other disturbances” (pp. III-20 to III-21). The California Cascades also scores high in terms of threats from ongoing habitat loss as a result of wildfire, and effects of fire exclusion on vegetation change (p. I-8). The Recovery Plan describes management in dry forest ecosystems, including seven recommended principles for dry forest restoration (pp. III-20 to III-40).

The Recovery Plan also describes that short-term impacts to provide for long-term benefits may occur, and that “land managers should not be so conservative that, to avoid risk, they forego actions necessary to conserve forest
ecosystems necessary to the long-term conservation of the spotted owl. But they should also not be so aggressive that they subject spotted owls and their habitat to treatments where long-term benefits do not clearly outweigh short-term risks. Finding the appropriate balance to this dichotomy will remain an ongoing challenge for all who are engaged in spotted owl conservation and all Federal actions will be subject to section 7 consultation allowing for site-specific analyses of the effect on spotted owls” (pp. II-11 to II-12).

This BA fully describes the Section 7 consultation process (see Appendix C), how recommendations for management of dry forests and active management were utilized to develop silvicultural treatments and minimization measures, and how the project's short term impacts balance with the long term benefits. The specific Recovery Actions related to vegetation management on National Forest System lands include Recovery Actions 10 and 32. In summary:

- Recovery Action 10 states “Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.” The intent of RA10 is to protect, enhance and develop habitat in the quantity and distribution necessary to provide for the long-term recovery of NSO. Where forest stands can be enhanced or developed through vegetation management activities, they should generally be encouraged, particularly where long-term goals outweigh short-term impacts. As a general rule, forest management activities that are likely to diminish an NSO’s home range capability to support NSO occupancy, survival and reproduction in the long-term should be discouraged. The FWS recognizes, however, that active forest management may be necessary to maintain or improve ecological conditions. It supports projects that intend to provide long-term benefits to forest resiliency and restore natural forest dynamic process, notably when implemented in a landscape context with carefully applied prescriptions that promote long-term forest health. The FWS also recognizes these projects may have both short- or long-term effects to NSOs and suggests treatments be designed to minimize impacts as much as possible while keeping with a project’s intent (USDI-FWS p. III-46). The Recovery Plan does provide prioritization guidance for treatments in current and historic NSO home ranges (USDI-FWS pp. III-44 to III-47), and the Forest consulted with the FWS on more specific prioritization for this Project (refer to the Effects in NSO Cores and Home Ranges analysis section of this document).

- Recovery Action 32 states “Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service...to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.” The intent of RA32 is to provide additional support for NSOs while reducing key threats, particularly negative competitive interactions with barred owls that likely occur where the two species’ home ranges overlap. Forest stands or habitat patches that meet the described conditions of RA32 are a subset of nesting, roosting, foraging habitat and actual stand conditions will vary across the NSOs range. The FWS recognizes these stands or patches may be relatively small (but important in a local area), may not be easily discernable using remote sensing techniques and likely require project-level analysis and field verification. Field reviews, described in Appendix C, were completed to identify and delineate RA32 areas. Habitat that meets the intent of RA32 is not proposed for mechanical treatment, but would be burned with low-intensity prescribed fire. While the
greater proportion of RA32 stands and patches are not considered “high quality” NRF habitat, they are the best of what is available in the project area. These stands and patches either encompass entire “treatment” units, a portion of a unit (ranging from 10 to 20 acres in size), or are incorporated into the unthinned patches required by the Forest’s LSRA (USDA-FS 1999 pp. 185, 188).

The Project’s treatments and overall design were developed to protect, enhance and help ensure long-term sustainability of late-successional habitat in the Elk Flat Late-Successional Reserve, including NSO habitat, and contribute toward meeting goals and objectives of the Recovery Plan while meeting the need for action in the project area. Where applicable, treatments were specifically designed to be consistent with the intent of Recovery Actions 10 and 32 and the dry forest restoration principles, while following management direction from the Forest Plan, LSRA and best available science on thinning and fuels treatments. The Project also incorporates recommendations from Recovery Action 11 (monitoring is proposed vs. experiments) and indirectly addresses several other Recovery Actions. A detailed description of Forest Plan consistency with Recovery Actions 10 and 32, and other Recovery Actions, is included in the project record.

**Recovery Plans for Other Species**

At this time, there is no federal draft or final recovery plan for the gray wolf (*Canis lupus*) in California and the Mountain Prairie Region of the FWS (Region 6) is the lead region for this species. The FWS has implemented three recovery programs for gray wolf in the following regions: Western Great Lakes (Minnesota, Michigan and Wisconsin, administered by the Great Lakes, Big Rivers Region), Northern Rocky Mountains (Idaho, Montana and Wyoming, administered by the Mountain-Prairie and Pacific Region) and Southwest (Arizona, New Mexico, Texas, Oklahoma and Mexico, administered by the Southwest Region). Recovery plans were established in these three regions to prioritize recovery criteria and actions appropriate to unique local circumstances. These recovery plans do not apply to the remaining population of gray wolves listed as endangered in the United States, including California.

There is no recovery plan for the proposed listed West Coast DPS for fisher at this time.

**State Plan for Gray Wolf**

The California Department of Fish and Wildlife (CDFW) is responsible for wildlife management in the state and has drafted a Conservation Plan for Gray Wolves (CDFW 2015).

**III. Consultation to Date**

The focus of this consultation is the threatened northern spotted owl (NSO) and designated critical habitat, and the endangered gray wolf. The detailed consultation record is included in Appendix C. The life history of both species dictates the habitat characteristics and spatial scales considered in the consultation and this analysis. Appendix D summarizes the life history requirements, the existing environment and habitat evaluation, and the species status for the project. Streamlined consultation offers action agencies like the Forest Service an opportunity to address their conservation responsibilities under section 7(a)(1) of the ESA, similar to the early consultation process described at 50 CFR 402.11. Region 5 of the Forest Service has a Memorandum of Understanding with the Pacific Southwest Region of the FWS (USDA-FS and USDI-FWS 2013) that outlines procedures for streamlining consultation. This
includes early involvement by FWS biologists on Forest Service Interdisciplinary Teams (IDTs), FWS participation in IDT meetings and field reviews, FWS providing feedback to the IDT on prescriptions and minimization measures that reduce or avoid adverse effects to species and their habitat, and discussions about preliminary effects determinations.

The Forest, through a TEAMS enterprise unit,8 initiated consultation for the Project on August 25, 2009 with the Red Bluff FWS field office. In October 2011, the responsibility for Section 7 consultation on the Forest transitioned from Red Bluff to the Yreka FWS field office. The information in Appendix C is based on IDT meeting notes and field reviews, email correspondence, phone conversations, Level 1 meetings, and discussions between FS and FWS biologists between August 2009 and March 2016.

The FS and FWS Yreka field office Level 1 biologists have participated in streamlined consultation for the project since 2012. The assigned FS and FWS project biologists cooperatively developed minimization measures and project design features for the NSO, its critical habitat and the gray wolf. The project was introduced to the Level 1 team on December 1, 2011 with a presentation of the Draft project initiation form. The majority of the field work and habitat reviews occurred during summer and fall 2012, and at various times in 2013 and 2014. A final project initiation form was presented to the Level 1 team on March 21, 2013. Public meetings that FWS staff attended include a stewardship field review on July 26, 2012, and a public scoping meeting on March 26, 2013. Yreka Field Office Biologists Dave Topolewski and Katherine Fitzgerald had primary involvement with the project including the public meetings, IDT meetings, and coordinated field trips with the FS biologist(s), project planners and IDT members. Robert Carey, Laura Finley, Jan Johnson, Nadine Kanim and Chad Anderson have been involved to discuss fisher analysis (2014), annual survey strategy (2011-2016), the Shasta Pack (2015-2016), and to conclude consultation.

The CNDDB was last accessed in October 2015 to verify NSO activity centers and survey history, and was rechecked in March 2016 (CNDDB 2016, 2015). Private landowners were contacted in November 2015 regarding the year’s NSO survey results. Refer to Appendix C for the detailed consultation process.

IV. Purpose and Need, Existing Condition Summary, Bounding, Methodology, Preferred Alternative and Project Design Features

Location

The Project is located on the McCloud Ranger District of the Shasta-McCloud Management Unit, Shasta-Trinity National Forest. The project area is approximately nine miles northeast of McCloud and is wholly within Siskiyou County California. The legal location is: T40N R1W Sections 4 and 5; T41N R1W Sections 27-34, Mt. Diablo Meridian. The project area is approximately 3,519 acres on National Forest System (NFS) lands.9 Private lands

---

8 Enterprise Units are Forest Service resources that offer an internal choice for the accomplishment of the agency’s work. The teams operate as independent, financially self-sustaining units funded by Forest Service clients. See http://www.fs.fed.us/enterprise/ for more information.

9 All acreage and distance figures in this document are approximate values, based on field review and mapping, but are geographic information system-generated and not necessarily mapped by global positioning unit. Acreages or distances may
owned by Sierra Pacific Industries and Olympic Resource Management (previously Hancock)\textsuperscript{10} are directly west and north of the project area. The elevation in the project area ranges from 4,000 to 4,500 feet. Table 1 lists Forest Plan land management allocations.

### Purpose and Need

The purposes of the Project are derived from project area management direction. This includes the NWFP, Forest Plan and the LSRA management objectives, priorities and criteria for desired conditions. The primary purpose is to reduce the current and future risk of large-scale disturbance events within early, mid and late-successional habitat within the Elk Flat LSR and nearby stands. This is consistent with Objectives I and III from the LSRA, which guides development and application of treatments within the Forest’s LSRs (USDA-FS 1999 pp. 1, 174-179). Risk reduction also meets the need of increasing stand and habitat resilience to disturbances such as drought conditions, insect attacks and fire and would promote continued development and connectivity of late-successional forest habitat in the LSR. This meets LSRA Objectives II and IV (pp. 175, 178-179 and 180-181). The LSRA describes the Elk Flat LSR as a treatment priority due to a high proportion of early successional forest habitat (p. 178).

Table 2. General Purpose and Need Statements for the Elk LSR Enhancement Project

<table>
<thead>
<tr>
<th>Purpose and Need Statement</th>
<th>Management Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Reduce current and future risk of large-scale disturbance events and loss of Early-, Mid- and Late-Successional Habitat</td>
<td>LSRA Objectives I and III (LSRA pp. 174-179)\textsuperscript{11}</td>
</tr>
<tr>
<td>- Increase Stand Resilience to Disturbances from Insects, Disease and Fire</td>
<td></td>
</tr>
<tr>
<td>- Accelerate Development of Late-Successional and Old-Growth Forest Characteristics</td>
<td>LSRA Objectives II and IV</td>
</tr>
<tr>
<td>- Promote Late-Successional Habitat Connectivity</td>
<td></td>
</tr>
<tr>
<td>- Restore meadow habitat in Elk Flat</td>
<td>Forest Plan pp. 4-14, 4-81 LSRA p. 205</td>
</tr>
<tr>
<td>- Retain hardwoods as a stand component at density levels commensurate with development of late-successional stands</td>
<td>Forest Plan pp. 3-25, 4-42, 4-44, 4-82 LSRA p. 162</td>
</tr>
<tr>
<td>- Increase Streamflow, Raise Water Table Elevation and Improve Water Quality and Vegetation Conditions within Riparian Reserves Associated with Elk Flat, Ash and Swamp Creeks and Their Tributaries</td>
<td>ACS Objectives Forest Plan p. 4-53</td>
</tr>
<tr>
<td>- National Forest Transportation System (FTS) Management and Decommissioning of Unauthorized Routes</td>
<td>Forest Plan pp. 4-4, 4-16 to 4-17</td>
</tr>
</tbody>
</table>

The need for action was determined by comparing existing conditions with desired conditions relative to the identified purposes.\textsuperscript{12} Based on direct observations of initial mortality, the project area was prioritized for analysis change slightly as field layout is completed and analysis acreages in this document may differ than those in other resource reports or the NEPA document. These differences do not invalidate the analysis.

\textsuperscript{10} Lands are managed by Black Fox Timber Management Group, Inc.

\textsuperscript{11} In this context, the LSRA refers to young stands and plantations (up to 12.9" DBH) as early successional (USDA-FS 1999 Appendix E) and reducing the risk of setting the development and persistence of these young stands back through large-scale disturbance. This LSRA objective does not include areas that are not capable of developing into late-successional habitat, or those that are most valuable as early-seral habitat, such as meadow.

\textsuperscript{12} The Forest Plan describes the desired condition, which is embodied in the forest goals and objectives, further clarified by the standards and guidelines, and is described for each Management Area (Forest Plan p. 4-6). The LSRA provides desired condition descriptions (starting on p. 162) and conditions existing at the time of publication in 1999 (Chapter 2). The Recovery Plan provides a recovery strategy and recommendations for conserving and prioritizing NSO habitat. Additionally, compliance with regulatory frameworks, consistency with policy, and consideration of best available science (per 40 CFR 1607.3) help guide identification of the desired condition.
and treatment. Common stand exams (CSE) were completed in 2007 (USDA-FS 2007), fuel loading was re-assessed in 2011, and the SMMU IDT conducted additional field reviews in 2012-2015. These reviews assessed the tree stocking and species composition of natural stands, plantations and meadow conditions, and the Ash and Swamp Creek stream channel morphology (tree age, stand density, snags, down wood, ongoing mortality and fuel loading, presence of insects and disease and stream channel conditions/function). Refer to the Methodology section of this document and Appendix C for a full discussion of wildlife habitat reviews. Existing conditions, causal mechanisms and needs for action relative to the Forest Plan desired conditions were also identified in Step 5 of the Edson Watershed Analysis and Chapter 5 of the Mount Shasta Watershed Analysis. These analyses include several recommendations that have been incorporated into the Project’s design.

EIS Chapter 1 fully describes the Purpose and Need and how each proposed action relates to Forest Plan and LSRA direction and recommendations from the two Watershed Analyses (USDA-FS 2016).

**Existing Condition Summary**

The Elk Flat LSR’s origins are as a habitat conservation area under the Interagency Scientific Committee’s northern spotted owl management strategy (USDA-FS 1999 p. 124). When it was established, it was occupied by one pair of northern spotted owls (ST-215 activity center). This activity center has not been occupied by a reproducing or territorial pair since 1990 or a verified resident single owl\(^\text{13}\) since 2003 (see the Surveys section in Appendix D for a detailed survey account). The LSR was also identified as an area of important late-successional habitat during the mapping efforts undertaken for the NWFP (Johnson et al. 1991). When it was assessed for the 1999 Forest-wide LSR Assessment, late-successional habitat comprised approximately 46% of the capable area that could support it, with 30% and 24% in a mid- and early-successional condition (USDA-FS 1999 pp. 125-126).

The LSR is bounded on the north and west by lands managed for industrial timber production, and by matrix lands to the south and east dominated by ponderosa pine and open flats. Harvest practices on private lands, and in portions of the LSR, have significantly reduced the amount and recruitment of important key habitat features used by NSO, and other late-successional species, including large diameter snags and down wood. Even-aged management, sanitation, and selection harvest has been moderately extensive on private lands, resulting in a landscape dominated by early and mid-seral stands with significantly fewer structural features typically associated with NSO use. Connectivity to the west, north and east is primarily provided through dispersal habitat, with small pockets of foraging and nesting/roosting, which likely provides for adequate dispersal movements to the Fons Managed Late-Successional Area (MLSA) and Mt. Shasta LSR that is ~3 to 5 miles north/northwest and to the Algoma LSR that is ~ 5 miles east/southeast of the project area.

Average elevation in the project area is 4,150 feet, and as lands transition from essentially flat to gentle predominantly east facing slopes, elevation increases to 4,400 feet. While the California Wildlife Habitat Relationships system or CWHR\(^\text{14}\) classifies the majority of the project area as ponderosa pine type, field review and ground-truthing shows there is a variety of species classes, primarily due to lack of fire to reduce white fir and cedar regeneration. Ponderosa pine-dominated natural stands are primarily in the eastern and southeastern extent of the project area. In these natural stands, the overall stand is at risk, if not currently gone, due to overstocking, root

\(^{13}\) As defined in the 2012 survey protocol, Section 16.13.1 (USDI-FWS 2012a p. 25)

\(^{14}\) Used for vegetation descriptions in the silviculture analysis and vegetation diversity report, as it crosswalks to the Forest Plan seral stage classifications
disease, bark beetles or a combination of these influences and stressors. Pine is also a stand component in the remaining lower elevation portions of the project area in mixed-conifer pine and white fir-pine stands. Where elevation increases, natural stands are more dominated by white fir, incense cedar, ponderosa and sugar pine, with higher occurrences of Douglas fir and black oak.

Approximately 80 percent of the forested stands in the LSR are highly to extremely dense, particularly in relation to the survivability of pine. Full site occupancy generally occurs beginning at 60 percent of maximum stand density index, or SDI. This is when density-induced mortality (self-thinning) begins to occur as individual tree growth slows and the risk of mortality increases as competition for resources increases (Woodall 2005, 2003). An exception to this 60 percent standard is ponderosa pine. Research repeatedly observes widespread mortality in ponderosa pine stands resulting from pine beetle outbreaks at densities below what had been considered 60 percent of maximum SDI (Oliver 1995; Oliver and Uzoh 1997). Based on the relationship with bark beetles, as ponderosa pine stands reach and exceed an SDI of 230 (or 60 percent of the SDI of 365), pine mortality from beetle outbreaks increases.

The project’s older pine plantations (40+ years) are near or above an SDI of 365. In natural stands, the 2007 CSEs measured densities above an SDI of 230, with many exceeding 365. While mixed conifer stands also benefit from being managed at an SDI level of 250, the objective would be to keep SDI values between 230 and 250 for a minimum of 20 to 30 years (Oliver and Uzoh 1997 pp. 62-63; Long and Shaw 2005). The lower desired SDI of 230 is based on requirements of ponderosa pine, as it requires the most growing space in mixed conifer stands. An average SDI less than 250 over the next 20 to 30 years would meet stand development and health objectives for ponderosa pine and mixed conifer/pine stands by reducing stocking enough to allow a tree’s natural defenses to properly function and enhance tree growth (Cochran 1998; Fettig et al. 2007; Fiddler et al. 1989; Kolb et al. 1998; Long and Shaw 2005).

Since 1993, mortality in the LSR has been monitored annually through observation flights. Endemic levels of mortality were observed during 1993, 1995 and 1997. Light mortality was observed on ~40 acres in 1994 and moderate levels were observed on ~100 acres in 1996; confined to ponderosa pine in both years (USDA-FS 1999 p. 125). Forest health specialists have also assessed the LSR for black stain and *Heterobasidion* root disease, finding it in numerous natural stands and plantations (Snyder 2012).

Based on aerial photo interpretation of stand mortality from 2009 through 2014 and field review, approximately 10 percent of the LSR is comprised of several mortality pockets and stands of standing dead trees (snags) and down logs (Payne 2015, McRae 2011). These conditions are most prevalent and extensive in the eastern and southeastern portions of the project area in the 60-100 year old ponderosa-pine dominated natural stands where snags range from 20-30” diameter. Across the remainder of the project area’s natural stands, and in plantations of all ages, there are smaller mortality patches. These range from groups of 5 to 10 trees up to one acre and are also primarily in the ponderosa pine component, with additional *Heterobasidion* root disease-related mortality occurring in white fir stands. These conditions present a current and future threat to surrounding habitat from increased fuel loading, potential for spotting during a wildfire, and a potential for surface fires to be intense and easily carry to the under,

---

15 The measurement of stand density index, or SDI, is used to describe existing stand density in relation to an empirically determined biological maximum and indicate the degree of competition for resources (Reineke 1933)
16 Mortality areas range from small pockets of 5-10 trees up to one acre; 5-10 acres, and 80-100+ acres
mid and overstory tree crowns. Where dying trees and snags are concentrated along open NFS roads, they can be a
safety hazard to the public.

Current conditions in mixed-conifer stands that represent lower quality NSO foraging habitat also reflect an
increase in a shade-tolerant understory and midstory, composed primarily of dense white fir, incense cedar and pine
with average diameters of 12-16 inches and smaller pockets of pine regeneration. As competition for resources
(water, nutrients, and sunlight) increases, tree growth and vigor declines and the risk of stand loss from insect
outbreaks or high severity fire increases (Agee and Skinner 2005; Cochran 1998; Fettig et al. 2007; Kolb et al.
1998). Without low-intensity fire or other disturbances in these stands, tree growth has slowed and trees are
approaching or have reached the maximum carrying capacity for SDI, described above (Payne 2015). Based on the
2007 CSEs and field reviews, snags in these stands, and the more moderate quality NSO habitat areas, average
three/acre in the larger than 20” diameter size class. Some stands have 6-8+ snags/acre in this size class and larger
(units 150, 153, 154, 156, portions of 165 and 168-2).

Measured tree ages in natural stands range from 55-95 years, though are more broadly categorized as 60-120 years
given the stand history (USDA-FS Various Years, FACTS data). There is a minor component of scattered remnant,
predominant trees (ranging from 42-80”+ inches DBH) in some natural stands and older plantations. These older
predominant Douglas and white fir, incense cedar, sugar and ponderosa pine trees are remnants from the period of
railroad logging on the McCloud Flats (Payne 2015). It is important to note that the ongoing density-related
mortality is not limited to the under and midstory trees; the large predominant, and dominant, ponderosa and some
sugar pine trees have also died or are dying. This loss of current late-successional habitat and structure is reflected
in the existing conditions of the mortality pockets described above (Payne 2015).

Plantations range in age from just over 10 years to 40+ years, and account for 25 percent of the project area. The
majority of the 20-40+ year-old plantations are ponderosa pine-dominated. Younger plantations contain a broader
species composition of white fir, small amounts of Douglas fir, incense cedar and pine. Most of the plantations and
natural stands proposed for treatment are uniformly dense in the mid and understory (pine, white fir and cedar
regeneration) or lack horizontal and vertical diversity (pole to medium, 5-21” DBH, trees with stagnated growth and
no under or midstory). The 20-40+ year old plantations contain densely spaced trees with interlocking crowns that
impede the growth potential of the trees, and also present a risk to surrounding stands with higher value late-
successional habitat due to overstocking, potential for root disease and bark beetle infestation, and fuel loading.

The 240 acres of Riparian Reserves of Ash and Swamp Creek are mostly devoid of riparian vegetation. Some small
canopy gaps have allowed for establishment of willow and other minor riparian species (George 2015; field
review). The meadow at Elk Flat accounts for 15 percent of the project area. It is dominated by perennial grasses,
shrubs and forbs and contains individual trees and small stands of predominant ponderosa pine, and other conifer,
along with encroaching conifer stringers of small pine regeneration and pole to medium-sized trees.

Surface fuel loading in portions of the project area ranges from 5-60 tons/acre in the 10”+ diameter size classes. In
larger mortality patches where snags have already fallen, levels are closer to 100 tons per acre and logs range from
20-36”+ diameter. Surface fuels are expected to increase to 35-100 plus tons per acre when snags and dying trees
fall over the next 5-10 years. These areas would be characterized as a Fuel Model 13 which is when a fire is
generally carried by a continuous layer of slash. Fires spread quickly through the fine fuels and intensity builds as
the large fuels start burning. Active flaming is sustained for long periods and a wide variety of firebrands can be generated (NWCG 2006).

Three fuel models account for approximately 85 percent of the land base in the LSR; FM-10, FM-2 and FM-9 (USDA-FS 1999). Fuel model 10 is characterized by dense late-successional conifer stands with heavy amounts of dead and down wood. The understory is densely populated with intermediate size conifers. A wildfire in these conditions would be intense enough to cause crowning, spotting and rapid rates of spread and large, stand-replacing fires can be expected. Fuel model 2 is characterized by poorer, sparsely timbered stands and younger plantations with grass and brush. Surface fires can spread easily with fuel pockets generating high heat intensities. Fuel model 9 is characterized by a closed canopy conifer stand with densely stocked pole size trees in the understory. Typically, these stands contain pockets of smaller dead and down wood. FM-9 fuels create high fire intensities during surface fires that can easily spread through the understory to the crowns of dominant conifers.

The entire LSR is departed from the natural fire regime and return interval as the majority (91%) historically experienced high frequency (0-35 years), low- to mixed-severity fire. There are no recorded large scale fires for the past 100 years and under existing surface fuel loading and ladder fuels, fire would not be able to effectively play its natural role of a short interval, low to moderate intensity regime (McRae 2015). The preponderance of small- and medium-sized trees (primarily white fir, incense cedar and ponderosa pine regeneration), that accounts for ~80 percent of the project area adds to surface fuel loading and reflects the lack of stand differentiation that occurs under dense, stagnant growing conditions.

Based on preliminary fuel modeling of a wildfire during 97th percentile weather conditions, up to 40% mortality in the natural stands is predicted from passive crown fire and flame lengths of 4-6 feet.17 The high heat and potential for torching and spotting in the event a natural or human-caused fire start occurs in, or spreads to, the heavy mortality areas presents a risk to current and developing late-successional habitat. While the Forest recognizes natural disturbance is an important process in late-successional forest ecosystems, human and natural processes have altered the disturbance regime in the LSR such that without action, further stand and structural composition loss is expected to occur from the combination of continued overstocking and density-related mortality, root disease, insect attacks and predicted lethal fire effects. With the amount of surface fuels and passive crown fire that is predicted under no action, indirect suppression strategies would likely be utilized in the event a fire occurs. These conditions can lead to larger wildfire size, intensity and severity and large-scale loss of forested habitat (Scott and Reinhardt 2001; Graham et al. 2004).

LSRs were established as part of the conservation strategy for species associated with late-successional and old-growth forest ecosystems under the NFWP that, in combination with the other land allocations and standards and guidelines, are to maintain a functional, interactive, late-successional and old-growth forest ecosystem. The standards and guidelines are meant to maintain and protect late-successional forest ecosystems from loss from large-scale fire, insect and disease epidemics and major human impacts while maintaining natural ecosystem processes such as gap dynamics, natural regeneration, pathogenic fungal and insect activity and low-intensity fire (USDA-FS and USDI-BLM 1994 p. B-1). Prolonging the existing conditions described above through no action

17 Per discussion with the silviculturist and fuels specialist regarding modeling results, this 40% level represents an estimate of full mortality; it does not mean that 40% of an affected stand would be lost under a fire in the 97th percentile weather conditions with 60% remaining, but that 40% of the natural stands in the project area would be completely lost (McRae, Payne 2014, 2015).
does not meet this direction. For additional details on the existing and desired conditions, refer to the silviculture report (Payne 2015, 2016), fire and fuels report (McRae 2015, 2016) and the EIS.

**Timing of the Project**

Implementation is expected to start in 2016. Mechanical thinning and fuels treatments, meadow restoration, site preparation/ reforestation activities, road actions, riparian restoration treatments and the first entry of prescribed fire is estimated to be completed within 5-10 years. Mechanical fuels treatments are expected to occur within approximately one season to five years after thinning treatments, given that some machine piling/burning of piles could occur a few years after the last units are harvested. Three prescribed fire entries are proposed and are estimated to take up to 30 years to implement from the start of the project. Monitoring activities during and beyond this timeframe include monitoring prescribed fire effects; conducting NSO, goshawk and forest carnivore surveys; noxious weed monitoring; post-planting survival assessments; and monitoring aspen for browse and prescribed fire impacts. Refer to Table 6 for the survey and monitoring activities specific to the NSO and gray wolf.

**Bounding and Analysis Methodology**

Wildlife use and distribution across an area is primarily influenced by availability of suitable habitat and connectivity within and between habitat elements. Use is influenced by site-specific factors such as structure or physical features (e.g. tree/shrub species, size class; CWD and snags; cavities; water; caves; forage base) and landscape considerations such as proximity to other suitable habitat or the need for isolation or seclusion. A multi-scale analysis that assesses site-specific conditions in stands proposed for treatment, and on the larger landscape in terms of proximity to and availability of other suitable habitat, is considered.

**Spatial and Temporal Bounding**

The analysis of effects to listed species is typically bounded by reasonable and agreed upon spatial and temporal boundaries. The ESA defines the spatial boundary for analysis as the action area, which includes all areas likely to be affected directly or indirectly by the proposed Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area is generally larger than the project area, but only encompasses the geographic extent of environmental changes (i.e. the physical, chemical and biotic effects) that may result directly and indirectly from an action, and elicit a response in an individual (USDI-FWS 2015). Additionally, effects analyses may occur across multiple analysis units in an action area that are relevant to conservation concerns for listed species and that frequently overlap. For example, Critical Habitat Units/Subunits and areas in an LSR may partially overlap with an action area, but not be coincident, and may require separate evaluations resulting in multiple scales of ‘effect’. Similarly, a treatment unit or specific treatment activity may be in or near an LSR, NSO activity center or home range, potential territory, or critical habitat and may require separate evaluations of the treatment’s effects relative to each conservation unit. For purposes of the NSO and gray wolf analyses, the following spatial and temporal bounding is established.

**Spatial Bounding**

**Action Area:** For the northern spotted owl, the action area is defined by a 1.3-mile buffer on Alternative 1 silviculture and fuels treatments and road actions. This bounding is an appropriate scale as it is equivalent to the radius of the estimated median annual home range size for NSO in California, based on radio-telemetry data.
(Thomas et al. 1990; USDI-FWS 2011). It allows for an analysis of other adjacent or overlapping territories/home ranges and potential effects to connectivity, thereby framing the context and significance of potential impacts to those other areas. It is accepted by the FWS as the range for NSO effects analysis, and includes managed private timberlands that may influence habitat use in and outside the project area.

The NSO action area is approximately 15,960 acres and consists of NFS lands (8,303 acres; 52%) and private industrial timberlands (7,657 acres; 48%). See Map 3 in Appendix B. Timberlands in the NSO action area are currently managed by Sierra Pacific Industries and Olympic Resource Management (Navarre 2015). Elevation ranges from 3,000 to 5,200 feet. There is one activity center (AC) and associated core and home range in the NSO action area, designated ST-215.

For the gray wolf, the action area is defined by a 5-mile buffer on proposed activities. This bounding was selected as it encompasses the average territory size (Mech and Boitani 2003; Fuller et al. 2003; USDI-FWS 2013; Wiles et al. 2011; ODFW 2010), includes managed private timberlands that may influence wolf source habitat and use in and outside the project area, and represents a reasonable distance that wolves should be able to hear and potentially respond to a disturbance or other activity given the range of hearing from 6 miles in forested conditions to 10 miles in open conditions (Western Wildlife Outreach 2015). This area will be used to assess effects to the amount, distribution and quality of source habitat for this species. While this bounding may be considered too broad, given that the geographic extent of environmental changes (physical, chemical and biotic effects) which may result directly or indirectly from the project would likely only extend to the project area boundaries, the information on the Shasta Pack is new and this bounding is considered a conservative approach. While this bounding encompasses an area large enough for an average territory based on literature and research outside California (the average gray wolf territory size is not yet known for California, but it is likely to be primarily based on prey availability and security habitat), the low security habitat in the action area would not support any wolf territories in-and-of itself.

The gray wolf action area is approximately 135 square miles (88,759 acres). It consists of NFS lands (41,961 acres; 48%), private industrial timberlands and rural residential lands (44,798 acres; 52%).

<table>
<thead>
<tr>
<th>Action Area</th>
<th>Bounding</th>
<th>Total Acres</th>
<th>NFS Lands</th>
<th>Private Lands</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSO</td>
<td>1.3 miles</td>
<td>15,960</td>
<td>8,303 (52%)</td>
<td>7,657 (48%)</td>
</tr>
<tr>
<td>Gray wolf</td>
<td>5 miles</td>
<td>86,759</td>
<td>41,961 (48%)</td>
<td>44,798 (52%)</td>
</tr>
</tbody>
</table>

Timberlands in the gray wolf action area are currently managed by Sierra Pacific Industries, Olympic Resource Management, Rome Creek Timber, LLC, Lawrence Smith Trust, and TC&I Shasta, LLC (Navarre 2015). Private land ownership and management is relatively contiguous in the western, northern and eastern portions of the gray wolf action area, with checkerboard ownership in the far northern extent (see Map 2 in Appendix B). Elevation ranges from 3,000 to 8,300 feet.

\footnote{As one mile is the current accepted distance for limited operating periods to den or rendezvous sites, a slight distance beyond this may be considered a more appropriate bounding to account for project-related noise effects. Noise would be expected to taper to levels not expected to elicit any measurable response at a one mile or greater distance. While wolves may hear noise from a longer distance, it would likely be at a diminutive or background level. Given the new and limited information on the Shasta Pack however, the information on the Pack relative to the project area, and the average territory size, this larger action area is being utilized. Future bounding is subject to change as better information becomes available.}
**Project Area:** The 3,519-acre project area, described by legal locations of township, range, and sections, is entirely located on NFS lands and contains all proposed treatment units. The project area consists of 3,074 acres of LSR and 445 acres of matrix lands in commercial wood products emphasis. The project area is bounded on the east by the Cramer Springs road (41N12), the south by the Pilgrim Creek road (FA13) and the north and east by private land boundaries. See Table 1 for land allocations.

**Treatment Area:** The 3,483-acre subset of the project area that reflects the physical footprint where vegetation thinning, mechanical fuels treatments and prescribed fire would occur, and therefore, potential direct effects. See Maps 1 and 7 in Appendix B.

**NSO Core and Home Range:** The 500-acre core and 3,398-acre home range, inclusive of the core. NSOs occupy structurally complex forested habitats that provide nesting, roosting and foraging opportunities. They exhibit strong site fidelity (USDI-FWS 2012 pp. 71886 and 71912) and locations used by territorial NSOs (e.g. nest sites associated with reproductive/non-reproductive pairs, or highly used roost sites associated with pairs or territorial singles) are referred to as activity centers (USDI-FWS 2011 p. G-1, 2012a). As a general rule, reproductive NSOs require about 500 acres of fairly high quality habitat surrounding their nest site(s). This core area is often approximated by a 0.5-mile radius circle centered on a nest. The core represents an area of concentrated use that is used disproportionately by territorial NSOs, especially during the breeding season, where effects of proposed actions are presumed to have relatively stronger influences on NSOs compared with areas located further from the nest (USDI-FWS 2009, 2011 p. G-1). For the ST-215 core analysis, habitat conditions are evaluated within the 0.5-mile radius/500-acre circle centered on the last verified nest site in 1990, and single subadult female detection in 2003. This represents the best available information regarding verified NSO occupancy and habitat use, based on survey data (see Table 32 in Appendix D).

The NSO home range surrounds the activity center and includes the 500-acre core. Habitat in a home range provides foraging and alternate nest/roost sites that support NSO occupancy, survival and reproduction and sizes vary across the NSOs range based on prey availability and habitat conditions (USDI-FWS 2011 p. G-2). Typically, about 40 percent of a home range is composed of mature forest, or other fairly high quality NSO habitat as fully described in the life history requirements of the NSO Recovery Plan and Final Rule for NSO Critical Habitat (USDI-FWS 2011, 2012). Actual NSO home ranges likely conform to the distribution of higher-quality habitat, and while it is recognized that they are generally non-circular, this spatial analysis represents a reasonable approximation of the area within which territorial NSOs in the California Cascades province obtain resources. For this analysis, habitat conditions are evaluated within a 1.3-mile radius (~3,398-acre ‘circle’) of the last verified nest site in 1990, and single subadult female detection in 2003 (Thomas et al. 1990; USDI-FWS 2009).

**Critical Habitat Analysis Area:** The portion of the action area that overlaps critical habitat. There are 797 acres of critical habitat in the NSO action area, with 720 acres in the project area. The analysis focuses on predicted effects to primary constituent elements (PCEs) and principle biological features of critical habitat; those forest types in early, mid or late-seral stages that support the NSO across its geographical range, nesting/roosting, foraging, and dispersal (PCE1, 2, 3 and 4). The predicted changes to PCEs from proposed activities are assessed. There is no critical habitat in the gray wolf action area (USDI-FWS 1978).

**Elk Flat LSR:** The 3,074-acre portion of the project in LSR allocation. As they serve as a management mechanism under the NWFP to provide for a viable population of NSOs throughout their historic range, and the stand
conditions in the LSR are integral to the Purpose and Need, an analysis of the project relative to effects on NSO habitat quantity and distribution in the LSR was completed and is included in the project record. While not formally part of the regulatory process under the ESA, as participants in the NWFP the FWS has typically shown interest in LSR management and tracks effects in LSRs.

**Temporal Bounding**

Temporal bounding for the NSO analysis consists of both short and long term timeframes. Short term consists of when treatments occur and vegetation begins to respond, usually within one season to 10 years of implementation. Temporal bounding for disturbance (direct) effects is narrowed to the time during implementation when the possibility of disturbance would be greatest to NSO, if present. Long term effects extend for approximately 20 or more years after treatment and correspond to the modeled changes and effectiveness of thinning and fuel treatments. Direct effects are defined by the period that actions occur in/near treatment units, or potential reproductive areas and habitat, and are typically short term. Indirect effects occur over both short and long term timeframes.

Effects of past actions and influences are included in the environmental baseline and existing condition for NSO in the action area which is fully described in Appendix D of this document. Based on the project’s modeled and expected treatment effectiveness, and that past projects maintained a higher tree density allowing for canopy recovery in 15 to 20 years (Fleming 2012), it is reasonable to establish temporal bounding by a 20 to 30 year window of recovery. This timeframe is considered adequate to encompass several NSO breeding attempts, and potential disturbances to those attempts, as NSO do not attempt to breed every year and the number of years varies between each attempt (Forsman et al. 1984; USDA-FS 1989-2015 NSO survey records).

Temporal bounding for the gray wolf analysis consists of when activities will occur and potentially elicit avoidance behaviors to management activities by wolves or their ungulate prey. In terms of prey base effects, forage, fawning and cover vegetation typically begins to respond within one season after implementation. The timeframe for consideration of direct and indirect effects is 5-10 years from the onset of project activities that mechanically manipulate vegetation or have an effect on road density. This bounding is reasonable since after that time, there will be little noticeable residual effect of the project on wolves or their prey from increased human activity and noise in the project area, or habitat and road density modifications that can measurably influence use.

Temporal bounding for ESA cumulative effects of future State or private activities, not involving Federal activities, which are reasonably certain to occur in the NSO and gray wolf action areas is 30 years. This bounding includes the total expected time to fully implement the project, along with the three prescribed fire entries (with smoke generation being the primary potential effect during these entries). This bounding is appropriate as it includes the period when all project activities are expected to be completed and when any effects from foreseeable future State or private actions can be reasonably predicted and felt on the landscape in combination with the project’s effects.

**Methodology**

This BA was prepared using the best scientific and commercial data available at the time it was developed in order to determine the likely effects of the preferred alternative on the NSO, NSO critical habitat and the gray wolf. This includes the following information and data: Forest Service and private-land NSO surveys and NSO activity center
searches from 1989 through 2015; the most recent and appropriate\textsuperscript{19} scientific research and species information available for the NSO, including the Revised Recovery Plan (USDI-FWS 2011), Final Rule for NSO Critical Habitat (USDI-FWS 2012) and 2015 meta-analysis for NSO population monitoring (Dugger \textit{et al}. 2015); and information from the FWS, CDFW reports and data, state management plans and other literature reviews on gray wolf life history, habitat requirements and new information on the Shasta Pack (CDFW 2015; Kovacs 2015).

Refer to the Surveys section in Appendix D for a complete description of the survey efforts to date for both the NSO and forest carnivores, including information on the gray wolf. Map 5 in Appendix B displays the NSO call points for 2012-2014, and the Map 5a data set displays the camera locations on the McCloud Ranger District for 2014, 2015 and 2016 to date.

NSO survey records and activity center stand searches on the SMMU (USDA-FS 1989-2011) and more recent 2012-2015 protocol surveys and stand searches, in accordance with the January 2012 Revised Survey Protocol (USDI-FWS 2012), helped to inform the project design and analysis for the NSO. Field reviews and ground-truthing of NSO habitat type and quality in the project area were completed in August-September 2009 (Baxter and Paul 2009). This habitat layer was updated at the broad and fine scale for the NSO action area from fall 2011 through May 2013 during subsequent field reviews (see Map 4 in Appendix B for the final habitat map). Portions of private lands in the home range were field verified in connection with habitat typing data from these landowners. For the remainder of the NSO action area, the Forest’s existing vegetation layer from the Remote Sensing Lab (USDA-FS 2007), the draft NSO Habitat EVEG model for the SMMU, and aerial photo interpretation (2012 and 2014 National Aerial Imagery Photography or NAIP) were utilized.

Common stand exams (CSE; USDA-FS 2007) and FACTS data for plantations were used as a minor supplement to the NSO field reviews for habitat type and quality. Fuel loading data was assessed in 2007 using Browns Transects, and again in 2011 using ocular estimation and photo series methods (Maxwell \textit{et al}. 1979). Predicted future stand attributes were modeled from the CSE and fuels data, using the Forest Vegetation Simulator (FVS) Inland California and Southern Cascades variant (Keyser 2008, 2013). The FVS Fire & Fuels Extension (FVS-FFE (Reinhardt \textit{et al}. 2003)) was used to model pre- and post-treatment fuel loading, vegetation characteristics that influence fire behavior (such as canopy base height and crown bulk density) and flame lengths under 90\textsuperscript{th} and 97\textsuperscript{th} percentile weather conditions. These methods and the FVS-FFE modeling assumptions and limitations are described in the silviculture report (Payne 2015) and fire and fuels report (McRae 2015).

Additional field and vegetation analysis work was completed in fall 2015 to assess the existing condition for gray wolf. Data sources included the Forest’s existing vegetation layer (USDA-2007) and knowledge of habitat type and quality for deer and elk in the project area; the 2014 and 2015 carnivore surveys in the project area, action area and SMMU (USDA-FS 2014, 2015, 2016 to date); and historic data from CNDDDB and NRIS (2015, 2016). This includes past carnivore surveys on the SMMU and near the project area (North State Resources 2010, 2003). Information updates from the CDFW regarding the Shasta Pack and other wolves was provided to the SMMU in February and March 2016 (Figura 2016).

To determine the amount of habitat in treatment units, the NSO habitat layer was intersected with the treatment unit GIS layer. The table below displays each stand, stand type, age range, general treatment prescription and the habitat

\textsuperscript{19} Literature and studies within similar stand conditions and habitat types as those within the project area and action area, including information on NSO life history requirements, population date and barred owl interactions
acres pre- and post-treatment. Several units have more than one habitat type, and the information at the bottom of the table includes information regarding Recovery Action 32 stands and assumptions for treatment effects.

As described in the Project Design Features section below, at least 10-12% of each thinning unit would be retained in an unthinned condition. Based on field reviews and delineation, at least 74 of the 795 acres of NSO foraging habitat proposed for thinning are in Recovery Action 32 stands and would not be mechanically thinned, with at least 10-12% of the remaining foraging and dispersal habitat being in unthinned patches. The habitat acreage listed in the table below is for the entire 3,483-acre treatment area, and includes the RA32 stands and unthinned patch areas. Also, the acres and descriptions in this document for the total foraging or dispersal habitat degraded do not account for the RA32 stands and unthinned patches (or marking guides that retain important habitat features) in thinned stands and therefore, degraded habitat acreage would be slightly less than what is reported. The acreage listed and described for habitat maintained/benefitted, or habitat downgraded or removed are more accurate as it is based on the assumptions listed at the bottom of the table.

Pre and post-treatment habitat acres by treatment unit - bold text indicates a change in habitat type from thinning and subtreatments

<table>
<thead>
<tr>
<th>Unit</th>
<th>Ac</th>
<th>Stand Age/Type</th>
<th>Treatment^</th>
<th>Pre-Treatment Acres</th>
<th>Post-Treatment Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NR</td>
<td>HQF</td>
</tr>
<tr>
<td>202</td>
<td>15</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 0 0 0 15</td>
<td>0 0 0 0 0 15</td>
</tr>
<tr>
<td>203</td>
<td>12</td>
<td>10-20 Pl</td>
<td>Interplant/UB</td>
<td>0 0 0 0 12</td>
<td>0 0 0 0 0 12</td>
</tr>
<tr>
<td>208</td>
<td>27</td>
<td>10-20 Pl</td>
<td>Thin</td>
<td>0 0 3 0 0 14</td>
<td>0 0 3 0 0 14</td>
</tr>
<tr>
<td>214</td>
<td>7</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 3 0 0 4</td>
<td>0 0 3 0 0 4</td>
</tr>
<tr>
<td>216</td>
<td>17</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 3 0 0 14</td>
<td>0 0 3 0 0 14</td>
</tr>
<tr>
<td>217</td>
<td>4</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 3 0 0 4</td>
<td>0 0 3 0 0 4</td>
</tr>
<tr>
<td>218</td>
<td>15</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 14</td>
<td>0 0 1 0 0 14</td>
</tr>
<tr>
<td>222</td>
<td>7</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 4</td>
<td>0 0 1 0 0 4</td>
</tr>
<tr>
<td>223</td>
<td>4</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 4</td>
<td>0 0 1 0 0 4</td>
</tr>
<tr>
<td>224</td>
<td>6</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 4</td>
<td>0 0 1 0 0 4</td>
</tr>
<tr>
<td>226</td>
<td>16</td>
<td>10-20 Pl</td>
<td>Interplant/UB</td>
<td>0 0 0 0 16</td>
<td>0 0 0 0 16</td>
</tr>
<tr>
<td>230</td>
<td>10</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 10</td>
<td>0 0 1 0 0 10</td>
</tr>
<tr>
<td>231</td>
<td>26</td>
<td>10-20 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 10</td>
<td>0 0 1 0 0 10</td>
</tr>
<tr>
<td>233</td>
<td>11</td>
<td>10-20 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 10</td>
<td>0 0 1 0 0 10</td>
</tr>
<tr>
<td>1</td>
<td>35</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 34</td>
<td>0 0 1 0 0 34</td>
</tr>
<tr>
<td>16-115</td>
<td>13</td>
<td>20-30 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 13</td>
<td>0 0 1 0 0 13</td>
</tr>
<tr>
<td>106</td>
<td>9</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 9</td>
<td>0 0 1 0 0 9</td>
</tr>
<tr>
<td>107</td>
<td>11</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 11</td>
<td>0 0 1 0 0 11</td>
</tr>
<tr>
<td>110</td>
<td>41</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 41</td>
<td>0 0 1 0 0 41</td>
</tr>
<tr>
<td>112</td>
<td>14</td>
<td>20-30 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 14</td>
<td>0 0 1 0 0 14</td>
</tr>
<tr>
<td>113</td>
<td>36</td>
<td>20-30 Pl</td>
<td>Thin/Interplant</td>
<td>0 0 1 0 0 36</td>
<td>0 0 1 0 0 36</td>
</tr>
<tr>
<td>114</td>
<td>12</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 12</td>
<td>0 0 1 0 0 12</td>
</tr>
<tr>
<td>115</td>
<td>16</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 12</td>
<td>0 0 1 0 0 12</td>
</tr>
<tr>
<td>116</td>
<td>12</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 12</td>
<td>0 0 1 0 0 12</td>
</tr>
<tr>
<td>117</td>
<td>29</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0 0 1 0 0 28</td>
<td>0 0 1 0 0 28</td>
</tr>
<tr>
<td>122</td>
<td>6</td>
<td>20-30 Pl</td>
<td>Underburn</td>
<td>0 0 1 0 0 6</td>
<td>0 0 1 0 0 6</td>
</tr>
<tr>
<td>123</td>
<td>15</td>
<td>20-30 Pl</td>
<td>Thin/Interplant</td>
<td>0 0 1 0 0 15</td>
<td>0 0 1 0 0 15</td>
</tr>
<tr>
<td>Unit</td>
<td>Ac</td>
<td>Stand Age/Type</td>
<td>Treatment</td>
<td>Pre-Treatment Acres</td>
<td>Post-Treatment Acres</td>
</tr>
<tr>
<td>------</td>
<td>----</td>
<td>----------------</td>
<td>-----------</td>
<td>--------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NR</td>
<td>HQF</td>
</tr>
<tr>
<td>124</td>
<td>33</td>
<td>20-30 Pl</td>
<td>Thin/Interplant</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>125</td>
<td>10</td>
<td>20-30 Pl</td>
<td>Thin/Interplant</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>126</td>
<td>22</td>
<td>20-30 Pl</td>
<td>Thin</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>58</td>
<td>40+ Pl</td>
<td>Thin, Groups, Small Oak Release</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>40+ Pl</td>
<td>Thin, Groups, Radial Thin Pine</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>40+ Pl</td>
<td>Thin, Radial Thin Pine</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>40+ Pl</td>
<td>Thin, Groups, Radial Thin Pine</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>109</td>
<td>40+ Pl</td>
<td>Thin, Groups, Radial Thin Pine, Small Oak Release</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>40+ Pl</td>
<td>Thin, Radial Thin Pine</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>58</td>
<td>40+ Pl</td>
<td>Thin, Groups, Radial Thin Pine</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>85</td>
<td>40+ Pl</td>
<td>Thin, Groups, Radial Thin Pine</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1-U</td>
<td>1</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td>142</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>114</td>
<td>0</td>
</tr>
<tr>
<td>151</td>
<td>51</td>
<td>60-100 Nat Stand</td>
<td>VDT, White Fir Gaps</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>153</td>
<td>104</td>
<td>60-100 Nat Stand</td>
<td>VDT, White Fir Gaps, Radial Thin Pine, Oak Release</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>154</td>
<td>119</td>
<td>60-100 Nat Stand</td>
<td>VDT, Small Oak Release</td>
<td>0</td>
<td>43</td>
</tr>
<tr>
<td>155</td>
<td>104</td>
<td>60-100 Nat Stand</td>
<td>VDT, Radial Thin Pine, Small Oak Release</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>156</td>
<td>90</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>156-U</td>
<td>50</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>157</td>
<td>155</td>
<td>60-100 Nat Stand</td>
<td>VDT, Radial Thin Pine, Small Aspen Release</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>157-U</td>
<td>6</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unit</td>
<td>Ac</td>
<td>Stand Age/Type</td>
<td>Treatment^</td>
<td>Pre-Treatment Acres</td>
<td>Post-Treatment Acres</td>
</tr>
<tr>
<td>------</td>
<td>----</td>
<td>----------------</td>
<td>-------------</td>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NR      HQF F DI CA NON</td>
<td>NR      HQF F DI CA NON</td>
</tr>
<tr>
<td>159</td>
<td>63</td>
<td>60-100 Nat Stand</td>
<td>VDT, Radial Thin Pine</td>
<td>0 0 2 35 0 26</td>
<td>0 0 2 22 0 39</td>
</tr>
<tr>
<td>159-U</td>
<td>2</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0 0 0 0 0 2</td>
<td>0 0 0 0 0 2</td>
</tr>
<tr>
<td>162</td>
<td>84</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 0 2 0 82</td>
<td>0 0 0 2 0 82</td>
</tr>
<tr>
<td>165</td>
<td>27</td>
<td>60-100 Nat Stand</td>
<td>VDT, Small Oak Release</td>
<td>0 14 12 0 1 0</td>
<td>0 14 12 0 1 0</td>
</tr>
<tr>
<td>167</td>
<td>5</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 4 0 1 0</td>
<td>0 0 4 0 1 0</td>
</tr>
<tr>
<td>168-1</td>
<td>7</td>
<td>60-100 Nat Stand</td>
<td>VDT, Small Oak Release</td>
<td>0 0 6 0 0 1</td>
<td>0 0 6 0 0 1</td>
</tr>
<tr>
<td>168-2</td>
<td>14</td>
<td>60-100 Nat Stand</td>
<td>Underburn (Oak in Unit)</td>
<td>0 14 0 0 0 0</td>
<td>0 14 0 0 0 0</td>
</tr>
<tr>
<td>169</td>
<td>31</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 19 12 0 0</td>
<td>0 0 19 12 0 0</td>
</tr>
<tr>
<td>170</td>
<td>11</td>
<td>60-100 Nat Stand</td>
<td>VDT, White Fir Gaps, Small Oak Release</td>
<td>0 0 10 0 0 1</td>
<td>0 0 10 0 0 1</td>
</tr>
<tr>
<td>171</td>
<td>16</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>2 0 14 0 0 0</td>
<td>2 0 14 0 0 0</td>
</tr>
<tr>
<td>172</td>
<td>5</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 4 0 0 1</td>
<td>0 0 4 0 0 1</td>
</tr>
<tr>
<td>173</td>
<td>28</td>
<td>60-100 Nat Stand</td>
<td>Underburn (Oak in Unit)</td>
<td>0 0 27 0 0 1</td>
<td>0 0 27 0 0 1</td>
</tr>
<tr>
<td>175</td>
<td>26</td>
<td>60-100 Nat Stand</td>
<td>VDT, Aspen Release</td>
<td>0 0 0 0 0 26</td>
<td>0 0 0 0 0 26</td>
</tr>
<tr>
<td>176</td>
<td>32</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 0 0 0 32</td>
<td>0 0 0 0 0 32</td>
</tr>
<tr>
<td>178</td>
<td>28</td>
<td>60-100 Nat Stand</td>
<td>VDT, White Fir Gaps, Small Oak Release</td>
<td>0 0 27 0 1 0</td>
<td>0 0 27 0 1 0</td>
</tr>
<tr>
<td>179</td>
<td>6</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 0 3 0 3</td>
<td>0 0 0 3 0 3</td>
</tr>
<tr>
<td>181</td>
<td>3</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 0 3 0 0</td>
<td>0 0 0 3 0 0</td>
</tr>
<tr>
<td>182</td>
<td>37</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0 0 31 4 0 2</td>
<td>0 0 31 4 0 2</td>
</tr>
<tr>
<td>204</td>
<td>15</td>
<td>60-100 Nat Stand</td>
<td>Thin as Feasible, Extensive Mortality Area</td>
<td>0 0 0 0 0 15</td>
<td>0 0 0 0 0 15</td>
</tr>
<tr>
<td>235</td>
<td>20</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0 0 17 0 2 1</td>
<td>0 0 17 0 2 1</td>
</tr>
<tr>
<td>317</td>
<td>2</td>
<td>60-100 Nat Stand</td>
<td>VDT, Small Oak Release</td>
<td>0 0 0 2 0 0</td>
<td>0 0 0 2 0 0</td>
</tr>
<tr>
<td>318</td>
<td>10</td>
<td>60-100 Nat Stand with Plantation Trees</td>
<td>Underburn (Oak and Aspen in Unit)</td>
<td>0 0 0 0 0 10</td>
<td>0 0 0 0 0 10</td>
</tr>
<tr>
<td>Unit</td>
<td>Ac</td>
<td>Stand Age/Type</td>
<td>Treatment^</td>
<td>Pre-Treatment Acres</td>
<td>Post-Treatment Acres</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----------------</td>
<td>-------------</td>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NR</td>
<td>HQF</td>
</tr>
<tr>
<td>346</td>
<td>55</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>346-U</td>
<td>4</td>
<td>60-100 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>347</td>
<td>12</td>
<td>60-100 Nat Stand</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>401</td>
<td>147</td>
<td>60-100 Nat Stand</td>
<td>Underburn / Implement Pilgrim Veg Project Thinning</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>152-1</td>
<td>108</td>
<td>80-120 Nat Stand</td>
<td>VDT, Groups in White Fir, Radial Thin Pine</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>152-2</td>
<td>8</td>
<td>80-120 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>158</td>
<td>135</td>
<td>80-120 Nat Stand</td>
<td>VDT, Radial Thin Pine</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>160</td>
<td>39</td>
<td>80-120 Nat Stand</td>
<td>VDT, Groups in White Fir</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>161</td>
<td>33</td>
<td>80-120 Nat Stand</td>
<td>VDT</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>163</td>
<td>89</td>
<td>80-120 Nat Stand</td>
<td>Thin</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>164</td>
<td>31</td>
<td>80-120 Nat Stand</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>166</td>
<td>12</td>
<td>80-120 Nat Stand</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>174</td>
<td>12</td>
<td>80-120 Nat Stand</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>177</td>
<td>12</td>
<td>80-120 Nat Stand</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>180</td>
<td>4</td>
<td>80-120 Nat Stand</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>201</td>
<td>12</td>
<td>80-120 Nat Stand</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>206</td>
<td>114</td>
<td>80-120 Nat Stand</td>
<td>Thin as Feasible, Extensive Mortality Area</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>221</td>
<td>9</td>
<td>80-120 Nat Stand</td>
<td>Underburn</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>402*</td>
<td>518</td>
<td>2-180+ Meadow / Open Flat</td>
<td>Meadow Enhancement, Aspen Release</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

^ This stand table and the habitat acres pre- and post-treatment represent the entire stand. It does not represent total mechanical treatment acres, but does represent total underburning acres (unthinned patches and Recovery Action 32 stands/units are included).

- For purposes of this analysis, all NR and High Quality Foraging areas are considered Recovery Action 32 ‘stands’.

- In thinning units, all Recovery Action 32 stands would be designated as unthinned patches. These areas may exceed the 10-12% minimum for unthinned patches, dependent on habitat/stand conditions (e.g. units 165, 161, others).
Incomplete and Unavailable Information

For the stands not included in the 2007 CSE and Browns Transects, stand data collected from similar stands was utilized to extrapolate thinning and fire effects for no action and Alternative 1. Extrapolation was applied based on field reconnaissance to compare stand conditions, stand history and aerial photo comparisons (Payne 2015). There are some assumptions and limitations in the FVS-FFE modeling analysis regarding the thinning and fuels treatment effects under the no action and action scenarios. In summary, while the 2007 CSE data and FVS-FFE modeling program work in concert, the stand data is just under nine years old. The subsequent field reviews in 2010-2014, and additional sampling of fuel loading in 2011, further informs the existing condition for down wood, the analysis for snags “modeled” over time, and the expected fire effects under 90th and 97th percentile weather conditions. The age of the CSE data and the rapidly changing conditions and increased mortality, notably in the ponderosa pine component, between 2009 and 2012 is such that the conclusions presented in the modeling results reflect trends, and not absolute numbers.

Current stand exam data for species, size classes and associated tons per acre of down wood in each stand is also not available. The existing condition for down wood is approximated based on the 2007 CSEs and Browns Transects in the 13 inventoried stands (11 with mechanical treatment), the 2011 field review of mortality areas in other stands, and subsequent field reviews across the project area from 2012-2015.

The current modeled results of no action and Alternative 1 for fire effects (flame lengths, rates of spread, severity) is not available to be spatially displayed and show differences across the project area. The EIS Chapter 3 Fire and Fuels section, and the fire and fuels report, discuss these effects in general terms and for the project area as a whole (McRae 2015). The wildlife analysis uses these general terms, and the output results from individual stand modeling in FVS-FFE, to describe expected fire behavior in certain stands and extrapolate it to similar stands. The Map 6 data

| NR, high quality foraging, or foraging habitat in plantations would be designated in an unthinned patch, or not thinned per marking guides. |
| Treatments vary across stands and habitat types and would be implemented per unit-specific prescriptions and marking guides. Some treatments listed for a unit would not occur in the core or home range (i.e. no radial thinning in core and no groups in natural stands in home range; see Tables 19 and 21 for core and home range treatments). |
| Treatment acres that down grade, remove or improve habitat function are more accurate and are based on the following assumptions: |
  - Oak release treatment removes conifers 30-60 feet out from the oak, with the longer distance to southern aspects, while retaining any predominant or dominant trees. In critical habitat, all Douglas fir, sugar pine and incense cedar ≥24” dbh would not be removed during oak release, as these species in this size class contain and can develop valuable roost and rest-site and nest and den-site cavity structure that is important to NSO and fisher. The 27 acres of oak release in unit 153 is based on field review and GPS data. |
  - Radial thin treatment removes all trees within 50 feet of a predominant pine’s bole with exception of other predominant trees of any species. Up to two pine per acre in plantation units 7, 12, 13, 14, 15, 16, 18; and natural stands 152-1, 153, 155, 158 and 159 may be released (with 4 pine per acre in unit 157). This treatment creates an approximate 0.25 to 0.30-acre area around the released pine where there are no trees (other than other predominant trees, if present). In the natural stands, this treatment would downgrade foraging or remove dispersal habitat. |
  - Group selections in the six older plantations, and one natural stand (unit 160) are ≤2 acres and would not exceed more than 20% of a stand. In natural stand 152-1, the three planned groups are estimated to total 4 acres, given current stand conditions of few root disease pockets. |
  - Small gaps in white fir in natural stands 151, 153, 170 and 178 would range from 1/10 to 0.25 acre, be placed in dense areas where trees average ≤16” DBH, and would not exceed more than 10% of the stand. These gaps would not remove predominant or dominant trees. |
  - Non habitat is either ponderosa pine-dominated, openings, meadow, barren, or young plantations with small tree size classes |

*Approximately 140 acres of this unit is in meadow / non-forested opening and underburning is the only treatment in this area.
set in **Appendix B** displays the predicted fire behavior under no action (based on the 2007 CSE and Browns Transect data and Flammap modeling that was completed in 2009 and 2010; Riegle 2010). A similar mapping effort has not been completed to reflect the current FVS-FFE modeling, changed/changing stand conditions, and higher levels (40-100+ tons per acre) of fuel loading in the eastern and southeastern portions of the project area. The 2010 ‘no action’ analysis and Map 6 data set also does not account for the increase in mortality pockets in young and old plantations (including in the ST-215 core), or the increase in mortality pockets in the mixed conifer-pine natural stands in other portions of the project area. The 2010 ‘no action’ analysis and spatial output of fire behavior modeling is used, however, to demonstrate what the potential effects could be in discrete portions of the project area and different habitat types. In the absence of newer mapped data from the FVS-FFE modeling effort, the 2010 information is considered the best available data in terms of displaying ‘no action’ effects to habitat at smaller scales than the entire project area.

**Analysis Assumptions**

- Acres and stand conditions are approximate and in some cases, existing conditions (basal area, canopy closure, tree size classes) are averaged across a combination of similar stands.
- Minor differences in acreage effects exist between this analysis and other documents or appendices due to rounding or differences in resource analysis areas and methodologies employed for assessing impacts. These differences do not invalidate this analysis or conclusions.
- Prey assessments or surveys have not been completed for the project, but during fieldwork and NSO habitat typing, abundant woodrat nests were observed. It is assumed that based on habitat conditions, and observations during fieldwork, that woodrats are abundant and northern flying squirrels are present to a limited extent in the higher quality habitat areas.
- New landing sizes are approximated to range between 0.5 and 0.75 acre, with the maximum acreage assessed to account for the maximum potential effect to NSO habitat or critical habitat PCEs. Landing needs are based on an estimated one landing per 30 acres treated. Depending on unit acreage, alternative, and layout, units smaller than 30 acres may require their own landing. Existing landings and natural openings would be used as feasible to reduce new disturbance, and in accordance with project design features and resource protection measures. Final landing and skid trail location is approved during sale administration.
- Landing construction, reconstruction or construction of mechanical fireline would not affect (remove, degrade, downgrade) habitat function, though these activities could remove, reduce or disturb habitat components.
- Temporary road widths would not exceed 14 feet.
- Trees, snags, or logs that are a safety hazard to the public or operations may be felled (USDA-FS 2012). Falling/removal of hazard trees or snags would reduce snag density in certain areas (along roads, near private property lines, in the extensive mortality area). Residual snags and down logs would not be below levels specified in the project’s design (see Table 6, WL-40) or the levels directed by the LSRA, which states that the numbers of snags, and down logs, can vary on any particular acre (USDA-FS 1999 p. 164).
Alternative 1 (Preferred Alternative)

This BA considers Alternative 1, the preferred alternative, in detail as it would affect the most habitat for the NSO, or potentially create disturbance to any breeding NSOs or gray wolves in or near the project area. EIS Chapter 2 describes alternative 1 and EIS Appendix A includes detailed information on treatments and marking guides. A summary of proposed actions is included below in Table 4.

Table 4. Summary of Alternative 1 proposed actions based on treatment acres

<table>
<thead>
<tr>
<th>Alternative 1 Treatment Summary</th>
<th>Estimated Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce stand densities and increase within- and between-stand heterogeneity and complexity in natural stands through: variable density thinning, small gap creation in white fir, group selection in <em>Heterobasidion</em> root disease infection centers of white fir, radial thinning around legacy predominant pine, and targeted biomass thinning (4-9.9&quot; DBH trees) -Within these treatment areas, release California black oak on ~40 acres -Release aspen on ~20 acres -Thin in Riparian Reserves to promote riparian vegetation on ~211 acres</td>
<td>1,273</td>
</tr>
<tr>
<td>Reduce stand densities and increase heterogeneity and complexity in older (40+ year) plantations through: variable density thinning, group selection, radial thinning around legacy predominant pine and other species -Within these treatment acres, conduct young plantation thinning</td>
<td>584</td>
</tr>
<tr>
<td>Machine pile and burn piles to reduce surface and activity-generated fuels</td>
<td>944 to 1,461</td>
</tr>
<tr>
<td>Underburn all treatment units upon completion of thinning and mechanical fuels treatments, including 6 acres of oak and 4 acres of aspen underburn only areas</td>
<td>3,483</td>
</tr>
<tr>
<td>Reforestation to promote species and age class diversity in group selection areas of six older plantations and two natural stands and extensive mortality areas</td>
<td>256</td>
</tr>
<tr>
<td>Restore soils through windrow re-spreading in two older plantations</td>
<td>167</td>
</tr>
<tr>
<td>Remove encroaching conifer in and along the periphery of Elk Flat meadow</td>
<td>378</td>
</tr>
<tr>
<td>Decommission unauthorized routes that intersect stream channels, conduct floodplain and stream recontouring to correct floodplain function, improve streambank stability and improve riparian vegetation</td>
<td>8</td>
</tr>
<tr>
<td>Recontour stream channel and floodplains and add embedded woody debris</td>
<td>7</td>
</tr>
<tr>
<td>Revegetate Riparian Reserves with riparian species</td>
<td>95</td>
</tr>
</tbody>
</table>

Treatments will occur in LSR, matrix and Riparian Reserves. No mechanical treatments will occur in NSO nesting/roosting habitat, high quality foraging habitat or other areas delineated for Recovery Action 32, designated unthinned patches in natural stands and plantations, or snag retention areas. While these areas would not be mechanically treated, they are subject to underburning. The Project Design Features section below, and Tables 6, 7, 8 and 9 include resource protection measures and monitoring activities to meet the project’s purpose and need while enhancing and protecting elements of late-successional habitat.

Forest stand treatments will be accomplished through a variety of manual and mechanical methods including commercial timber harvest, stewardship and service contracts and mechanical and manual fuels treatment. Harvest operations will yield sawlogs and biomass chip products. Trees will be either hand felled with a chainsaw or cut with mechanized equipment such as a feller-buncher, then moved and processed with mechanized equipment. Cut

---

20 Sawlogs are trees 10 inches and larger in diameter; biomass material is 4-9.9 inches in diameter. Merchantability standards are subject to change due to log market conditions.
trees will be transported from the stump to central landing areas to be limbed and processed into logs or chips (whole tree yarding). Areas where reforestation is proposed may be site-prepared\textsuperscript{21} and planted with a mix of native conifer species or hardwood. No mechanical site preparation will occur in Riparian Reserves. Prescribed fire treatments will use a variety of techniques to reduce fuels and achieve the objectives outlined in Tables 8 and 9 below. The Effects sections of this document describe treatments in relation to habitat affected.

**Transportation Management**

A combination of NFS roads, existing unauthorized routes and new temporary roads will be utilized to implement the preferred alternative. NFS roads would be maintained during project activities by grading, resurfacing, culvert cleaning, hazard tree removal, snow plowing or clearing roadside brush (36 CFR 220.6(d)4); dust abatement/watering; or administrative monitoring. Small trees, saplings in roads or alongside roads may be cut as part of maintenance activities. An estimated 2.9 miles of new temporary road are proposed to reduce impacts to soils and other resources from skidding longer than 0.25 mile distances. All new temporary roads and 6.4 miles of existing routes will be decommissioned upon project completion. Decommissioning consists of many activities but for the project, the typical method will be to till\textsuperscript{22} the road surface to alleviate compaction and allow for re-establishment of vegetation, restore drainage patterns, and block the entrance with an earth berm or guard rail barricade. To provide legal access to an established dispersed site, 0.1 mile of an existing unauthorized route will be added to the managed road System. No permanent NFS road construction is proposed. Some closed roads would be re-opened, maintained and used for the project, and then re-closed.

**Hazard Trees and Snags**

Any trees or snags that are a safety hazard to the public or operations may be felled. Hazard trees along roads will be identified according to direction contained in “Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region” (USDA-FS 2012).

**Interrelated and Interdependent Project Elements**

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification [50 CFR §402.02]. Interdependent actions have no independent utility apart from the proposed action [50 CFR §402.02]. Interrelated and interdependent activities include temporary road, skid trail and landing construction that facilitate thinning, temporary material storage and any chipping activities. They also include site preparation and reforestation activities; borate fungicide application to cut tree stumps to reduce the spread of *Heterobasidion* root disease (annosus); and hazard reduction treatment in 87 acres as a pre-treatment prior to thinning or prescribed burning. On these 87 acres, there is a high level of mortality where snags may be felled or removed from along roads and private property.

\textsuperscript{21} Site preparation is the hand or mechanical manipulation of a site, designed to enhance the success of regeneration/planting survival. Treatments vary and may include scarifying, piling, ripping, scalping, burning or mastication to create microclimate conditions conducive to establishment and growth of desired species. These activities are typically completed in the fall prior to spring planting.

\textsuperscript{22} A winged tilling device is used to lift the soil vertically and fracture it laterally to alleviate compaction up to a depth of 18 inches.
An adaptive management strategy that addresses the deteriorating stand conditions between the analysis and implementation phases for risk reduction is also proposed. In 12 ponderosa pine-dominated stands with high levels of ongoing mortality (~811-acre area), dying trees or snags may be felled (those that were not marked during prescription layout). As described in the Analysis Assumptions section above, residual snags and down logs in these areas would not be below the levels specified in the project’s design (see Table 6, WL-40) or those directed by the LSRA, which states that the numbers of snags, and down logs, can vary on any particular acre (USDA-FS 1999 p. 164). Other adaptive management includes monitoring aspen release treatments and possibly utilizing mechanical means or fire to stimulate growth, and thinning biomass using prescribed fire instead of mechanical thinning methods (see Table 9).

**Project Design Features**

All thinning and fuels treatments were designed to retain important elements of NSO nesting, roosting, foraging and dispersal habitat while meeting the project’s purpose and need. The ID Team recognizes the need to maintain understory and within-stand structural components for NSO and their prey (and other late-successional associated species such as fisher and northern goshawk). The project’s design features (how the project was designed to minimize or avoid direct effects to individuals and habitats, including decisions to exclude or defer portions of the project area and high value habitat areas from mechanical treatment) and Resource Protection Measures (RPMs, or measures taken during implementation that also minimize the potential for direct or indirect effects) are fully described in EIS Chapter 2. The project was designed, and RPMs were developed, through the interdisciplinary process. Those specific to listed species were discussed and developed during the Streamlined Consultation Process with the FWS. Measures specific to NSO and its suitable and dispersal habitat, and the gray wolf in terms of disturbance effects, are summarized here and listed by EIS reference number in Table 6 below.

Mechanical thinning and harvest operations, fuels treatments (piling, burning, underburning via ground crews or helicopter/aerial ignition), site preparation and reforestation, riparian restoration, temporary road construction and route decommissioning activities create noise and smoke above ambient levels. NSO surveys, spot checks or activity center searches and carnivore surveys will be continued prior to and throughout implementation as agreed to with the local Level 1 team, and as funding and staffing permit. The level of NSO survey effort will be based on survey history, likelihood of NSO occurrence in the project area, the 2012 survey protocol and annual survey coordination meetings with FWS and adjacent private landowners (USDI-FWS 2012 pp. 4-6). The site-specific spatial and temporal measures are expected to minimize or avoid significant disturbance effects to NSO and gray wolf (see Table 6).

The majority of the design features in natural stands and plantations that are thinned mechanically would be implemented through stand-specific prescriptions and marking guides (see EIS Appendix A). These describe the range of basal areas, tree selection, and other subtractions (radial thinning, oak release, group selection, small gap creation in white fir). The proposed residual basal area targets and tree selection criteria for each stand in NSO habitat are intended to retain layering, canopy cover and habitat elements while addressing the current unsustainable stand densities. Tree selection for thinning is a process of identifying those trees that are desirable for habitat objectives, and removing trees to reduce competition for nutrient, light and water, and to reduce ladder and canopy fuels. While there is no prescribed upper diameter limit for thinning treatments, Table 5 describes general tree selection standards. Public safety and safe operations may preclude retention (or removal) in some instances.
Table 5. General tree selection standards and criteria

<table>
<thead>
<tr>
<th>Retain in All Stands</th>
<th>All predominant trees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All dominant trees that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops</td>
</tr>
<tr>
<td></td>
<td>All healthy large overstory dominant trees of all species</td>
</tr>
<tr>
<td></td>
<td>All healthy pine of any size where pine is underrepresented</td>
</tr>
<tr>
<td></td>
<td>A component of healthy small understory and midstory trees</td>
</tr>
<tr>
<td></td>
<td>A component of heavily damaged or diseased trees that provide wildlife habitat</td>
</tr>
<tr>
<td></td>
<td>All hardwood trees</td>
</tr>
<tr>
<td>Black oak Release in NSO Critical Habitat</td>
<td>Retain all Douglas fir, incense cedar and sugar pine that are 24” DBH or larger</td>
</tr>
<tr>
<td>Trees to Generally Remove</td>
<td>Primarily midstory intermediate and smaller co-dominant trees</td>
</tr>
<tr>
<td></td>
<td>Primarily shade tolerant white fir that has grown up through the understory over the last several decades due to fire suppression and stand succession.</td>
</tr>
</tbody>
</table>

**Unthinned Patches**

In all portions of thinning units in LSR, unthinned patches would be designated in at least 10-12 percent or more of a stand. This is in accordance with Activity Design Criteria #4 and #5 in the Forest wide LSRA (USDA-FS 1999 pp. 185, 188). Unthinned patches retain important stand processes and conditions such as thermal and visual cover; natural suppression and mortality; small trees and shrubby openings; natural size differentiation; large trees and trees with cavities, deformed or decadent limbs; large snags and down logs; undisturbed debris; and dense or multilayered stand attributes that contribute to structural heterogeneity for late-successional associated wildlife and habitat values. The unthinned patches are not factored in to the target residual basal area range for stands when marking, but are considered ‘separate’ stands in treatment units where no mechanical treatment will occur. In some plantations and stands with heavy mortality that don’t support NSO habitat, retention areas of large snags would comprise portions of or all of the unthinned patches.

**Thermoregulation Sites**

Other microsite habitat elements in natural stands and plantations that support foraging or dispersing NSOs (and resting fisher) include habitat rest or roost clumps. These are distinct groups of tightly spaced overstory or midstory trees, usually with a small or large snag component, that have late seral characteristics such as large limbs, cavities, or long branches and with smaller (<10-inch size class) shade tolerant trees growing underneath or in close proximity. In the project area, these clumps often range from a tight group of 3-6 trees to a 1/10-acre size. They provide perching and roosting sites for NSO, and rest sites for fisher, contributing an important thermoregulatory function in a stand. If not part of a prior designated unthinned patch, these clumps would be identified during marking and retained in all natural stands and older plantations at a rate of approximately four small clumps and two large clumps per acre, as available.23 Similar to the unthinned patches, these clumps are not factored in to the target residual basal area range during marking. Because of this, residual stand basal area is expected to be higher than the 125-175 sqft/ac prescribed in most NSO habitat, and would be approximately 180-230 sqft/ac in moderate

---

23 Plantations ranging from 10-30 years old do not typically contain these habitat features outside areas that would be designated as unthinned patches
quality foraging habitat, or 125-200+ sqft/ac in lower quality foraging habitat, depending on the stand conditions and tree species composition. These habitat elements are supported in various literature (see Appendix D).

**General Project Design in High Value NSO Habitat, and ST-215 Core and Home Range**

General project design elements for NSO habitat: NSO nesting/roosting, and high quality foraging, habitat will not be treated mechanically. These areas would be burned with a low-intensity prescribed fire, in accordance with burn plan prescriptions and measures listed in Tables 6, 7, 8 and 9. Some areas of higher quality habitat will not be subject to direct ignition (see Table 7; SF-30). Where oak is a stand component, it will be released unless specific stand conditions or critical habitat features preclude release as described above in Table 5.

In the ST-215 core: Units 150, 152-2, 168-2 (natural stands); 214 and 216 (10-20 year old plantations) will not be treated mechanically. In natural stand unit 151, no thinning will occur in areas of large overstory tree concentrations of white fir and incense cedar. Other portions of this unit would be thinned to ~150 sqft/ac basal area, and small ≤ 0.25-acre gaps would be placed in homogenous white fir that is <16” DBH. Radial thinning treatments around predominant legacy pine will not occur in natural stands. Biomass thinning will not occur in natural stand units 161, 166, 172 and 178 where this stand element has been determined to strongly support NSO foraging quality. Group selection will not occur in natural stands. In older plantations (40+ years), thinning, group selection and radial thinning around predominant legacy pine would occur in units 7, 14 and 16. In older plantation unit 15, thinning and radial thinning would occur. Units 208 and 233 (10-20 year old plantations) would be thinned.

In the ST-215 home range outside the core: Unit 173, and portions of units 152-1, 154, 163, 165 (natural stands); 112, 230 and 231 (10-30 year old plantations) will not be treated mechanically, but underburned. Radial thinning treatments around predominant legacy ponderosa and sugar pine is prescribed in portions of natural stand units 152-1 (dispersal) and 153 (foraging). Biomass thinning will not occur in units 152-1, 165, 168-1 or 174. Group selection is prescribed in natural stand 152-1 in dense, homogenous pockets of white fir with advanced *Heterobasidion* root disease. In older plantations (40+ years), thinning, group selection and radial thinning around predominant legacy pine will occur in units 12, 13 and 18. In older plantation unit 6, thinning and group selection will occur. Units 1, 113, 114, 115 and 116 (20-30 year old plantations) would be thinned.

The following site-specific temporal and spatial project design features were developed to minimize direct and indirect effects to NSOs, their prey species and their habitats; and to maintain important late-successional habitat attributes on the post-treatment landscape. Information on monitoring during and post-implementation is included. Table 6 is specific to NSO and gray wolf, though may include features that overlap with fisher or species of concern. Table 7 lists those project design features and RPMs specific to other resources that also have a direct benefit to NSO habitat elements or other late-successional associated species.

---

24 Where these, and other units listed for the ST-215 core, extend outside the core into the home range, the same treatment design applies.
Table 6. Project design features for NSO and gray wolf

<table>
<thead>
<tr>
<th>Resource (ID from Chapter 2-EIS)</th>
<th>Project Design Feature (PDF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL-33 NSO Surveys</td>
<td>NSO surveys, stand searches or spot checks will be conducted prior to and throughout implementation, consistent with current survey protocol (USDI-FWS 2012) and as discussed and agreed to with the FWS-FS Level 1 team on an annual basis. For 2016, three stand searches and spot checks are planned.</td>
</tr>
</tbody>
</table>
| WL-34 NSO Limited Operating Periods | A limited operating period (LOP) for habitat altering, smoke- and noise-generating activities above ambient levels is required within 0.25-mile of an active NSO nest, and within 0.25 mile of NR habitat (units 150, 168-2, portions of units 152-1, 154). The LOP will remain in effect until surveys, stand searches or spot checks are completed during a year of operations. The NSO LOP begins February 1st and will extend through April 15th (or longer if surveys, stand searches or spot checks are not completed by that date).  
  - If nesting NSOs are not detected, operations may commence upon notification from the biologist that surveys are negative.  
  - If a single NSO is detected, operations may commence after July 9.  
  - If nesting NSOs are detected, the LOP will remain in effect within 0.25 mile of the nest through:  
    - July 31st for noise-generating activities above ambient levels (road actions).  
    - September 15th for habitat altering/smoke-generating activities.  
While there are currently no verified nesting, territorial, or resident single NSO(s) in or within 0.25 mile of the project area (based on 2012-2015 surveys), these LOPs and other protection measures specific to nesting/individual NSOs will be included in the timber sale contract. The measures will also be included in the burn plan and any other implementation contracts or plans. They will be applied in case of new discoveries. |
<p>| WL-34 NSO Spot Checks            | Per the 2012 survey protocol, spot checks are intended to supplement general project-level surveys and avoid the potential direct take of NSOs from project implementation. Based on the survey history for NSOs and barred owls in the action area, if implementation is underway before February 1st the spot checks will occur concurrent with operations. If an NSO is detected during any survey efforts, all ongoing operations that have a likelihood of direct harm to an NSO or creating above-ambient noise shall be postponed. |
| WL-34 Smoke Management           | When burning in spring outside the prescribed LOP area in WL-34 above, WL-44 below for gray wolf, or WL-43 below for migratory birds (or any new NSO or wolf LOP areas based on positive detections), smoke should be managed so that light to moderate, dispersed smoke may be present in an area, but dissipates or lifts within 24 hours. Ignition should be discontinued if heavy, concentrated smoke begins to inundate the area. |
| WL-35 Underburning Plans         | For all NSO LOPs, the biologist will work with the SMMU fuels department on an annual basis when developing, or modifying the project's burn plan. This PDF applies to all treatment units (and LOPs for other species). |
| WL-36 New NSO or Barred Owl Detections | If a new NSO (non-nesting or nesting) or barred owl detection occurs prior to or during project implementation, technical advice or re-initiation with the FWS will be required. |
| WL-37 Prey Species Habitat       | Where piling and burning is conducted in NSO foraging habitat, leave two unburned slash piles per acre to provide small mammal habitat. Pile size can vary as safety allows, but in general should not exceed 10 feet long by 10 feet wide by 6 feet tall. The biologist and fuels specialist will conduct a review after piling is completed, per the Monitoring Plan, to determine which piles to retain or if additional piles are needed. If needed, hand piles of smaller material will be constructed (~1-2 per acre). Applicable units: 151, 152-1, 154, 157, 158, 159, 160, 163, 164, 165, 166, 169, 174, 181, 201 and 235. While units 175, 204 and 206 do provide for a substantial prey base (notably for goshawk and fisher), it is not operationally feasible to retain unburned piles in these units that are within the extensive mortality area. |
| WL-38 Burning in the ST-215 NSO Home Range/Core | No more than 50 percent of the suitable habitat in an NSO core or home range will be burned during any given burn season; or if nesting or resident NSO are present, during any 12-month period. In the event a new NSO activity center is established, this same design feature will apply to the Burn Plan (see WL-35). Applicable units: 156, 182, 221, 224, 346 and 346-U; 150, 151, 152-1, 152-2, 153, 154, 161, 163, 165, 166, 167, 168-1, 168-2, 170, 171, 172, 173, 174 and 178. |</p>
<table>
<thead>
<tr>
<th>Resource (ID from Chapter 2-EIS)</th>
<th>Project Design Feature (PDF)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WL-39</strong> Fisher Denning LOPs that overlay suitable NSO habitat</td>
<td>To minimize direct disturbance to female fishers during their most vulnerable period of denning and kit rearing, an LOP for vegetation and fuels management activities will extend from March 1 through July 31 around known denning areas and within areas that support denning habitat. Applicable units: 150, 152-2, 153, 154, 156, 168-2, 182, 221 and delineated areas along Ash Creek in units 152-1, 157 and 163.</td>
</tr>
<tr>
<td><strong>WL-40</strong> Snag Retention (applies project wide, not specific to listed species)</td>
<td>Snag and down log retention in the LSR is based on the recommendations for mixed conifer and white fir vegetation communities (LSRA, Tables 3-1 to 3-3). These recommendations represent an average for a landscape or treatment area (i.e.100 acres) and snag and down log numbers can vary on any particular acre (LSRA p. 164).</td>
</tr>
</tbody>
</table>

**WL-40a**
In LSR thinning and fuels treatment units, retain, on average, 7 snags per acre ranging from 15 to 20+ inches diameter with a preference for snags larger than 20 inches or the largest size class available (LSRA p.164).

Plantation units may or may not contain this level of snags, and thinning prescriptions were developed with snag objectives as part of the desired condition. Live trees with decadent late-successional characteristics count toward snag retention and recruitment where snags are not available.

While snag removal is not proposed as a treatment in the majority of the project area or suitable NSO habitat, snags may be felled to reduce hazards to the public or during operations, or to complete specific elements of the proposed action (e.g. group selection in plantations, hazard reduction within 300 feet of specified private property boundaries and 150 feet of designated roads, site preparation for reforestation efforts).

**WL-40b**
Retain Douglas-fir, sugar pine and incense cedar snags larger than 20 inches diameter, safety permitting.

**WL-40c**
Where safely feasible retain groups of snags in existing mortality pockets. Retained snag pockets should be at least 150 feet from System roads and 300 feet from private property boundaries.

**WL-40** Down Wood Retention | During thinning, piling, underburning and site preparation/reforestation activities:

**WL-40d**
In LSR thinning and fuels treatment units and matrix areas outside meadow enhancement unit 402, maintain and protect existing CWD from disturbance to the greatest extent possible (Forest Plan pp. 4-38, 4-61).

**WL-40e**
In accordance with the LSRA, the desired condition is an average of 6 to 10 large down logs per acre. Retained logs are to be in a variety of decay classes with a preference for 20-inch diameter logs, or the largest size class available.

- In pine dominated stands retain at least 6 logs per acre.
- In fir dominated stands, retain at least 8 logs per acre.
- In mixed conifer dominated stands, retain at least 10 logs per acre.
- In hazard reduction zones (outside NSO habitat), large down log retention would average 4 to 6 per acre.

On average, remaining tonnage will range from 5 tons per acre in size classes less than 3 inches, to 20 to 35 tons per acre for larger diameter logs, depending on location. This is in accordance with the LSRA (p. 3-3), the Forest Plan, the Forest Plan habitat capability models and best available science for maintaining and promoting habitat suitability for the NSO (and northern goshawk and fisher).

**WL-40f**
Where safely feasible, retain scattered or concentrations of natural fall and down wood piles and 10-20% of the existing shrubs and minor species important for NSO prey base (whitethorn, bush chinquapin, Scouler’s willow) when conducting site preparation and planting to meet the conditions described in WL-40e. Preference is to retain piles in the interior of a treatment unit, and not in close proximity (within 50 feet) to main use roads or private property.

**WL-42** Underburning and large down wood, understory layering and large snags/trees | To minimize loss of nesting, roosting, foraging, resting, denning and prey base habitat components (including mycorrhizal fungi), underburning would occur during conditions that do not result in more than 10% full consumption of down logs in the 20 inch diameter and larger size class. Burning under conditions that limit consumption of 24 inch diameter and larger logs to 5% or less are preferable.

This applies to all units, though may not be operationally or safely feasible in units 163, 175, 204 and 206 due to the extensive pine mortality.

This RPM is also intended to minimize potential for loss of understory layering, large snags and trees, and large down wood in nesting/roosting, resting/denning, and higher quality foraging habitats for NSO (and northern goshawk and fisher) in units 150, 152-1, 152-2, 154, 155, 156, 162, 165, 167, 168-2, 173, 182 and 221.
### Monitoring

The wildlife biologist and silviculturist will coordinate with the marking crew and inspect the marking to ensure that prescriptions in suitable and dispersal NSO habitat are applied as described in the prescriptions, marking guides and project design features to assure that NSO habitat structure and function is maintained or promoted.

Units will be monitored post-harvest by the fuels specialist, silviculturist and wildlife biologist to validate project treatment and habitat objectives, incorporate project monitoring results and check for changed circumstances prior to reentry for follow-up fuels work. This includes evaluating and determining the most appropriate fuels management practice to avoid unnecessary disturbance to understory vegetation. Specifically, the need for machine piling and burning prior to underburning will be evaluated in units designated for possible machine piling. Post-harvest and post-piling fuels monitoring would compare effectiveness, soils impacts, and costs, with other nearby projects. Public participation in monitoring will be encouraged.

Monitoring will be completed to assess effects of underburning treatments in suitable NSO habitat, as described for Recovery Action 11 in the Revised Recovery Plan. The effects will be evaluated periodically to see if the underburning treatment is meeting the levels of acceptable mortality determined by the IDT and FWS (see Table 8 and 9 below), or whether there is new information to be assessed prior to continued implementation.

Stands will be surveyed / monitored for NSO prior to and for the full extent of project implementation utilizing a variety of methods. Similar monitoring may be performed after implementation to evaluate effects of the project on any territories or home ranges that may become reoccupied (ST-215) or newly occupied in the project area.

Black oak release in NSO and fisher habitat will be monitored to assess if objectives for oaks and foraging, resting and denning habitat are being met (e.g., is habitat functional as foraging or dispersal post-treatment, are oaks regenerating, are additional protection measures required for application of prescribed fire). The effects will be evaluated periodically to determine if the treatment met the objectives determined by the IDT and FWS, or whether there is new information to be considered and assessed prior to continuing implementation.

Carnivore monitoring, utilizing a variety of methods (cameras, track plates, scat surveys), will occur prior to, and to the extent practicable, during and after project implementation. This monitoring work informs the SMMU regarding fisher (and other forest

---

<table>
<thead>
<tr>
<th>Resource (ID from Chapter 2-EIS)</th>
<th>Project Design Feature (PDF)</th>
</tr>
</thead>
</table>
| **WL-43** Migratory bird LOPs that overlay suitable NSO and fisher habitat in Ash Creek Riparian Reserves | To limit the potential for direct adverse effects to ground-nesting and riparian-obligate migratory bird species in Elk Flat meadow and along the Ash Creek Riparian Reserve when underburning:  
- Burning from August 1 to February 1 is permitted, provided the NSO LOP described in WL-34 (and NGO LOP in WL-31) are not in place.  
- Avoid burning operations during primary nesting season of April 15 to July 31 if the LOPs for NGO or NSO are not in place to address this, and in areas outside the fisher LOP described in WL-39.  
- When burning in spring, smoke should be managed so light to moderate, dispersed smoke may be present in an area or drainage, but dissipates or lifts within 24 hours.  
- Ignition should be discontinued if heavy, concentrated smoke begins to inundate the area.  
- Units where RPM applies: 150, 152-1, 152-2, 154, 157, 163, 171, 180, 218, 346, 347, 401 and 402. |
| **WL-44** Gray Wolf Measures | If a den site is detected in or near the project area during the project implementation timeframes, an LOP that restricts above ambient noise- and smoke-generating activities within one mile of the den will be implemented from April 1 through June 30. |
| **WL-44b** | While the provision for the den site LOP is expected to provide protection from any prolonged or substantial project-related disturbance during the critical pup-rearing period at early rendezvous site(s), a similar LOP for activities within one mile of active rendezvous sites from April 1 through August 31 will be implemented.  
Further discussions and coordination with FWS may result in modified distances or more flexible dates for this specific RPM. |
| **WL-44c** | These LOPs will be implemented unless there are topographic features or terrain that clearly separates the noise- or smoke-generating activity from the den or rendezvous site(s). |
| **WL-44d** | While there are no known den or rendezvous sites associated with the Shasta Pack within one mile of the project area at this time, the LOPs specific to gray wolf will be included in the timber sale contract and would be put in place if denning wolves are detected. These measures will also be included in the burn plan and any other implementation contracts or plans. |
Table 7. Other design features addressing wildlife habitat elements or suitable habitat areas

<table>
<thead>
<tr>
<th>Resource (ID from Chapter 2-EIS)</th>
<th>Project Design Feature/Resource Protection Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydrology &amp; Soils HS-3</strong></td>
<td>Some existing landing piles will not be burned in Riparian Reserves in unit 346. Existing landing piles selected for specific retention of either water quality or wildlife values will be identified and designated and will not be burned as determined by the hydrologist or wildlife biologist.</td>
</tr>
<tr>
<td>Burning of large wood in old landing piles</td>
<td>- This feature protects large (~60’ long x 10-20’ high) large down wood piles in Riparian Reserves for fisher, NSO, and northern goshawk prey base.</td>
</tr>
<tr>
<td><strong>HS-5</strong></td>
<td>Mechanical fireline construction shall only remove litter and duff and avoid removing the upper layers of the topsoil.</td>
</tr>
<tr>
<td>Mechanical fire line</td>
<td>- This feature helps to protect mycorrhizal, hypogeous and other fungal associations in soil types that contribute to NSO and fisher prey forage.</td>
</tr>
<tr>
<td><strong>RR-6</strong></td>
<td>A minimum 20-foot equipment exclusion zone (EEZ) will be flagged along intermittent and ephemeral stream channels and may be increased based on site-specific evaluation. This EEZ may be larger than 20 feet, depending on resource conditions and Riparian Reserve and wildlife objectives for the treatment unit.</td>
</tr>
<tr>
<td>Equipment exclusion zones in Riparian Reserves</td>
<td>From the boundary of the delineated EEZ, equipment may reach in to accomplish treatment objectives (reach is generally 20 feet). The EEZs may be entered, if needed after post-harvest activities are completed by heavy equipment, to restore meadow, channel and floodplain function areas that were disturbed during past activities, and as determined by the project hydrologist. No machine piling would occur, though hand piling is permitted in the EEZ (see RR-11).</td>
</tr>
<tr>
<td></td>
<td>- This feature protects large down wood and trees in Riparian Reserves for fisher, NSO, and northern goshawk habitat and prey base.</td>
</tr>
<tr>
<td><strong>RR-8</strong></td>
<td>No mechanical site preparation will take place in Riparian Reserves.</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>- This feature protects residual large down wood, snags, shrubs in Riparian Reserves for fisher, NSO, and northern goshawk habitat and prey base.</td>
</tr>
<tr>
<td><strong>RR-11</strong></td>
<td>In Riparian Reserves, embedded down logs, stumps and riparian plants and root systems will be retained during burning operations with minimal (up to 5%) damage. Large decadent willow scattered within Reserves will be allowed to lightly burn with up to 5% mortality.</td>
</tr>
<tr>
<td>Down Wood and Vegetation Impacts from Burning/Piling &amp; Burning</td>
<td>Piles may be burned in the Ash Creek Reserve, but no machine piling will occur in the designated EEZ as described in RPM RR-6. Hand piles may be constructed and burned if ≥20 feet away from the inner gorge in the Ash Creek Reserve.</td>
</tr>
<tr>
<td></td>
<td>Applies to units: 18, 106, 107, 113, 150, 154, 157, 163, 180, 346, 347, 402, 152-1, 152-2 and 346-U.</td>
</tr>
<tr>
<td><strong>RR-13</strong></td>
<td>Existing landings will be utilized and no new landings will be constructed in the Ash Creek Reserve. An earth scientist or hydrologist will assist the sale administrator in designating any new landing locations in other units containing intermittent or ephemeral channel Riparian Reserves.</td>
</tr>
<tr>
<td>Landings</td>
<td>- This feature maintains habitat in Riparian Reserves for fisher, NSO, and northern goshawk.</td>
</tr>
</tbody>
</table>

Camera stations will continue to be utilized to monitor for potential wolf use, including near or at potential den or rendezvous habitats within the project area, within one mile of the project’s activities and other portions of the wolf action area. This data and work will be shared, and coordinated as feasible, with any similar monitoring being conducted by the CDFW.

Wolves around den and rendezvous sites are fairly obvious, given the tracks, prey carcasses and bones, scat, and visual observation(s) of a wolf or wolves. While these signs have not been observed in or near the project area to date during activities or pre-decision planning and field work, surveys for other wildlife and implementation monitoring are ongoing and will continue throughout and after project implementation. Information from these surveys will be used to determine if LOPs are needed, if the determinations made in this BA are still applicable or whether there is new information to be considered prior to continuing implementation.

Interagency coordination and close collaboration with FWS and CDFW is an essential conservation measure. The Forest Service will continue to coordinate and communicate with FWS and CDFW on their monitoring efforts. While there are no immediate plans to collar individuals in the Shasta Pack, as coordination with Oregon and other agencies is needed (Kovacs 2015), if individuals are collared it may be feasible to better track their location and implement necessary conservation measures. If the Forest Service observes wolves, dens or rendezvous sites, it will be reported to the CDFW and the FWS so that follow-up investigation(s) can occur.
<table>
<thead>
<tr>
<th>Resource (ID from Chapter 2-EIS)</th>
<th>Project Design Feature/Resource Protection Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Invasive Plants-15</strong> Seeding and Mulching</td>
<td>When seeding decommissioned temporary roads, unauthorized routes, landings and main skid trails, use a native mix of pollinator-friendly forbs and grasses at a rate of 10 to 15 pounds per acre and mulch with certified weed-free straw, or other approved fine slash to reduce seed predation, retain moisture, reduce the potential for wind erosion and, if necessary, to reduce overland flow erosion during rainfall events and snow melt. At this time, there are no high priority weed populations in the project area.</td>
</tr>
<tr>
<td><strong>Road Management-16</strong> Temporary Roads</td>
<td>Temporary roads will be kept to a minimum and will be routed through non-late-successional or low quality late-successional habitat as feasible.</td>
</tr>
</tbody>
</table>
| **POC-18** Plants of concern – California black oak release | Minimize impacts to California black oak and other hardwoods during thinning and burning operations as practicable. Units known to have oaks: 6, 14, 153, 155, 154, 165, 168-1, 168-2, 170, 173, 178, 317 and 318.  
  - This feature protects oaks that have other trees growing directly adjacent or overlapping with them, protects oak during prescribed fire operations and contributes to maintaining existing fisher resting and NSO foraging or roosting habitat. |
| **Silviculture & Fuels SF-24** Underburning Measures that tie to Tables 8 and 9 | Underburning treatments in natural stands will be planned and implemented to meet prescribed targets of duff and litter consumption while minimizing mortality of shrubs and trees (displayed in Table 8 and Table 9 below) and retaining coarse woody material at levels that meet RPMs: RR-11, WL-40c, WL-40d, WL-40e and WL-42.  
  - The target consumptions and maximum mortality levels are determined as an average across the project area and were developed through consultation with FWS. |
| **SF-25** Tree Retention during Prescribed Fire | Measures will be taken to reduce injury or mortality to large predominant trees during prescribed fire operations. Potential methods may include but are not limited to:  
  - **SF-25a** Multiple low severity burns to reduce fuel accumulations over time but in accordance with RPMs for maintaining snags and large down wood.  
  - **SF-25b** Burning in conditions of a moist duff layer (subject to LOPs in RPMs WL-34, WL-38, WL-39, WL-43 and WL-44), ensuring consumption of the upper layer of litter, while protecting roots in lower duff areas  
  - **SF-25c** Varying ignition techniques, such as short head runs, designed to limit residence time at the base of large trees.  
  - **SF-25d** Pulling duff away from bole damage such as lightning scars and pitch seams that may cause fire to burn longer or move up into the crown.  
  - **SF-25e** Tree well burning to pre-burn an area immediately surrounding the tree during moist conditions prior to stand under burning (subject to LOPs).  
  - **SF-25f** Reducing large down fuels near the base of the tree to limit heat and residence time on the tree bole and fine roots.  
  - **SF-25g** Mixing duff and litter to encourage fine roots to grow down into the soil prior to underburning or to bring moisture to the surface to discourage fire from reaching the boles. |
| **SF-26** Prescribed fire in Plantations that are not thinned | Prescribed fire in plantations not thinned under this project (some stands in the 10-30 year old age class) will be managed at each entry to minimize mortality to trees to no more than 15% and consumption of shrub, forb, grass cover and CWD to no more than 10%.  
  - No snags will be directly ignited.  
  - Firing techniques or control lines will be utilized as needed to retain existing migratory bird habitat and other early seral wildlife (deer, bear, turkey) forage and cover, while returning low intensity fire to the landscape.  
  - Avoid prolonged duration of fire to prevent damage to roots and root collars of trees <10” diameter at soil level.  
  These protection measures will be evaluated prior to repeated burn entries to address the current conditions at that time and any required changes to methods. |
| **SF-27** Prescribed fire in plantations that are mechanically thinned prior to burning | Prescribed fire in plantations being thinned under this project (all of those in the 40+ year old age class, and some in the 10-30 year old age class), will be managed at each entry to minimize mortality to trees to no more than 15% and consumption of shrub, forb and grass cover to no more than 25 to 50%.  
  - Maintain CWD in accordance with RPMs RR-11, WL-40c, WL-40d, WL-40e and WL-42, (also see number 17 on page C-3). |
Resource (ID from Chapter 2-EIS) | Project Design Feature/Resource Protection Measure
--- | ---
• No snags will be directly ignited. The end result should be a mosaic of burned and unburned shrub and understory vegetation pockets throughout the stand.

**SF-28**
Prescribed fire in plantations that are mechanically thinned prior to burning
Apply prescribed fire only after remaining trees show signs of increased health and vigor. Fuels and silviculture specialists will assess signs of readiness by evaluating thinning response (release) indicated by increased increment of spring wood in the radial core or increased foliage or shoot growth. Adequate response may occur as early as one full growing season following a thinning treatment in a healthy stand under average precipitation years.

**SF-29**
Forb, Shrub Retention during Underburning
During underburning, maintain at least 30% of grass, forbs and shrubs. Evaluate these protection measures prior to repeated burn entries for current conditions.

**SF-30**
No Direct Ignition in Unthinned Patches/RA32 stands
There will be no direct ignition in unthinned patches to reduce fire effects to sensitive and ethnobotanical species and wildlife habitat.
Units this RPM applies to: 123, 152-1, 154, 165, 169, 171, 172, 174 and 235
• This measure aims to protect high quality NSO foraging habitat designated under Recovery Action 32 and high quality fisher denning habitat.

---

Table 8. Levels of acceptable mortality when underburning natural stands - underburn only

<table>
<thead>
<tr>
<th>Prescribed Fire Objectives</th>
<th>Size Class (DBH)</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duff Consumption</td>
<td>NA</td>
<td>30 to 50%</td>
</tr>
<tr>
<td>Litter Consumption</td>
<td>0-3&quot;</td>
<td>40 to 100%</td>
</tr>
<tr>
<td></td>
<td>1-3&quot;</td>
<td>40 to 85%</td>
</tr>
<tr>
<td></td>
<td>3-10&quot;</td>
<td>30 to 70%</td>
</tr>
</tbody>
</table>

Average CWD and Snag Removal
Burn to retain CWD and snag objectives in accordance with Project Design Features RR-11, WL-40c, WL-40d, WL-40e and WL-42

<table>
<thead>
<tr>
<th>Conifer Mortality</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4&quot;</td>
<td>50 to 100%</td>
</tr>
<tr>
<td>4 to 8&quot;</td>
<td>10 to 30%</td>
</tr>
<tr>
<td>9 to 14&quot;</td>
<td>&lt;10%</td>
</tr>
<tr>
<td>&gt;14&quot;</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>

Brush and Shrub Mortality
N/A               30 to 50%

Table 9. Levels of acceptable mortality when underburning natural stands after thinning

<table>
<thead>
<tr>
<th>Prescribed Fire Objectives</th>
<th>Size Class (DBH)</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duff Consumption</td>
<td>NA</td>
<td>30 to 50%</td>
</tr>
<tr>
<td>Litter Consumption</td>
<td>0-3&quot;</td>
<td>40 to 100%</td>
</tr>
<tr>
<td></td>
<td>1-3&quot;</td>
<td>40 to 85%</td>
</tr>
<tr>
<td></td>
<td>3-10&quot;</td>
<td>30 to 70%</td>
</tr>
</tbody>
</table>

Average CWD and Snag Removal
Burn to retain CWD and snag objectives in accordance with Project Design Features RR-11, WL-40c, WL-40d, WL-40e and WL-42

<table>
<thead>
<tr>
<th>Conifer Mortality</th>
<th>Acceptable Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4&quot;</td>
<td>50 to 100%</td>
</tr>
<tr>
<td>4 to 8&quot;</td>
<td>10 to 30%*</td>
</tr>
<tr>
<td>9 to 14&quot;</td>
<td>&lt;10%</td>
</tr>
<tr>
<td>&gt;14&quot;</td>
<td>&lt;5%</td>
</tr>
</tbody>
</table>

Brush and Shrub Mortality
N/A               30 to 50%

*If material that is 4 to 6.9 inches DBH is not commercially thinned due to market conditions at time of implementation and is instead treated with prescribed fire during underburning operations, with or without other mechanical or hand treatments, the range of acceptable mortality will be 30-50% to meet objectives since the burning treatment would be utilized to complete the thinning of that size class.
V. Species Status, Surveys, Existing Environment and Past Influences on Existing Conditions

This section is included in Appendix D and describes the species status (range-wide and local), survey history, and existing environment, habitat and prey conditions for NSO and gray wolf, including relevant research and literature. It includes survey data, predator status and past influences on existing conditions. There are multiple tables in the appendix that describe NSO habitat conditions at various scales. Table 10 below is included here as it summarizes the suitable, capable, dispersal and non-habitat for NSO at all analysis scales for the project. Gray wolf security habitat and other source habitat data is described in Appendix D.

Table 10. Summary of suitable, dispersal, capable, non-habitat and NSO critical habitat for all spatial scales

<table>
<thead>
<tr>
<th>Habitat</th>
<th>ST-215 0.5-mile core</th>
<th>ST-215 1.3-mile home range</th>
<th>Treatment Unit</th>
<th>Project Area</th>
<th>Elk Flat LSR</th>
<th>NSO Action Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nesting/Roosting (N/R)</td>
<td>125</td>
<td>126</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>High Quality Foraging (HQF)</td>
<td>24</td>
<td>82</td>
<td>89</td>
<td>89</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>Foraging (F)</td>
<td>196</td>
<td>1048</td>
<td>1044</td>
<td>1053</td>
<td>1048</td>
<td>3329</td>
</tr>
<tr>
<td>Dispersal (Di)</td>
<td>9</td>
<td>958</td>
<td>301</td>
<td>317</td>
<td>301</td>
<td>3801</td>
</tr>
<tr>
<td>Capable (Cap)</td>
<td>96</td>
<td>334</td>
<td>329</td>
<td>331</td>
<td>331</td>
<td>335</td>
</tr>
<tr>
<td>Non-Habitat (Non)</td>
<td>50</td>
<td>850</td>
<td>1600</td>
<td>1609</td>
<td>1185</td>
<td>8141</td>
</tr>
</tbody>
</table>

**NSO HABITAT**

<table>
<thead>
<tr>
<th>Habitat</th>
<th>ST-215 0.5-mile core</th>
<th>ST-215 1.3-mile home range</th>
<th>Treatment Unit</th>
<th>Project Area</th>
<th>Elk Flat LSR</th>
<th>NSO Action Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCE1 (Cap)</td>
<td>91</td>
<td>165</td>
<td>164</td>
<td>165</td>
<td>165</td>
<td>165</td>
</tr>
<tr>
<td>PCE2 (N/R)</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>PCE3 (HQF)</td>
<td>13</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>PCE3 (F)</td>
<td>154</td>
<td>308</td>
<td>308</td>
<td>308</td>
<td>308</td>
<td>308</td>
</tr>
<tr>
<td>PCE4 (Di)</td>
<td>0</td>
<td>76</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>76</td>
</tr>
<tr>
<td>Non-Habitat in CH</td>
<td>46</td>
<td>106</td>
<td>89</td>
<td>90</td>
<td>90</td>
<td>106</td>
</tr>
<tr>
<td><strong>ECS-3 CH DESIGNATION</strong></td>
<td><strong>424</strong></td>
<td><strong>797</strong></td>
<td><strong>629</strong></td>
<td><strong>720</strong></td>
<td><strong>720</strong></td>
<td><strong>797</strong></td>
</tr>
</tbody>
</table>

^ Portions of the ST-215 core, home range and action area are located on private lands. Acres are reported at varying scales and are not meant to be summed (i.e. core habitat acres may overlap with critical habitat designation, treatment and project area and the Elk LSR scales). The treatment unit habitat is the existing condition, not the amount proposed for mechanical treatment; though all treatment areas are subject to prescribed fire in accordance with the Project Design Features and measures listed in Tables 6, 7, 8 and 9.

VI. Effects of Alternative 1 on NSO

Direct effects are the direct or immediate effects of a project activity on a species or its habitat; including effects of interrelated and interdependent actions. Direct effects are generally described as those that result in physical harm, death or the disruption of reproductive attempts during project implementation or near occupied habitat but also include effects to habitat structure or function. Indirect effects are those caused by the proposed action that occur
later in time, but are still reasonably certain to occur [50 CFR §402.02]. For example, changes to habitat may affect a species later in time by affecting prey base, reducing the risk of habitat loss caused by a stand replacing fire or modifying habitat to the extent that allows predators to move in. Cumulative effects under the ESA refer to those effects of future State or private activities, not involving Federal activities, which are reasonably certain to occur in the action area of the Federal action subject to consultation [50 CFR §402.02]. These are described in the **Cumulative Effects** section of this document.

When considering effects on wildlife, the primary factors of change and impact include those that either influence habitat suitability, use or species behavior (breeding, feeding, sheltering, movement). Factors considered when evaluating the types and significance of direct and indirect effects include proximity of the action to individuals or their habitat and the distribution or geographic area (spatial analysis scales) where a disturbance will occur (e.g. if treatments do not occur in suitable or dispersal habitat, territories/home ranges, near reproductive sites, there is usually ‘no effect’). The timing of the actions (will actions occur during pair-bonding, breeding, fledging or dispersal periods?) and the nature of the effect on required elements for a species life-cycle, population size and distribution, and the duration of the effect are also considered.

**NSO Indicators**

Potential direct, indirect and cumulative effects (as defined under the ESA) of Alternative 1 are evaluated using a combination of qualitative and quantitative indicators to address the factors listed above. These indicators are used to determine the degree (magnitude, duration and intensity) that treatments may affect individuals or their habitat components; including predicted changes in an individual species’ response to a disturbance or habitat manipulation, or changes in habitat function at various spatial scales.

Integral to the indicator effects analysis is how the specific prescription elements, project’s design and RPMs minimize the potential for direct, indirect or cumulative effects (including negative, short-term adverse or long-term beneficial effects). This analysis is based on research, local and regional monitoring as it applies to the NSO and other applicable best available science.

NSO indicators include:

- Potential for direct disturbance to breeding pairs, young or dispersing individuals;
- Amount and quality of suitable habitat (nesting, roosting, foraging) benefitted/maintained, degraded, downgraded or removed in a core and home range;
- Amount of dispersal habitat modified or removed from a core and home range;
- Amount of capable habitat improved toward dispersal or suitable condition; and
- Amount and quality of suitable and dispersal habitat affected at the project area scale, including the Elk Flat LSR, post-thinning and 20 years post thinning.

Measurements for how project activities inform the above indicators include:

- Distance to breeding pairs/individuals and location of treatments (i.e. proximity to nests, high quality habitat);
- Duration (timing) and magnitude (repeat entries) of silviculture, fuels treatments and road actions;
- Size class, density, species composition and canopy cover of the stands pre, immediately post and 20-years after treatment;
Stand variability and structural complexity, including canopy gaps, canopy closure, basal area variation, no treatment areas (skirts) and created gaps, understory, snags and down wood; and

Flame lengths and fire type as a measure of intensity and severity.

Critical Habitat indicators include (and are entirely dependent on habitat indicators above):

- Amount, by PCE, maintained/benefitted at the ST-215 core and home range scale;
- Amount, by PCE, degraded, downgraded or removed;
- Amount of suitable critical habitat projected in 20 years (PCE2/PCE3);
- Amount of dispersal critical habitat projected in 20 years (PCE4); and
- Amount of capable critical habitat projected in 20 to 30 years (PCE1).

Measurements for how project activities inform the above Critical Habitat indicators are similar to those listed for NSO habitat.

**Direct Effects to NSO**

Direct effects to reproducing individuals are not expected as the ST-215 activity center is not currently occupied by a nesting or territorial pair, and the project includes limited operating periods to minimize the potential for direct effects during critical breeding periods. There are no mechanical treatments proposed in the ST-215 core, nesting/roosting habitat or high value habitats that might be used as reproductive sites by NSOs. Table 11 lists the closest activities to the ST-215 activity center. For the first 5-10 years of implementation, log haul and road maintenance activities would be the main actions occurring in proximity (~0.25 mile) to the activity center. Piling and burning of piles in specific units, and low-intensity prescribed fire would occur after thinning is completed in other portions of the project area and the timber sale contract is ‘closed’, or when units are released for mechanical fuels treatment.

The ST-215 activity center, nesting/roosting habitat and high quality foraging habitats would be subject to prescribed fire unless resource protections prohibit use of fire in an area.

Table 11. NSO activity center information for the action area

<table>
<thead>
<tr>
<th>Activity Center ID</th>
<th>Distance from Nearest Project Activities</th>
<th>Highest Status</th>
<th>Year/Status Last Verified</th>
<th>Response from Project Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-215</td>
<td>0.25 mile to haul route and road maintenance activities</td>
<td>Nesting Pair</td>
<td>1990</td>
<td>- Last response in 2003 of a single subadult NSO female</td>
</tr>
<tr>
<td></td>
<td>Low-intensity prescribed fire in the AC; would occur 5-10 years after initial thinning in other parts of project is completed</td>
<td></td>
<td></td>
<td>- Nesting NSO pair in 1990 - nest failed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- No verified NSO detections from 2004-2015, or in 1991</td>
</tr>
</tbody>
</table>

Activity center searches, surveys or spot checks will be continued prior to, and throughout, implementation under mutual agreement with the local Level 1 team and per the methods described in the 2012 NSO Survey Protocol (see Table 6, WL-33). The last confirmed detection of a resident single, subadult female NSO in the activity center was

---

25 Based on the NSO survey results listed in Table 32 and described in detail in Appendix D, and as defined in the 2012 survey protocol, Section 16.13.1 (USDI-FWS 2012a p. 25)
in 2003, and a probable NSO feather was observed in the core in June 2011 (USDA-FS 1989-2015; Farber 2013). There was no confirmation of NSO presence in 2011 during follow-up stand searches or other nighttime calling done by the Forest Service. The annual 3-visit protocol surveys and stand searches conducted from 2004-2005, and from 2007-2011; the 6-visit surveys and stand searches from 2012-2014; and the agreed-to spot check survey and stand searches in 2015 did not detect or confirm any additional NSOs. While surveys did not occur every year, there are at least nine consecutive years of negative survey history (see Table 32 in Appendix D). There are currently no other known or verified NSOs or activity centers on NFS or private lands in the action area (Feamster 2015; Wizner 2015). Also as described in Appendix D, there was a barred owl pair in the project area from 2012 through October 2014, and barred owls or NSOs may recolonize the project area or activity center, regardless of project implementation.

Regardless of the removal of the barred owl pair or project implementation, it is possible that dispersing juvenile, subadult or non-territorial NSO(s) may be in the project area or action area, but be non-responsive during survey efforts. The project includes multiple activities that could result in direct effects to NSO behaviors of breeding, feeding, sheltering and dispersing due to noise disturbance or habitat modification (if NSO are present). The disturbance effects include harvesting and fuels treatments (noise from heavy equipment use; falling of trees), smoke from pile burning and underburning; noise from temporary road and landing construction, route decommissioning activities, road maintenance and hauling of logs and/or chips.

While adult, subadult and dispersing NSOs are highly mobile and able to move from disturbances such as noise or smoke, these ‘stressors’ have a higher likelihood of affecting adult and juvenile NSOs during the breeding season when they are more closely associated with the core. This is the period when juvenile owls are not yet able to fly and adults expend high amounts of energy defending their territory. While smoke from proposed pile burning and underburning may also disturb foraging or dispersing NSOs (if present), causing them to move away from smoky areas in the short term, this potential effect would be of short duration, several days or less in any single location.

Because NSOs are highly mobile, it is expected that foraging or dispersing juvenile, subadult or adult NSOs can easily avoid activities that would create smoke or noise above ambient levels. Juveniles that are not yet able to fly and the adults that are closely defending a nest may be vulnerable to such activities however. To minimize, if not eliminate, the likelihood that project activities will have direct effects on single or breeding NSOs or their young during critical breeding and fledging periods, the project includes a range of limited operating periods (LOPs) for noise- and smoke-generating activities. If surveys cannot be completed to determine NSO presence, LOPs will remain in effect for the specified dates and locations.

While there are currently no verified nesting, territorial, or resident single NSO(s) in or within 0.25 mile of the project area, the LOPs and other protection measures specific to nesting/individual NSOs will be included in the timber sale contract. These measures will also be included in the burn plan and any other implementation contracts or plans and will go into effect in the case of any new discoveries.

**Limited Operating Periods**

The following LOPs apply to all project activities:

- An LOP for habitat altering, and smoke- and noise-generating activities above ambient levels is required within 0.25 mile of an active NSO nest, and within 0.25 mile of units 150, 151-2, 168-2, and portions of
units 152-1 and 154. This LOP will remain in effect until surveys, stand searches or spot checks are completed during a year of operations. The LOP begins February 1st and will extend through April 15th (or longer if surveys, stand searches or spot checks are not completed by that date).

- If nesting NSOs are not detected during the survey efforts, operations may commence upon notification from the biologist that surveys are negative.

- If a single NSO is detected, operations may commence after July 9.

- If nesting NSOs are detected, the LOP will remain in effect within 0.25 mile of the nest through:
  - July 31st for noise-generating activities above ambient levels (road actions).
  - September 15th for habitat altering/smoke-generating activities (see Table 6, WL-34).

- Per the 2012 survey protocol, spot checks are intended to supplement general project-level surveys and avoid the potential direct take of NSOs during implementation. Based on the NSO and barred owl survey history, if implementation is underway before February 1st, spot checks will occur concurrently with operations. If an NSO is detected during the spot check effort, all ongoing operations that have a likelihood of direct harm to an NSO or creating above-ambient noise shall be postponed in accordance with the LOPs listed above (WL-34).

- If a new NSO (non-nesting or nesting) or barred owl detection occurs prior to or during project implementation, technical advice or re-initiation with the FWS will be required (WL-36).

In addition to the planned surveys and LOPs, the project includes these design features to minimize direct and indirect effects to any potential individuals and habitat:

- When burning in spring outside the prescribed LOP area, smoke should be managed so that light to moderate, dispersed smoke may be present in an area, but dissipates or lifts within 24 hours. Ignition will be discontinued if heavy, concentrated smoke begins to inundate the area (WL-34).

- No more than 50 percent of the suitable habitat in an NSO core or home range will be burned during any given burn season, or if nesting or resident NSO are present, during any 12-month period. In the event a new activity center is established, this same design feature will apply to the burn plan. Current units include: 156, 182, 221, 224, 346 and 346-U; 150, 151, 152-1, 152-2, 153, 154, 161, 163, 165, 166, 167, 168-1, 168-2, 170, 171, 172, 173, 174 and 178 (WL-38).

- For all NSO LOPs, the biologist will work with the fuels department on an annual basis when developing, or modifying the project’s burn plan (applies to all units, WL-35).

**Barred Owls**

Barred owls are a forest habitat generalist but they often select suitable NSO habitat (Hamer *et al.* 2007; Wiens *et al.* 2014). The potential for direct (and indirect) effects from barred owls is also addressed in the **Appendix D** barred owl sections). While there are currently no known or verified barred owls or NSOs in the project area or action area based on surveys, this does not mean a barred owl or NSO could not re-colonize, or disperse through the ST-215 core, home range or other portion of the action area and NSOs may be non-responsive during survey efforts
As described in recent literature from a demography study area in coastal northern California, removal of barred owls resulted in increases in NSO occupancy post-removal (Diller et al. 2016). The study area did have an overall lower density of barred owls compared with other portions of the NSOs range, but preliminary results suggest that NSOs are likely to recolonize their former territories following barred owl removal. This effect has not been demonstrated to date in the Elk LSR project area or ST-215 activity center to date (the barred owl pair was removed in October 2014), however NSOs may recolonize the activity center, or use portions of the project area during dispersal. It is also possible that barred owls may recolonize the project area, regardless of project implementation.

Barred owls are recognized as a significant threat to NSO recovery (USDI-FWS 2011; Dugger et al. 2015) and many studies have found negative correlations between NSOs and barred owls where they co-occur. Results from the latest NSO meta-analysis indicate that competition with barred owls may be the primary cause of NSO population decline (Dugger et al. 2015). Although the barred owl constitutes a significantly greater threat to NSO recovery than originally thought at the time of NSO listing in 1990, it is unclear whether forest management has an effect on the outcome of interactions between barred owls and NSO (Gutiérrez et al. 2004). Data relevant to the relationship between NSO survival and reproduction response and barred owl interactions specific to forest management also remains limited. Even without fully understanding the effects of forest management, recent research demonstrates the importance of maintaining high quality nesting/roosting habitat and decreasing habitat fragmentation to minimize NSO interactions with barred owls (Dugger et al. 2005, 2011, 2015; Forsman et al. 2012; Wiens et al. 2014). In environments where the two species compete directly for resources, maintaining these larger amounts of older forest (nesting/roosting habitat) as it is available, may help NSOs persist in the short term and reduce competitive interactions (Dugger et al. 2011, 2015).

The key vital rates that barred owls are influencing the most in NSO populations appear to be apparent survival and local extinction rates (Dugger et al. 2015). Additionally, Dugger and others (2015), along with Diller and others (2016) found a positive association between barred owl removal and spotted owl vital rates. Wiens and others (2014) also predicted that competitive release from barred owls would result in decreases in space use and energy expenditure with corresponding increases in site occupancy and reproductive output of NSOs, but only if sufficient nesting, roosting and foraging habitats are available for re-occupancy by NSOs and their prey.

Wiens and others (2014) also found a strong potential for exploitation and interference competition between NSOs and recently established barred owls, and that availability of old forests and associated prey species are likely to be the most strongly limiting factors in the competitive relationship between the two subspecies. Therefore, the evaluation of direct and indirect effects from barred owl focuses on whether the proposed treatments could potentially act to exacerbate competitive interactions between the two subspecies by reducing the availability of high-quality habitat or prey availability.

There are no mechanical treatments proposed in nesting/roosting, or other high value habitats for NSO, and it is unlikely that underburning these areas would contribute to competitive interactions between the two subspecies or significant reductions in prey base (see the Effects to Nesting/Roosting and High Quality Foraging Habitat section below). As there is no current evidence that thinning treatments in foraging habitat creates conditions favorable to barred owls that could subsequently facilitate expansion into a treated area, and thinning treatments would not occur in nesting/roosting or other high value habitat, it is also unlikely that thinning treatments will exacerbate competitive interactions between the two subspecies. Foraging habitat is well-distributed in the western and central portion of the project area and the majority of thinning treatments would maintain habitat function,
downgrading a minor proportion of foraging habitat that currently has low intrinsic value for NSOs due to dense stand conditions of small trees. Foraging habitat function would not be removed by the project treatments and the thinning and underburning treatments are not expected to significantly impact foraging opportunities or prey base for NSOs (see the Effects to Foraging Habitat section below).

The short or long term trends of barred owl and NSO interactions in the action area are not known, given the lack of occupancy data, but barred owls do occur on the McCloud Ranger District and may be increasing (Feamster 2014, 2015). At the site scale, implementation of the proposed actions is not expected to appreciably reduce the amount of high value or foraging habitat in the project area and there is no evidence that competitive or negative interactions would increase as a result of implementing the treatments.

As described above in Table 6 (WL-36) and the Management Recommendations section of this document, if barred owls are detected in the action area prior to or during implementation, the biologist will coordinate with the local Level 1 team regarding technical advice or to reinitiate consultation, based on specific circumstances. No further conclusions are made regarding the project’s effects and the potential influences on barred owl and NSO interactions.

Direct and Indirect Effects to NSO Habitat

Treatment activities in the project area, and at the ST-215 home range and core scale, within suitable, dispersal and capable habitats are displayed in Table 12. Machine piling/burning pile acres are not additive to main treatments.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Nesting/Roosting (RA32)</th>
<th>High Quality Foraging (RA32)</th>
<th>Foraging</th>
<th>Dispersal</th>
<th>Capable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Area and ST-215 AC</td>
<td>Total</td>
<td>HR</td>
<td>Core</td>
<td>Total</td>
<td>HR</td>
</tr>
<tr>
<td>Variable Density Thinning and Subtreatments in Natural Stands</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Thinning and Subtreatments in Plantations</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Machine Pile/Burn Piles Natural Stands</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Machine Pile/Burn Piles Plantations</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Underburn Only Natural Stands</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>82</td>
<td>75</td>
</tr>
<tr>
<td>Underburn Only Plantations</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>89</td>
<td>82</td>
</tr>
</tbody>
</table>

The proposed silviculture and fuels treatments have the potential to affect the ability of NSOs to feed, shelter or disperse, if they are present, by modifying habitat components required for these activities or that support prey base (see the NSO Prey section in Appendix D for general information on prey in the action area). Terms used to categorize the degree of predicted change in habitat quality or function, and facilitate quantification of the area (acres) affected include:
Maintain/Beneficial – indicates that changes to habitat may be neutral or beneficial to habitat function even though habitat elements may be modified.

Degrade – signifies when treatments have a negative influence on the quality of habitat due to the removal or reduction of NSO habitat elements but not to the degree where existing habitat function is changed.

Downgrade – applies to treatments that reduce habitat elements to the degree the habitat will not function in the capacity that exists pre-treatment, but activities will not remove habitat entirely (i.e., downgrade from nesting/roosting to foraging habitat).

Remove – pertains to treatments that reduce habitat elements to the degree that habitat will no longer function as suitable for NSO (USDI-FWS 2005, 2009).

The determination of significance of habitat changes from project activities, and whether these changes are likely to adversely affect NSO, its habitat, prey or critical habitat, must be based on the analysis of the treatment-specific temporal and spatial factors. Direct and indirect effects to habitat are assessed by estimating the level of change from existing habitat quality to the anticipated post-treatment habitat condition. The 2007 CSEs and field-verified habitat conditions, prescriptions and marking guides were used to estimate the change and level of effect to habitat and elements of critical habitat from mechanical thinning and fuels treatments. This assessment is supplemented by FVS-FFE modeling that demonstrates trends for proposed treatments and local monitoring of similar treatments (see Tables 40 and 41 in Appendix E for FVS modeling results) and the project design features that maintain habitat elements. Recent thinning, piling/burning of piles and underburning activities on the SMMU have been reviewed annually since 2011 to verify if thinning prescriptions, RPMs and burn plan prescriptions retained habitat elements similar to those designed for this project (residual understory vegetation, canopy cover, snags, down wood). These monitoring efforts typically found that habitat function and stand elements were maintained and improved (USDA-FS 2014, 2015). The general effects of interrelated and interconnected activities such as new landing and temporary road construction and borate application are known from past-project monitoring and research (USDA-FS 2006). The combination of these analysis tools allows for a quantitative and qualitative assessment of the project’s predicted level of effect on NSO habitat function.

While the FVS-FFE modeling results for tree size classes and wildfire effects under action (and no action) are used to estimate trends and what is likely to occur with or without treatment, the determination of effects from action more importantly considers the size of the area treated (i.e. large unit, or small gap area); the diversity of stand conditions pre- and post-treatment; prey habitat effects; and the distribution of untreated riparian reserves and designated unthinned patches, RA32 areas and roosting habitat elements that contribute to maintaining important habitat elements, function and quality. All design features and RPMs listed in Tables 6, 7, 8 and 9 would be applied regardless of treatment activity.

These combined factors, along with published descriptions of forest structure associated with NSO habitat and use in dry forest types, are used to determine if habitat function would be maintained/benefitted, degraded, downgraded or removed. For instance, foraging habitat suitability and the evaluation of effects consists of a wide range of stand conditions, rather than a single threshold value such as basal area or canopy cover or closure. This evaluation is

26 Areas where foraging habitat function was not completely maintained included fuelbreaks or other thinned stands where biomass was thinned heavier than what is prescribed for this project, where biomass material was wholly removed or where down wood was removed below prescribed levels.
consistent with the high degree of variability of foraging habitats used by NSOs described in recent research publications and described in detail in the Existing Environment and Habitat Status section for the NSO in Appendix D.

It is important to understand that the modeled FVS-FFE results are not intended to be absolute values, but rather display relative trends in stand development after a prescribed treatment or no treatment. The FVS modeling examined general tree density, growth and Stand Density Index, trees >24” DBH, and snags ≥ 20” diameter post-thinning and 20-years post thinning (and only in thinning units). The effects of a fire during 90th and 97th percentile weather conditions under action and no action were also modeled. The model is run for the general thinning treatment across a stand and while the outputs are based on the 2007 CSE data and changing stand and mortality conditions (described in the Methodology section), they still only represent trends and averages for a stand. The post-treatment stand variability that is expected, based on habitat retention and marking guides, is not a model output. Because of this, the effects of: variable density thinning, group selections in older plantations and two natural stands, small gaps in homogenous white fir, oak release treatment, and radial thinning around legacy predominant pine are not factored in to the model’s results. Therefore, stand density, basal areas, and tree and snag size classes post-treatment are expected to be slightly higher than what is reported below in Tables 15-18 below and in Appendix E Tables 40 and 41.

For example, radial thinning around legacy pine requires and results in a wider spacing around the selected trees (up to 50 feet, applied at a rate of 2 TPA with the exception of unit 157 where it is up to 4 TPA) compared with the more common, closer spacing of 16-25 feet. The model also does not take into account the project design elements of unthinned patches, untreated RA32 areas, or retention of habitat roost/rest clumps described in the Project Design Features section. These unthinned areas would have slower growth, and potentially higher tree mortality with an increase in fuel loads over the long term, but would also maintain and contribute to important NSO and late-successional habitat elements and processes in the short term. Treatments would not remove important structural components such as predominant legacy trees; dominant trees with late-successional characteristics such as large boles, decadent branching, cavities and flattened tops; healthy dominant trees; large snags or large down wood, unless necessary for operational safety (Table 5). The careful application of low-intensity prescribed fire in all portions of the project, unless prohibited in a sensitive area by RPMs, would also contribute to within-stand vegetation and down wood variability. The fine-scale juxtaposition of treatment and no-treatment areas is expected to contribute to a stand’s diversity, resilience and heterogeneity and positively modify fire behavior, consistent with many of the silvicultural practices described for dry forests in the Recovery Plan (USDI-FWS 2011 pp. III-14, III-21 to III-22, cites omitted; North et al. 2009; North and Sherlock 2012).

Effects to Nesting/Roosting and High Quality Foraging Habitat

Nesting/roosting and high quality foraging habitat will not be mechanically treated, but will be underburned using low-intensity prescribed fire. This treatment is predicted to maintain and benefit habitat by reducing surface and small ladder fuels, though there is some uncertainty associated with these predicted effects. While stand density, species composition and levels of predominant, dominant, codominant and intermediate size class trees and large down log and snag abundance are not expected to be appreciably reduced in these habitat types, this is the first time the SMMU has introduced low-intensity prescribed fire in this habitat type. It is proposed to reintroduce a lacking disturbance element and would be carefully applied and monitored.
Table 8 describes the levels of acceptable mortality for tree size classes 4” diameter and larger, shrubs and consumption of CWD and snags in these areas (snags will not be directly ignited) for underburning only. These measures were discussed and cooperatively developed between the IDT and FWS (see Appendix C).

As described above, other temporal and spatial protection measures limit the amount of burning in the ST-215 core/home range in a season or year, and would reduce injury or mortality to predominant trees and other habitat elements such as snags and large down wood during burning operations (Tables 6 and 7). The area within a fire perimeter that actually burns is also highly variable (Sugihara et al. 2006). A broader discussion of underburning effects on habitat and prey base is included below in the Low-Intensity Prescribed Fire section.

Monitoring of prescribed fire and its effects is included to determine if burn timing, ignition methods or overall prescriptions are being met (see Table 6-Monitoring section). Low-intensity prescribed fire in these habitat types (and in foraging, dispersal and capable habitat) is expected to result in both short term negative effects to prey and down wood levels, depending on burn timing (disturbance, repeated disturbance, seasonality of burning and wood consumption) as well as beneficial effects of increased understory vegetation diversity, grass, forbs, and potential increases in prey base over the long term while reducing surface fuel loading (Anthony 2007; Beche et al. 2005; Innes et al. 2006; Knapp et al. 2007, 2005; Roberts et al. 2015).

Table 13 displays the general effects to suitable, dispersal and capable habitat.

<table>
<thead>
<tr>
<th>Habitat Function</th>
<th>Total Habitat in Units</th>
<th>Maintained/Benefitted through low-intensity prescribed fire only</th>
<th>Improved through thinning treatments in plantations and natural stands</th>
<th>Degraded</th>
<th>Downgraded</th>
<th>Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nesting/Roosting</td>
<td>120</td>
<td>120</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>High Quality Foraging</td>
<td>89</td>
<td>89</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Foraging</td>
<td>1044</td>
<td>249</td>
<td>0</td>
<td>697</td>
<td>98^</td>
<td>0</td>
</tr>
<tr>
<td>Dispersal</td>
<td>301</td>
<td>76</td>
<td>4</td>
<td>180</td>
<td>0</td>
<td>41^^</td>
</tr>
<tr>
<td>Capable</td>
<td>329</td>
<td>6</td>
<td>323*</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

^ Downgraded through variable density thinning combined with radial thinning of legacy pine (71 ac); and variable density thinning combined with oak release (27 ac)

^^ Removed through variable density thinning combined with radial thinning of legacy pine

* Moved toward dispersal in 294 acres of 40+ year-old plantations, 25 acres of natural stands, and 4 acres of young plantations

**Effects to Foraging Habitat**

*Variable density thinning with oak release, radial thinning legacy pine, gaps and group selection*

**Treatment Summary**

Of the total 795 acres thinned, foraging habitat function would be degraded on 697 acres, and downgraded on 98 acres. These effects are not expected to significantly or adversely impact how any NSOs may utilize the landscape for foraging. Foraging habitat would be degraded by variable density thinning treatments, combined with limited group selection, small gap creation in white fir, small (1/10- to 1/4-acre) areas of oak release and focused biomass
thinning. Foraging habitat would be downgraded through variable density thinning, combined with a larger area of black oak release (~27 acres) and radial release of predominant legacy pine (~71 acres). In some portions of foraging habitat where fuel loading exceeds the desired levels prescribed for wildlife and safe underburning (see Table 6, WL-40), piling and burning of piles would occur on up to 242 acres. All foraging habitat is proposed for low-intensity prescribed fire.

Treatment Recommendations and Rationale

The Recovery Plan discusses silvicultural practices to promote forest resilience that can be applied to various forest types. Short-term decisions to increase a dry forest ecosystem’s ability to adapt to climate-driven drought stresses may include vegetation management around older individual trees to reduce competition for moisture and longer-term strategies may include promoting heterogeneity among and within forest stands (Franklin et al. 2002, 2006, 2007, 2013; Wright and Agee 2004; Agee and Skinner 2005, Reinhardt et al. 2008; Johnson and Franklin 2009; Hessburg et al. 2005; Kennedy and Wimberly 2009; Blate et al. 2009). Heterogeneity in vegetation composition and structure patterns are also key features of resilient forests and complex arrangements and spatial patterns of vegetation produce a similar variability in fire behavior and effect, maintaining ecosystem heterogeneity (Stephens et al. 2010, 2008). In many areas, fire could be encouraged to perform its ecological role of introducing and maintaining landscape diversity, though it may be desirable to manage fire severity or return intervals through vegetation management at various temporal and landscape scales (Agee and Skinner 2005; Haugo et al. 2010; Littell et al. 2010; Reinhardt et al. 2008; Spies et al. 2010).

Ecological resilience includes the capacity to persist through and re-organize after disturbance, adapt to shifting environmental conditions and maintain basic ecosystem structure and function over time. Spatial heterogeneity at multiple scales, and forest structure and composition, is a critical component of this resilience (Churchill et al. 2013; Franklin et al. 2006, 2013). Stand-level spatial patterns influence key aspects of ecosystem resilience and function, including disturbance behavior, regeneration, snow retention, and habitat quality in frequent-low intensity fire regime pine and mixed-conifer forests. The reference conditions show that these frequent-fire forests are a complex mosaic of individual large and small trees, clumps of trees and openings. Restoration treatments that seek to restore this mosaic pattern and maintain ecosystem function are supported by recent studies and literature (North et al. 2009; Carey 2003; Carey et al. 1999; Franklin and Johnson 2012; Franklin et al. 2013, 2007, 2006; Hessburg et al. 2005, 2004, 2000).

As variable-density thinning is a silvicultural technique intended to promote biological diversity and structural heterogeneity characteristic of old-growth forests, it induces fine-scale variation in homogeneous second-growth forest canopies (Aukema and Carey 2008; Muir 2002). It consists of thinning a forest stand at different intensities at small scales to mimic patchiness found in old growth and late-successional forests and to create a mosaic of overstory and midstory tree densities (Carey 2003; Carey et al. 1999). Retaining large trees of fire-resistant species also seeks to maintain stand structural and compositional stability by keeping existing trees most likely to persist through future fires and other disturbances and retaining seed sources to facilitate regeneration of these species (Franklin et al. 2013, 2007). Retaining and promoting patches of dense trees, understory trees, hardwoods and canopy gaps that provide sunlight and growing space for a second cohort, shrubs or herbaceous plants on the forest floor also contributes to heterogeneity.
Variable density thinning is prescribed to accomplish all thinning treatments in the natural stands and older plantations. It does not include a singular density target, but thins to retain a range of densities through variation based on species (lower basal areas in pine, higher basal areas in fir or mixed conifer), and integrates the unthinned patches (also referred to as skips), and areas of heavy thinning or small openings (radial thinning, hardwood release, small gaps or group selections).

In the dry forest landscapes that support NSO habitat, increasing resiliency of a stand or landscape includes reducing conditions that contribute to stand vulnerability. This includes reducing stand density and surface and ladder fuels, especially in areas likely to experience fire. Many studies in mixed conifer forests have found that the effectiveness of thinning or fuels treatments designed to modify or change fire behavior or suppression efforts are highest when tree thinning is combined with prescribed fire (Agee and Skinner 2005; Lehmkuhl et al. 2007, 2015; Prichard et al. 2010). Some of these authors acknowledge the potential for direct and indirect effects on resources while recognizing difficulty in balancing potential opposing management objectives. Efforts that enhance forest resilience to wildfire and other disturbances at the stand level often focus on a set of management objectives for fuel loading, including reducing woody surface fuels, ladder fuels, crown density and continuity, and retaining large trees of fire resistant species. Reducing woody surface fuels helps reduce the potential for surface fire intensity (heat release), flame lengths and can help reduce fire severity (Lehmkuhl et al. 2015). Reducing ladder fuels (biomass) can also disrupt vertical continuity of fuels and reduce the probability of surface fire transitioning to crown fire. Prescribed fire, mechanical thinning, or combined treatments are recommended to meet management objectives to reduce fuel loading and fire risk and mimic the landscape heterogeneity that is characteristic of low to moderate, and mixed-severity fire regimes (Collins et al. 2009, 2011; Collins and Stephens 2010; Perry et al. 2011).

**Treatment Effects in Foraging Habitat**

As conditions in the 60-120 year old natural stands that support foraging habitat are highly variable, a variety of treatments are proposed to meet the above recommendations and to: 1) protect and enhance habitat by reducing risk of loss and increasing resilience; 2) accelerate development of habitat through targeted thinning treatments; 3) maintain and promote connectivity; and 4) increase heterogeneity within stands through small gap creation, group selection, radial thinning around legacy pine and hardwood release.

All project design features as they relate to NSO habitat areas, unthinned patches, roosting habitat retention, tree retention and tree selection criteria, and other measures described in the Project Design Features section of this document and Tables 6, 7, 8 and 9 would be implemented. The short and long term effects to foraging (and dispersal) habitat function and development are based on their implementation.

Portions of stands have young, dense <10” DBH white fir, incense cedar and ponderosa pine in the understory; even-aged homogenous pockets of 12-16” DBH white fir and cedar with little structure or understory diversity; mixed species composition with higher levels of intermediate and codominant ponderosa pine in some areas or intermediate and codominant cedar, fir, and pine in other areas. Some areas have multi-layered stands with under and midstory layering, existing canopy gaps and shrubby openings, large down logs, large snags and decadence with a larger proportion of 26-30” DBH mixed conifer trees - *these latter areas would be excluded from mechanical treatment in unthinned patches or RA32-designated areas*. Platform structures from dwarf mistletoe in Douglas fir and sugar pine (and to a minor extent white fir) are important to many wildlife species for nesting, forage and cover (Bull et al. 1997) and are abundant in the N/R habitat, high quality foraging habitats and the RA32 areas that would
not be mechanically treated. Douglas-fir trees in thinning units are not proposed for removal with the exception of where they may be removed during radial thinning of pine (described below).

The general project design for the variable density thinning treatments precludes removal of any predominant trees, dominant trees with late-successional character such as large limbs, cavities, brooms, and decadence that would help assure these features are retained on the landscape, and healthy dominant trees of any species (see Tables 5 and 6). Removal of some mistletoe-infected white fir (evidenced by bole cankers/swelling) may reduce these structures in foraging and dispersal habitat, though field review for habitat conditions and treatment development shows there are few white fir with established brooms that might be removed (Sewell 2014; Appendix C).

**Variable Density Thinning** – Approximately 697 acres of foraging habitat would be thinned to basal areas ranging from 125-175 sqft/ac; with the lower basal area in pine-dominated portions of stands and higher basal area range where there is a mix of species. The treatment would remove primarily suppressed, intermediate and some codominant trees. This will immediately reduce stand density and canopy closure and result in minor changes to mid and understory layering.

Biomass thinning is prescribed in 359 of these acres (across 13 stands) at 16-18 foot spacing off residual trees larger than 9.9” DBH. The need for biomass thinning was carefully assessed in each foraging habitat unit by the project wildlife biologist and silviculturist, and discussed with the FWS (see the detailed account of consultation to date in Appendix C). Biomass would be thinned in areas where understory white fir, cedar and pine regeneration generally exceeds 300 TPA, where the under and midstory is too dense for owls to fly through, or where returning prescribed fire to the stand prior to thinning in this size class would not meet the objectives described in Tables 8 and 9.

In the remaining foraging habitat that is thinned, biomass would be retained to maintain understory layering and thermoregulation, cover and perching structure for prey and NSO. It is acknowledged that some understory biomass trees will be damaged or removed during operations, though not to the extent of prescribed thinning. This is expected to leave clumps and variation of small trees in the understory. While there would be less layering from thinning understory biomass trees on 359 acres of foraging habitat, this impact is considered insignificant relative to the predicted benefit of promoting and maintaining habitat function in the stand (i.e. affording more space in the understory for hunting and flight maneuverability, and reducing fuel ladders, density and homogeneity).

The FWS recognizes that management of habitat is important for the recovery of the NSO by emphasizing “in places where fire exclusion or past management has increased the density of surrounding trees, the densities of smaller trees will need to be reduced to decrease the competition for water and resultant susceptibility to drought stress and insect attack (Thomas et al. 2006). Such treatments in these stands are important because “restoring the large and old fire tolerant trees and structure requires more than simply retaining them where they are found” (USDI-FWS 2011 p. III-35).

**Black Oak Release** – Foraging units 154, 155, 165, 168-1, 170 and 178 contain small patches of oak that are being encroached by conifer, and foraging unit 153 contains a large stand (~27 acres). California black oak that is 4” DBH or larger would be released by removing adjacent conifers in an egg-shaped pattern. Using a quadrant system, conifers within 30’ of the oak’s dripline would be removed to the west, north and east, and within 60’ of the dripline

---

27 Units 6 and 14 (older plantations in NSO capable habitat) also contain black oak as a scattered component on the edges and will have release treatment. Units 168-2, 173 and 318 contain oak but are not proposed for mechanical thinning and therefore mechanical oak release would not occur in these units.
to the south/southern aspects. Predominant trees and dominant trees with late-successional characteristics and healthy sugar pine would not be removed. In addition, some conifers would be retained around individual or groups of oak that provide roosting structure for NSO (or cavities or good resting or denning structure for fisher), or where release could damage the oak. This treatment would primarily occur in unit 153, but may occur in portions of the other thinning units listed above where there are smaller pockets or scattered individual oak. Directional felling away from oak to minimize damage would also be employed, especially if there are oak or oak-conifer interlocking crowns. Where oak is released in critical habitat, Douglas fir, sugar pine or incense cedar that is 24” DBH or larger would not be cut as these species in this size class either contain (based on field review) or can develop valuable cavity, limb, and broom structures that are important to both NSO roosting and nesting and fisher resting and denning habitat (LaHaye and Gutiérrez 1999; Thomas et al. 1990; USDI-FWS 2014, 2012, 2011, 1992; Raley et al. 2012; LoFroth et al. 2011; Zielinski et al. 2004). Oak release would reduce competition from conifers for sunlight, nutrients and water and after treatment; portions of stands with released oak would be more representative of a mixed conifer/hardwood stand. In all treatment units, with the exception of the 27 acres in unit 153, oak release is considered a minor treatment and would not downgrade or remove habitat function (primarily due to its limited occurrence, individual trees or patches that are 1/10-0.25 acre in the other units).

In the 27 acres of unit 153 (outside the ST-215 core and in the southwestern extent of the home range) foraging habitat would be downgraded to dispersal function by this treatment, as overall canopy closure and cover would be below the lower threshold level of 40 percent, there would be wider spacing between residual trees, and the average basal area would range from ~60-120 sqft/ac. The effects of this treatment are compounded by the prescribed fire entries and are expected to last for 10-30 years. The follow-up underburning will incrementally reduce remaining under- and mid-story trees, and some down wood and snags, over the 30-year time period for the three prescribed fire entries.

While there will be residual patches of dense roost sites and oaks that are not released in the post-treatment condition (along with large/small trees, snags and down wood; and unthinned patches in proximity to the 27-acre ‘stand’), these conditions would not provide enough residual habitat to consider the 27-acre stand foraging habitat post-treatment. This treatment is considered a short term adverse effect to critical habitat elements of foraging (PCE3; described later in this document), and a long term benefit toward improving foraging habitat diversity, structure and prey base.

**Radial Thinning** – In foraging units 153, 155 and 157, approximately 71 acres of foraging habitat will be downgraded to dispersal by radial thinning around predominant legacy ponderosa and sugar pine. This treatment would be spread throughout these units, but similar to oak release, would not maintain foraging habitat function post-treatment. The radial thinning would not occur in the ST-215 core, as no radial thinning is planned in the core, per project design.

A maximum of two predominant pine per acre (except unit 157 which is four TPA) would be radially thinned where the greatest beneficial effect could result for relatively healthy predominant pine that are being crowded by advanced second growth trees.\(^{28}\) These predominant ponderosa and sugar pine are not easily replaced, as they take upwards of 150 years or longer to develop and are at increasing mortality risk due to high stand densities and

\[^{28}\text{Individual tree conditions would be assessed during marking and the ‘best’ 2 pine/acre or 4 pine/acre (unit 157) would be selected}\]
encroachment of a shade tolerant understory. Large, older (160+ years) ponderosa pine have been found to increase diameter growth and vigor in response to thinning (Latham and Tappeiner 2002; Kolb et al. 2007) as the treatment frees up site resources that support the vigor of the large trees and creates conditions more consistent with those found around large ponderosa pine under a natural frequent fire regime. If there are other predominant trees around the predominant pine of any species, they would not be removed; though dominant trees may be removed.

As this treatment would remove all smaller diameter trees within a 50-foot radius of the bole, except for other predominant legacy trees of any species or large diameter snags, numerous 0.25-0.30 acre size gaps would be spread across the treatment area where little to no understory or midstory vegetation remains. The effects of this treatment are expected to last for 20-30 years. Again, while the radial thin treatment will provide openings and space for natural regeneration, as well as minimal foraging opportunities, the overall habitat condition in these discrete patches will be considered dispersal in combination with the variable density thinning and follow-up underburning treatment.

Radial thinning at this microsite level would promote the health and survival of ‘released’ predominant trees by reducing competition for resources and removing lower canopy fuels that can carry fire into these tree crowns. If these predominant trees are in proximity to insect or disease centers (mostly in the current pine-dominated dispersal stands), the treatment would also remove symptomatic trees and provide a buffer to prevent root-to-root contact between infected and non-infected pine, increasing resilience of this legacy component.

The combined treatments of oak release and radial thinning that downgrade 98 acres of foraging habitat to dispersal represents 9% of the foraging habitat in the project area. These treatments are not expected to result in a significant negative effect to foraging or dispersing individuals or overall habitat function. This determination is based on the: 1) small scale of habitat affected and spatial distribution of these treatments across three units, 2) position of the treatments in the outer portion of the ST-215 home range (unit 153) or outside the home range (units 155, 157), and 3) the predicted long term benefit of increasing an important late-successional stand component’s resilience and increase in prey species diversity (Courtney et al. 2004 pp. 4-23 to 4-25, Appendix 5).

**White Fir Gaps and Group Selection** – Group selection (≤ 2-acre openings) and small gaps (≤0.25 acre openings) in white fir are intended to provide for regeneration of a new age and species class in homogenous stands, or portions of stands, that currently lack under and midstory heterogeneity or in root disease infection centers. Group selections and small gaps would not be placed in areas of healthy pine or large predominant trees of any other species. Additionally, Douglas fir of any size in group selection (or gap) areas would be retained as feasible. Small gaps are to be focused in homogenous white fir areas of 12-16” DBH trees, reducing the likelihood of other minor species, though the other species would be retained if present (per prescription design and marking guides).

Group selection would occur in about 11 acres of foraging habitat in units 152-1 and 160. In these stands, ≤ 2-acre groups would be placed in dense white fir pockets that have *Heterobasidion* root disease. These groups are not to exceed more than 20% of the stand, and in the case of unit 152-1, affect about four total acres across three group areas. There are about seven acres of groups in unit 160. Neither stand is located in the ST-215 core and where groups are proposed in 152-1, the portion of the stand is considered lower quality foraging habitat trending to dispersal. Unit 160 is also considered lower quality foraging habitat due to the pine component and lack of understory diversity. Both stands are experiencing a die back of ponderosa pine and white fir from the overstocking,

---

29 Group selection would also occur in all older ponderosa pine plantations that are NSO capable habitat.
disease and bark beetle complex that is summarized in the **Existing Condition Summary** section of this document and fully described in Chapter 1 of the EIS. The group selection treatments will help to break up disease centers and would be replanted with a mix of non-host species resistant to *Heterobasidion* and blackstain root disease (Snyder 2012, Franklin *et al.* 2007). This treatment is expected to provide some additional structural and species diversity in the homogenous portions of these stands as inducing this fine-scale heterogeneity into homogeneous canopies has been shown to have positive effects on diverse biotic communities and ecosystem function in the short term (Carey 2003). The light level increase on the forest floor would also reduce root disease progression and the mix of non-host conifer species would also help to reduce potential reinfection (Snyder 2012).

Small gaps in units that contain foraging habitat (151, 153, 170 and 178; all in the ST-215 home range) would remove homogenous white fir to create canopy openings of 1/10 to ¼ acre. This would increase sunlight and growing space for a second age class of (likely) natural fir regeneration and understory layering, also contributing to increased structural heterogeneity and some understory development. Gaps would be limited to less than 10 percent of the total unit area and would not remove any predominant or dominant late-successional trees. The approximated planning acreage assessed for this treatment is also 11 acres, but is expected to be closer to 3-5 acres based on marking review and the limited white fir gaps in these units (Appendix C).

Both group selection and gap creation treatments in foraging habitat are intended to contribute to structural heterogeneity and understory development in combination with the variable density thinning of 125-175 sqft/ac, retention of unthinned patches and roost clumps, and biomass thinning in some units. While there will be an immediate reduction in white fir density from these treatments, the openings are expected to promote development of understory shrubs, forbs and a second age class of trees (and in group selections, more diverse tree species) due to increased sunlight hitting the forest floor (McConnell and Smith 1970; Covington and Moore 1994; Carey 2003; Franklin *et al.* 2007). At this microsite level, the ‘skip’ and ‘gap’ treatment that will: 1) retain current stand structure in portions of the stands, 2) thin other dense portions to desired basal areas that reduce stand density index, and 3) create openings for shrubs and understory conifer regeneration are expected to contribute to within-stand heterogeneity while maintaining the function of foraging (*and dispersal*) habitat for NSO.

**Foraging Effects Summary**

Where foraging habitat is degraded on 697 acres by variable density thinning, oak release, group selection and small gap creation in white fir, the change in habitat quality but not function of habitat would last for approximately 5-20 years, depending on treatment location and type (see Table 13).

While some elements of foraging habitat will be reduced and portions of stands may be less complex due to: mid and understory trees being thinned, canopy closure being reduced (but not below 40%), or snags and down wood being impacted by mechanical equipment and operations, the treatments are predicted to retain sufficient structural elements and tree species composition that would continue to provide foraging opportunities for NSO and prey base habitat. These elements include larger predominant and dominant trees, small trees, within-stand layering, and large snags and down wood at the levels prescribed in Table 6, WL-40 (summarized below). Degraded foraging habitat would continue to function for NSO foraging since primary habitat elements of a mixed tree species composition, increased hardwoods, at least 40-60% or higher canopy closure, abundant down logs and large snags, layering and vertical and horizontal structure would be maintained post-treatment (Solis and Gutiérrez 1990; Irwin 2015, 2012, 2007).
The project design and RPMs retain the largest, oldest predominant trees and dominant trees that exhibit late-successional characteristics such as large boles, decadent branching, cavities and flattened tops. In treated and untreated areas of stands (foraging or dispersal), large decadent trees, snags, and down logs; large and small down wood that contributes to prey base and cover; and shrub and ground cover for prey would be maintained. On average, 7 snags per acre ranging from 15-20+ inches diameter, with a preference for snags larger than 20 inches (or the largest size class available) would be retained, as would all Douglas-fir, sugar pine and incense cedar snags larger than 20 inches diameter, as operationally/safely feasible. There would be an average of 6-10 large down logs per acre (depending on species composition) in a variety of decay classes with a preference for 20-inch diameter logs, or also the largest size class available. On average, and after piling/burning and underburning activities, the residual down wood tonnage in the project area would range from 5 tons/acre in size classes <3 inches, up to 20-35 tons per acre for larger diameter logs, depending on location (Table 6, WL-40a to WL-40f).

When combined with the retention of thermoregulation/roost sites, and the unthinned patches, the resultant basal area would range from 125-200+ sqft/acre. Other important habitat elements such as existing shrubs and openings for dusky-footed woodrats and other prey base would be retained, and promoted by the small gap creation and group selections. Research suggests that creating small openings may increase habitat use by foraging owls (Irwin et al. 2007, 2012; Courtney et al. 2004-Appendix 5). NSOs can frequently forage at the margins of early seral habitat and benefit nutritionally from being near openings (Hayward et al. 2011; Zabel et al. 1993, 1995). Understory layering where biomass is not thinned will continue to contribute toward vertical structure, cover and perch sites, and where biomass is thinned; it will create improved foraging conditions for NSO and reduce dense fuel ladders.

The aforementioned post-treatment conditions are considered well within the range of stand conditions and variability frequently used by foraging owls in the dry forest ecosystems of the eastern and southern Cascades (Irwin et al. 2007, 2012, 2015). Use by foraging (and dispersing) NSOs (should they be present), is also expected to continue post-treatment given the proximity to other suitable habitats and the range of stand conditions that will be maintained.

Degraded habitat generally returns to pre-treatment quality levels over a 20-year timeframe as remaining trees grow larger, reduced canopy levels reach and exceed 60+ percent, and the mid- and understory continues to develop. These time estimates bar any events such as another epidemic insect or disease outbreak, or uncharacteristic stand replacing fire that can reset the seral stage in a stand, or part of a stand.

The unthinned patches and larger stand areas set aside for no mechanical treatment would continue to provide functional and structural elements. This includes thermal and visual cover, dense small trees, pockets of natural suppression, mortality and size differentiation, and undisturbed debris. These stands will also remain at risk from density-related and insect and disease mortality, though these areas would be smaller and less contiguous than the current conditions.

Foraging habitat function would not be removed during any of the above-described vegetation management treatments. Effects to foraging habitat from landing construction are listed in Table 31 and discussed, along with temporary road effects, in the Interrelated and Interdependent section below.
Growth and Snag Modeling Results for the Preferred Alternative

The following information from the FVS modeling is provided to demonstrate trends in the thinned portions of stands. Table 14 displays the Forest Plan seral stage definitions and how they cross-walk to stand conditions in the project area. The FVS modeling of thinned stands, which does not take into account retention of unthinned patches and roosting habitat elements or deferred high value habitat, shows that the average diameter of overstory trees in the 4a, 4b and 4c seral stages that better correspond to foraging habitat would be 32, 30 and 29 inches post-thinning (see Table 15).

### Table 14. Forest Plan seral stage definitions used for FVS modeling results and project conditions

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Canopy Closure</th>
<th>DBH</th>
<th>Forest Plan Seral Stage Description</th>
<th>Site Specific Elk Project Area Description^</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>10-39</td>
<td>5-21”</td>
<td>Pole/medium tree stage including larger trees in the size range 20-50 feet in height</td>
<td>Pole to medium tree stage predominantly mid-successional with some early successional stands. May include some larger trees. Average height generally 20-60 feet. Average tree age is generally 15-50 years – Older Plantations, Dispersal Habitats, some Foraging</td>
</tr>
<tr>
<td>3b</td>
<td>40-69</td>
<td>5-21”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3c</td>
<td>≥ 70</td>
<td>5-21”</td>
<td>Large tree stage corresponding roughly to a late-successional classification. Trees generally &gt;50 feet tall except for oak types at lower elevations. Average age is generally over 110 years.</td>
<td>Medium to large tree stage spanning mid and late successional classification. Average tree age in stands is generally 60-100 years – Foraging Habitats</td>
</tr>
<tr>
<td>4a</td>
<td>10-39</td>
<td>21” +</td>
<td>Same as Forest Plan except:</td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>40-69</td>
<td>21” +</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td>≥ 70</td>
<td>21” +</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^Descriptions are specific to the Elk Flat LSR project area where high site quality leads to early large tree development, atypical to size/successional stage correlation described in the Forest Plan

### Table 15. FVS modeling results of thinned stands and average diameter of overstory trees compared to no action

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Year 1 - Average Diameter Overstory Trees</th>
<th>Alternative 1 - Average Diameter Overstory Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Action</td>
<td>Year 1</td>
</tr>
<tr>
<td>3a</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>3b</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>3c</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>4a</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>4b</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>4c</td>
<td>26</td>
<td>29</td>
</tr>
</tbody>
</table>

Approximately 20 years post-thinning, and accounting for at least one prescribed fire entry, the tree size classes in thinned stands are modeled to average in the 32, 31, and 30 inch diameter classes in the 4a to 4c seral stages. Compared with no action, this is considered a significant increase of tree growth response post-thinning. The larger differences between action and no action are in the 3a to 3b seral stages, as treated capable habitat and other stands that may contain dispersal or low quality foraging are predicted to develop into better quality habitat, notably in the 3c seral stage.

Again, it is important to understand that the FVS modeling does not take into account the project’s deferred high value RA32 habitat areas, unthinned patches in older plantations (~mixed conifer stands) or the 60 to 120-year old natural stands. Nor does it take into account the tree selection criteria that maintains predominant trees, dominant
trees with late-successional characteristics, healthy dominant trees, and retention of habitat roost/rest clumps. The modeling only shows the results of the thinning activities and is a reference model that allows for comparing trends across alternatives. With the unthinned patches and deferred high value habitat areas, there would be a higher proportion of 24” DBH trees (and larger size classes) per acre in about 25 percent of the project area where these trees are retained in an unthinned condition. When considering only suitable NSO habitat, approximately 40 percent of the total suitable habitat in the project area would not be thinned and is expected to have a higher proportion of 24” DBH and larger trees per acre.

The FVS modeling shows that the number of large trees (>24” DBH) per acre in the 3b and 3c seral stages would increase over time with thinning (Table 16). While modeling also shows lower levels of this same size class in the 4a to 4b seral stages under the thinning scenario when compared to no action, it is important to understand there would be an increase in overall larger average tree size classes with thinning (refer back to Table 15). Also with thinning, there would be a higher amount *project-wide* of 24” DBH and larger trees, but trees in these size classes would be more widely spaced on a per-acre basis in the thinned portions, resulting in fewer modeled number of trees per acre in this size class.

Table 16. FVS modeling results of thinned stands and trees per acre >24” DBH compared to no action

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>No Action - Trees per acre &gt; 24”</th>
<th>Alternative 1 – Trees per acre &gt; 24”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
<td>Year 20</td>
</tr>
<tr>
<td>3a</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3b</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3c</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4a</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>4b</td>
<td>23</td>
<td>31</td>
</tr>
<tr>
<td>4c</td>
<td>24</td>
<td>31</td>
</tr>
</tbody>
</table>

When the number of trees per acre in each seral stage is compared for thinning and no action (Table 17), the reduction in stand density is also evident, primarily in the 3b and 3c size classes that directly result in reduced live and dead canopy fuel loading and risk. These areas represent the thinning and subtreatments in the dense older plantations, and natural stands that contain stagnated, dense under and midstory conditions in white fir, incense cedar and ponderosa pine regeneration.

Table 17. FVS modeling results of thinned stands and total trees per acre compared to no action

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>No Action - Average Total Trees per Acre</th>
<th>Alternative 1 – Average Total Trees per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
<td>Year 20</td>
</tr>
<tr>
<td>3a</td>
<td>148</td>
<td>142</td>
</tr>
<tr>
<td>3b</td>
<td>914</td>
<td>565</td>
</tr>
<tr>
<td>3c</td>
<td>1399</td>
<td>789</td>
</tr>
<tr>
<td>4a</td>
<td>250</td>
<td>306</td>
</tr>
<tr>
<td>4b</td>
<td>297</td>
<td>319</td>
</tr>
<tr>
<td>4c</td>
<td>308</td>
<td>318</td>
</tr>
</tbody>
</table>
Based on the FVS modeling and where thinning occurs, there would be fewer, more resilient, larger and wider-spaced trees per acre and an overall increase in total diameter classes in the dominant, codominant and intermediate tree size classes from reduced density and reduced inter-tree competition. It is important to understand that these modeling results were derived from the 11 natural stands assessed during the 2007 CSEs, plantation data from FACTS and field reviews, and then extrapolated to other similar stands. The inventory data and modeling of thinning treatments over the 20-year timeframe reflects trends in tree growth, and not necessarily absolute numbers (Payne 2015; USDA-FS 2016).

While the growth modeling does provide a tool for comparing effects between alternatives, it does not accurately reflect changing snag levels; both because of recent increases in tree mortality, and because snag densities tend to be patchy and highly variable across the project area. Table 18 below displays the FVS-modeled snags per acre over 20 inches diameter before and after thinning, and at 20 years after thinning. Like the thinning modeling above, this model was run on stands that would be thinned only and also does not take into account the unthinned patches of live trees and existing snags, or the marking guidelines that retain predominant and dominant trees with late-successional characteristics and roost clumps that would contribute toward snag recruitment over the long term. The model also assumes there would be a 20 percent loss of existing snags during operations to provide safe operating conditions and from prescribed fire. The snag modeling results show that levels are expected to decrease after thinning treatments and this is largely due to the removal of hazards. The more open, pine-dominated mid-successional (seral stage 4a) stands have a projected marked decline at 20 years after thinning. These are currently “open” stands with fewer trees larger than 20” DBH and current existing high snag levels (>5-10 per acre). As the existing snags fall, there are low numbers of trees > 20” DBH that can recruit to snags in this size class and the more open stand conditions post-treatment would not promote density-induced mortality (Payne 2015).

The model and its projections also underestimate the numbers of snags 20 years post thinning in light that ongoing mortality from pine beetles is likely to persist until beetle populations decline and tree vigor improves post-thinning. Approximately half of the existing snags are projected to fall from a combination of wind throw and natural decay by year 20. While snags would continue to develop as disease and insect activity continue in the project area, their recruitment is expected to be at more endemic levels. In the unthinned patches, and higher quality habitat areas that are not mechanically treated, mortality is expected to continue over the long term and contribute to large snag and down log recruitment.

Table 18. Average snags per acre over 20 inches diameter in thinned units pre and post-thinning

<table>
<thead>
<tr>
<th>Snag Density ≥ 20” dbh by Forest Plan Seral Stage Class</th>
<th>No Action</th>
<th>Alternative 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Thin</td>
<td>20 Years</td>
</tr>
<tr>
<td>4a</td>
<td>3.6</td>
<td>0.4</td>
</tr>
<tr>
<td>4b</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>4c</td>
<td>4.4</td>
<td>4.6</td>
</tr>
<tr>
<td>Down Logs (range of sizes/classes but at highest size class available)</td>
<td>5 to 60 tons per acre</td>
<td>5 to 35 tons per acre</td>
</tr>
</tbody>
</table>
Fuels Treatments in Foraging Habitat

*Machine Piling and Pile Burning*

Mechanical piling treatments are proposed as a pre-treatment to underburning due to the ponderosa pine and white fir mortality across portions of the project area (see Table 12). Under the timber sale contract, piling would be limited to landings only. Any remaining piling needs would be accomplished post-thinning, using a combination of force account or service contracts. During project planning, a total of 39 units were identified as potentially needing machine piling/burning due to the large (24-30”+ diameter) material size of dead pine and white fir in concentrations of 40+ tons per acre, smaller mortality pockets of dying and dead pine and white fir, and then some small concentrations of fuel accumulations (3-18” diameter, 5-20’ long CWD and logs). These conditions, combined with dense ladder fuels in some stands, contribute to the likelihood of surface fires transitioning to the lower, mid and upper canopy from high heat and flame lengths ≥8 feet. Material size in most areas also exceeds that which could be safely or effectively hand piled, though hand piling may occur in Riparian Reserves (Table 7, RR-6). Acreage estimates account for the total area that could by piled, per unit and habitat review (McRae 2014, 2015).

Machine piling and burning of piles may occur in 17 units with foraging habitat on up to 242 acres, including 5 acres in oak release areas (not unit 153) and 15 acres where foraging habitat is downgraded by radial thinning. The need for piling would be assessed when activity-generated surface fuels, combined with natural fuels, exceed the requirements described in the project design features (Table 6, WL-40), or if a safety or prescribed fire/wildfire behavior concern is developing based on location and tonnage. Piling would only be implemented where needed and only one piling entry per unit would occur. The total potential acreage that could be piled was assessed in order to fully disclose effects on different resource areas and conditions. However, not every acre is expected to be piled and burned. The range of actual piling acres across the 17 units is estimated to be between 10-80% of the planned area. Machine passes would be limited to the extent needed to reduce fuel loading and piling would focus on high fuel load areas and mortality pockets to meet the levels described in Table 6 (WL-40a to 40f). A variety of equipment may be used, including but not limited to bulldozer or excavator. Monitoring of fuel loading and evaluation of where to place treatments and the effects of treatments would be completed.

In the Riparian Reserves along Ash Creek where limited thinning would occur in foraging habitat (~36 acres),30 piles may be burned, but no machine piling will occur in designated equipment exclusion zones or unthinned patches (Table 6, RR-6, RR-11). Hand piles may be constructed and burned if they are ≥20 feet from the inner gorge. Residual large (~40’ long x 20’ tall x 20’ wide) landing piles in Riparian Reserve unit 346 would not be burned in order to maintain structural elements for NSO prey (and fisher/northern goshawk prey and use; Table 6, HS-3).

Not all piles would be burned. Per project design feature WL-37, two unburned piles per acre would be left to provide small mammal habitat. While these piles would be left unburned initially, they may be partially or wholly consumed during the follow-up prescribed fire entries, expected to occur within 2-5 years after initial piling. The biologist and fuels specialist will also conduct a review of units where piling is completed to determine which piles to retain, or if any additional piles are needed. If needed, ~1-2 additional hand piles of smaller material would be constructed per acre.

---

30 There are approximately 50 acres of treatment area in the Ash Creek Riparian Reserve that may be subject to machine piling/burning of piles. The remaining 14 acres are situated in plantations or non-habitat units.
**Prey Effects from Machine Piling-Pile Burning**

NSO prey in the action area and project area is described in Appendix D. Prey abundance is an important element of NSO foraging (and dispersal) habitat and a significant reduction of prey influences habitat quality. Machine piling influences NSO ground-based prey and habitat by reducing shrub and forest floor vegetation, since it uses heavy equipment to drag and pile woody debris, and in the process, disturbs the soil surface and ground cover that provides habitat and forage base for voles, deer mice, dusky-footed woodrats and flying squirrel. These mechanical fuels treatments may cause short term disruptions in prey use and habitat from a reduction in shrubs, down wood and understory trees (Lyon and Huff 2000, Converse et al. 2006). Disturbance to surface litter and exposure of mineral soil during piling can result in patches of dense shrub and conifer seedling re-growth that also provide forage and cover. Conversely, machine piling reduces CWD, shown to be positively associated with the occurrence of truffles and hypogeous fungi (Amaranthus et al. 1994); an important food source for many small mammals and flying squirrels (Carey and Johnson 1995, Waters and Zabel 1995). Activities that cumulatively and significantly reduce the number of snags, or remove CWD and shrub understories during mechanical fuels treatments can lead to a localized reduction in populations of some NSO prey.

The reduction of down wood and snags (as well as small diameter understory trees, shrubs and forest floor vegetation) where machine piling is used is expected to be patchy, and may have short term adverse effects on prey, primarily woodrats and deer mice, due to displacement in and near these units. No mechanical piling or pile burning would occur in nesting/roosting habitat, high quality foraging habitat, or designated unthinned patches that contain higher levels of large down wood and snags. Adjacent untreated areas of early- and mid-seral forest, and shrubby openings would also continue providing habitat for woodrats (Sakai and Noon 1993). This treatment, combined with the measures that retain large down logs and snags (Table 6, WL-40a to 40f) and unburned piles for prey base (WL-37) is not expected to adversely or significantly contribute to the thinning effects that maintain foraging habitat function, but would contribute to habitat quality being reduced in the short term (the ‘degrade’ effect).

**Low-Intensity Prescribed Fire**

**Treatment Recommendations and Rationale**

Stephens and others (2012) discuss that prescribed fire and its mechanical surrogates are generally successful in meeting short-term fuel reduction objectives and creating more resilient stands to high-intensity wildfire. The purpose of the mechanical fuels treatment and prescribed fire is to improve the project area’s resilience such that it can tolerate fire (either through reintroduction via prescribed burning, or management of a natural ignition). Creating a modified fuelbed that supports a fire type that creates or maintains stands similar to those which occurred on the historic landscape is part of the project’s purpose and need, and any fire in the project area could offer an opportunity to restore the historically frequent, low-intensity regime (Reinhardt et al. 2008). The NWFP standards and guidelines describe that thinning prescriptions and prescribed fire can work in concert to develop diverse stands with large trees and a variety of species in the overstory and understory by releasing advanced regeneration of conifer, hardwood or other plants and reducing the risk from [high-severity, uncharacteristic] fire, insects, diseases or drought conditions (USDA-FS and USDI-BLM 1994 p. B-6). They stipulate that prescribed fire should be planned to minimize the consumption of litter and coarse woody debris (p. C-44).
The Recovery Plan also notes that “prescribed fire may be a means to reintroduce fire as an ecosystem process, but will likely need to be implemented at scales much greater than what has been done in the past to be effective (Baker 1994, Taylor 2000)” (USDI-FWS 2011 p. III-37).

**Treatment Summary and Design Features**

Prescribed low-intensity fire would be implemented on 3,483 acres in the project area, in accordance with the measures described in Table 8 and Table 9 and applicable RPMs in Tables 6 and 7. Entries would occur every 5-10 years for 2-3 entries with the intention of fully restoring conditions consistent with the natural fire regime. It may take up to three years to implement one burn entry, given measures to not burn more than 50 percent of the suitable habitat in an NSO core or home range in a season or year and other factors (Table 6, WL-38).

Roads and natural barriers would serve as primary control lines, though hand line or small to medium crawler tractors may be used to construct line where necessary along private land boundaries (~8-foot widths). Mechanical fireline construction would only remove litter and duff and avoids removing the upper layers of topsoil. It does not remove trees, though saplings and brush may be run over. Lines would be rehabilitated post-burning by dragging bermed material (brush, saplings) back over the line.

The combination of an initial mechanical treatment in most stands, followed by repeated fire entries, is expected to move the project area toward ‘condition class 1’, defined as a fire regime within the natural historic range (McRae 2015). It may also have cumulative adverse effects on prey species. As this is the first project to propose underburning across a project area where there is documented fisher and northern goshawk use, NSO habitat, and existing and potential late-successional habitat, numerous minimization measures and monitoring were developed (Tables 6, 7, 8 and 9).

Underburning treatments in natural stands would be implemented to meet prescribed targets of duff and litter consumption while minimizing the mortality of trees <4” diameter (range of 50-100%), and for trees >14” DBH, meeting a limit of <5% mortality (see Tables 8 and 9 in the **Project Design Features** section). Burning would be implemented to maintain shrubs at 30-50% levels and snags and down wood at the prescribed levels for natural stands and plantations. These levels were determined as an average across stands and were developed through consultation with the FWS.

Prescribed fire would only be implemented after remaining trees (where stands are initially thinned) show signs of increased health and vigor (Table 7, SF-28). During underburning, firing techniques, wind, fuel moisture and other conditions would be assessed to assure that at least 30-50% of grass, forbs and shrubs would be retained. No direct ignition would occur in RA32 stands or unthinned patches of units 152-1, 154, 165, 169, 171, 172, 174 and 235 to protect high quality NSO and fisher denning habitat. Also to minimize impacts to N/R and foraging habitat structure and prey base elements, including mycorrhizal fungi, underburning would only occur during conditions that do not result in more than 10% full consumption of down logs in the 20-inch diameter and larger size classes. Burning under conditions that limit consumption of 24-inch+ diameter logs to five percent or less is preferable. This measure applies to all units, though it may not be operationally or safely feasible in unit 163 (contains foraging habitat) and units 175, 204, 206 (non-habitat) due to extensive pine mortality. This measure is also intended to minimize loss of understory layering, large snags and trees, and large down wood in units 150, 152-1, 152-2, 154, 155, 156, 162, 165, 167, 168-2, 173, 182 and 221 (WL-42). When burning in Riparian Reserves, which primarily contain foraging,
dispersal or high quality habitat for NSO, embedded down logs, stumps and riparian plants and root systems would be retained with up to 5% minimal damage (Table 6, RR-11).

To reduce injury or mortality to large predominant trees, measures include burning in conditions of a moist duff layer while protecting roots in lower duff; varying ignition techniques to limit residence time at the base of large trees; pulling duff away from bole damage that may cause fire to burn longer or travel into the crown; implementing tree well burning to pre-burn an area immediately surrounding the tree (usually in early to late spring with snow and moister conditions and subject to LOPs); reducing large down fuel near the base of trees to limit heat residence time on the bole and fine roots; and mixing duff and litter to encourage fine roots to grow into the soil prior to underburning or to bring moisture to the surface to discourage fire from reaching the boles (Table 6, SF-25).

**Prescribed Fire Effects in Foraging Habitat**

As a stand-alone treatment, prescribed fire would be implemented on 249 acres of foraging habitat and after thinning, on 795 acres (see Tables 12 and 13). Based on research and personal observations of underburning practices and effects on the SMMU, prescribed fire is predicted to result in a mosaic of burn intensities; depending on existing fuel loading, current conditions and any changed conditions over the established time span for burning (Jordan 2015; McRae 2014, 2015; Clark 2014).

The prescribed burning with low-intensity surface fire would occur after thinning and piling/burning and could have cumulative adverse effects on prey, depending on the duration and timing (i.e. length between piling and first prescribed fire entry, amount of area burned in a season/year, follow-up entries).

As discussed above, mechanical piling may cause short term disruptions to prey in, and displacement of prey from, treatment stands. It can also reduce cover and forage habitat by reducing shrubs, CWD and understory trees (Lyon and Huff 2000, Converse et al. 2006). The project design features described above and in Tables 6 and 7 for piling/burning and underburning activities are expected to minimize the potential for adverse effects to small mammals. While individuals may be affected, a reduction in the local populations is not expected, largely because of the spatial and temporal variation in treatment.

The direct effects of prescribed fire on prey and suitable (and dispersal) habitat would primarily be limited to the season or year of implementation. Direct effects to habitat elements will depend on the season of burn, fuel moisture content and vegetation being burned. Underburning would reduce surface slash and essentially “thin” understory vegetation while releasing short-term nutrients for tree growth, and charring/burning residual trees or snags, small trees and saplings. Prescribed fires are typically meant to burn at a low-intensity, though may be fast-moving depending on fuel type, moisture or wind. They typically result in a mosaic burn that is beneficial to soil fertility and tree and shrub growth, provided >50% duff and fine litter is retained (Rust, Courtney 2015). Moderate to high-intensity burning can fully consume litter, duff and intermediate sized trees, reducing cover to <50 percent. If flare-ups occur (notably in stands that are not mechanically thinned before burning), they could reduce the under, mid and overstory layering through individual tree mortality, create small mortality patches, or create or consume snags (Innes et al. 2006; Franklin et al. 2007; Laudenslayer 1997). New snags would contribute to future down wood. Small openings created by single tree mortality, or small groups of co-dominant trees, are also well described in the literature as a significant ecological process in the development and maintenance of forest structure (Franklin et al. 2002, 2013). Given the narrow burn prescription for the ‘type’ of fire desired in the project area in both previously thinned and non-thinned stands (see Tables 8 and 9), the midstory is not likely not be reduced by more than five
percent, and the overstory likely less than one percent. A reduction in canopy closure in thinned and unthinned stands is not expected, though small canopy gaps may be created (Harrod et al. 2009). This is considered a beneficial effect.

Underburning would likely consume small pieces of wood, herbaceous vegetation, and possibly kill brush, but areas will not be burned completely and some areas will not have direct ignition, helping to retain stand structure and forest-floor complexity. Cool-burn prescriptions would also limit consumption of large down wood (Innes et al. 2006; Beche et al. 2005). Immediately following burning, prey numbers may decline until vegetation regenerates (one season to five years, depending on location).

Underburning in prior-thinned stands or more open-canopy areas is expected to increase understory structural complexity and habitat heterogeneity by stimulating shrub and plant growth; a beneficial effect to NSO prey (Anthony 2007; Knapp et al. 2007; Hayward et al. 2011; Zabel et al. 1993, 1995). Utilizing prescribed fire in the oak release areas may also impact truffle production, though studies on this are inconclusive (Smith et al. 2009; Wilson and Forsman 2013). Roberts and others (2015) also describe that the use and reintroduction of fire to create a heterogeneous mixture of fire severities, while also maintaining connected patches of unburned forest, could have short term negative effects on prey due to reduced refugia and food sources, but lasting positive effects on small mammal assemblages in historic frequent-fire landscapes.

Monitoring would be completed to assess effects of underburning-only treatments in suitable NSO habitat. These effects, as well as those observed during and after burning in thinned stands, would be evaluated periodically to assess if underburning treatments are meeting the levels of acceptable mortality determined by the interdisciplinary team and FWS (Tables 8 and 9). If monitoring indicates that modified protection measures are needed, either due to unintended effects or changed environmental circumstances, an analysis would be completed through a Chapter 18 NEPA review prior to additional entries.

**Effects to Dispersal Habitat**

Approximately 301 acres of NSO dispersal habitat would be treated (see Tables 12 and 13). Of these 301 acres, none are situated in the ST-215 core, and there are 64 acres in the home range. Of the home range amount, 15 acres are in critical habitat (units 12, 153, 169). Approximately 221 acres would treated with variable density thinning and radial thinning around legacy pine in the natural stands, ~4 acres would be maintained and benefitted through plantation thinning (including one acre in critical habitat), and ~76 acres would be maintained and benefitted with stand-alone low-intensity prescribed fire.

In the 221 acres of variable density thinning treatments, including ~70 acres of machine piling and pile burning, 180 acres of dispersal habitat would be modified but habitat function would be maintained post treatment. Dispersal function would be removed on about 41 acres through variable density thinning that includes radial thinning around legacy pine, including ~27 acres of machine piling and pile burning.

---

31 While the Forest is not conducting any specific experiments, as described for Recovery Action 11 (USDI-FWS 2011 p. III-47), the intent of this monitoring is to assess effects of low-intensity prescribed fire on unthinned nesting/roosting habitat and high quality foraging habitat, as well as thinned stands. Information would be utilized in future projects.
Thinning to an average basal area of 80-140 sqft/acre in dispersal habitat, depending on stand conditions, will reduce tree stocking. Combined with strategically placed radial thinning, these treatments would also reduce overstory canopy cover to a range of 30-50%, depending on treatment location.

In the 18 stands where dispersal habitat would be thinned and modified (remain functional for dispersing NSOs), the habitat is interspersed with foraging or non-habitat. 180 acres would be modified through the reduction of some elements (thinned trees and reduced snags, logs and some understory during piling/burning and underburning) but is expected to remain functional post treatment.

This determination is made based on the predicted residual canopy cover of 40-50%, combined with the retained variable understory structure, roost clump habitat and unthinned patches; and shrubs, snags and down wood that provide prey habitat. Approximately 14 of these acres are in critical habitat where residual basal area in dispersal would average 125-135 sqft/ac and canopy cover is estimated at 45-55% (units 153, 169). In unit 169, there is a potential that by the time treatments are implemented, dispersal habitat would no longer be functioning due to the ongoing mortality in the pine component that is actively reducing/removing canopy cover, though contributing to prey base through snags and down logs.

These treatments are spread across the project area and would not create significant barriers to dispersal.

Because radial thinning treatment removes most trees within 50 feet of the bole of large predominant legacy pine, and because where these 41 acres are situated (units 152-1, 158, 159) the stand conditions are already more open due to ongoing pine mortality, dispersal habitat function would be removed through thinning and radial thinning in patches. Where pine would be radially thinned, roost sites and adequate cover from avian predators are either not available, or would not remain in adequate levels post-treatment surrounding the pine. These treatments are concentrated in the eastern portion of the project area (west of Elk Flat meadow) and are in proximity to existing large and expanding areas of non-habitat. The increase in sunlight around these openings and in the remaining thinned portion of the stands is expected to stimulate natural regeneration and growth of shrubs and herbaceous cover, contributing to higher densities of woodrats (Manning et al. 2012; Wilson 2010; Innes et al. 2007; Forsman et al. 2004; Williams et al. 1992). NSOs also frequently forage at the margins of early seral habitat and benefit nutritionally from being near openings (Hayward et al. 2011; Zabel et al. 1993, 1995). The openings created during radial thinning in dispersal (and foraging habitat) are generally expected to have an indirect benefit to NSO habitat suitability over the long term in terms of prey abundance as understory growth of pole-sized/early seral habitat that woodrats prefer regenerates.

**Fuels Treatments in Dispersal Habitat**

Machine piling and pile burning heavy accumulations of down logs and surface fuels in 97 acres of dispersal habitat in natural stands would have similar effects to prey species and habitat as the piling/burning described for foraging habitat above. Given the greater abundance of larger material in dispersal stands (primarily 18”+ diameter, 10-40’ long down pine and some white fir at 25-50 tons per acre), piling is likely to result in disruption to higher levels of prey using these more open areas (golden mantled ground squirrel, deer mice, vole, dusky-footed woodrat).

Underburning with low-intensity fire on all 301 acres would also have similar effects as described for foraging, and significant reductions in residual canopy cover and overall tree size are not anticipated.
As previously described in the **Fuels Treatments in Foraging Habitat** section, the cumulative disturbance effects of thinning and mechanical equipment operating in stands, machine piling and burning of piles on 97 acres of dispersal habitat, and follow-up prescribed fire entries could have adverse direct effects on ground-based prey in the affected areas. Individuals could be adversely affected (displaced, killed), but the larger local population is not expected to be significantly reduced. The timing between entries (one season to 5+ years, depending) provides temporal separation of disturbance. Not all piling would be done in the same year and units would only be piled once (there are no repeat piling entries). Combined with the adjacent unthinned patches and snag retention, and measures that specify post-treatment down log and snag levels and unburned piles, significant adverse effects to prey population levels are not expected to occur in treated stands, or at the project area scale, due to the spatial and temporal separation of treatments.

**Effects to Capable Habitat**

The effects to capable habitat from variable density thinning and subtreatments, machine/piling and burning, and prescribed fire are similar to those described for foraging and dispersal habitat above.

Approximately 329 acres of capable habitat would have a combination of thinning, machine piling/burning piles, group selection, radial thinning and underburning (see Tables 12 and 13). All 329 acres are in the ST-215 home range and of this amount, 96 acres are in the core and 164 acres are treated critical habitat.

The current dense and uniform stand conditions in 294 acres of older (40+ years) ponderosa pine plantations limit use by most wildlife species and the stand variability created through thinning these trees to 80-100 sqft/ac, creating 2-acre group selections (~58 acres) and radial thinning around legacy pine (~58 acres based on prescription) would open up the canopy and facilitate access for foraging, or maneuvering through these stands. These plantations are ponderosa pine-dominated, dense and lack overall understory diversity (including large snags and down logs), but they are all situated within and between larger units of foraging habitat (see Map 4 in Appendix B). Several of the older plantations have remnant mixed conifer that currently provide roosting sites and foraging opportunities (more prevalent in units 16 and 18 in the home range, and portions of unit 14 in the core). These mixed conifer areas would not be mechanically thinned, but are part of the unthinned patches.

Group selections (≤ 2 acre openings) in six of the older plantations are proposed in two different stand conditions; they would either be placed in dense ponderosa pine or in existing pine mortality pockets where 70-90 percent of the trees have already died. This treatment would introduce a new cohort of species and age class, particularly along plantation edges adjacent to foraging or other higher quality habitats (e.g. unit 14 is directly adjacent high value habitat in units 168-2 and 150, and a portion of unit 18 is adjacent high value habitat in unit 154).

Piling and burning of piles is proposed in five of the older plantations on a total of ~28 acres, given some of the ongoing mortality and expected breakage during thinning operations that would increase fuel loading above desired levels for safe underburning. Prescribed fire would benefit understory composition, but may impact reforested areas in the group selections. Timing of prescribed fire would be coordinated in these areas with the Unit’s culture shop and the piling and one burning entry would likely occur prior to reforestation efforts. This would provide for local site preparation and then an approximate 10-year interval for tree growth before the next prescribed burn entry.

---

32 The exception is unit 6 where unthinned patch areas would primarily be composed of snags, as this stand lacks the remnant mixed species areas and overall habitat elements that contribute toward the LSRA activity design criteria for unthinned patches.
Long term stand development and habitat benefits would be realized through the increased tree species and structural complexity, improved resilience to mixed severity fire, and eventual long term development of multi-aged, multi-species stands that contribute an additional 294 acres of dispersal and foraging habitat in the core, home range and critical habitat. The short term benefit is the reduction in fuel concentrations in these stands which currently pose a risk to adjacent quality habitat.

The remaining 35 acres of capable habitat would also be improved and moved toward dispersal or low quality foraging condition by thinning and underburning-only in 4 acres in young plantations, and thinning or underburning-only in about 31 acres of 60-120 year old natural stands, followed by low-intensity prescribed fire.

**NSO Prey Effects Summary**

As described for foraging and dispersal habitat treatments above, responses by NSO prey to thinning and fuels treatments are expected to vary. As the understory layer of a forest is usually the first and quickest to respond to increases in growing space, light and nutrients created by thinning, it typically results in increased structure and plant diversity on the forest floor that provides food, shelter and protective cover for small mammals (Wilson and Forsman 2013).

**Treatment Rationale**

Franklin and others (2000) hypothesized that a mosaic of different vegetation and seral stages can offer a stable prey resource for NSOs. Dense, closed-canopy second-growth without legacies can not only be devoid of exploitable prey populations (Carey 1995; Carey and Johnson 1995; Carey and Harrington 2001) but also poorly suited for owl nesting, roosting or foraging. This period of low structural diversity can last for more than 100 years (Carey et al. 1999; Franklin et al. 2002). While dusky-footed woodrats are benefited by delayed recruitment of a dominant cohort of conifers and rapid recruitment by evergreen hardwoods, flying squirrels respond oppositely; requiring denser canopies and midstory cover/connectivity for protection from predators (Wilson and Forsman 2013). The degree to which legacies are retained during thinning is an important determinant of recolonization of a site by all life forms (Perry et al. 1989; Franklin et al. 2000), and such legacies include fungi that are a mainstay of northern flying squirrel (Amaranthus et al. 1989), large snags and down wood, and trees with cavities.

The proposed variable density thinning (including group selections in six pine plantations and two natural stands; small gaps in dense, small white fir; radial thinning of legacy pine; and hardwood release) is expected to accelerate development of spotted owl habitat and dense(r) prey populations (Carey 1995, 2001, 2003; Carey et al. 1999a, 1999b; Carey and Wilson 2001; Muir et al. 2002) especially since the treatment design retains decadence such as large snags, trees with cavities or structure (brooms, large limbs) and large coarse wood (Bunnell et al. 1999; Carey 2002). The effects of variable density thinning on prey (and habitat structure) can be similar to the positive effects of conventional thinning in terms of increased tree growth, crown differentiation, understory development and increased flowering and fruiting of understory plants that provide important habitat structure and prey base, but without the same extent of heterogeneity or canopy-connectivity loss, or substantive negative mechanical impacts (Carey et al. 1999). While there can be a short term impact on truffle production from mechanical equipment use and soil disturbance, thereby affecting flying squirrel abundance and NSO foraging success, the ecosystem recovers and begins to develop more quickly and completely than following conventional thinning. The created canopy gaps would also facilitate another age class of shrubs and small/pole-size trees that support woodrat.
Treatment Effects

Variances in effect on prey base habitat and individuals will be dependent on habitat type, type of treatment (e.g. just thinning and burning, just burning, or thinning/piling and underburning), and the spatial and temporal separation of treatments. The thinning and fuels treatments in the northwestern and western extent of the project area are expected to have a lower level of disturbance impact to individual ground-based prey, as higher levels of woodrats, voles, and deer mice are currently more concentrated in the eastern extent of the project in dispersal habitats with greater amount of openings, regeneration, shrubs, large down wood and large snags. This does not mean these prey species are not well-distributed in the early seral stands in the western portion of the project, just that they likely occur in higher levels in the eastern extent based on habitat conditions.

Where prescribed fire, thinning, or a combination of fuels reduction treatments have been used in forest types that historically experienced low- to moderate-intensity fire regimes, the treatments have not been shown to produce dramatic negative impacts on plant communities that support NSO and other wildlife prey. Various studies on the combination of thinning and prescribed fire in mixed conifer and ponderosa pine forests have also shown the risk to be low in both the understory and overstory layering and canopy (taking into consideration burning prescription, weather, moisture content of fuel; Stephens et al. 2012). Converse and others (2006) found the treatment responses of individual small mammal species to be dependent on the type of treatment, predicting that total small mammal biomass should increase after thinning, prescribed-fire, or combined thinning and prescribed-fire.

The short term (0-4 year) effect on prey response also shows that at the stand scale, thinning and low-severity prescribed fire can increase regeneration of vegetation, modify fuel dynamics and fire behavior and cycle nutrients. It is understood that these vegetation responses to each treatment can widely differ (Boerner et al. 2009; Schwilk et al. 2009), but thinning or low-severity prescribed fire have the potential at least in the short term, to create forests with similar structure and with habitat conditions favored by many species (Stephens et al. 2012). Long term assessments for these treatments are not available.

All treatments completed with whole tree yarding are expected to have some short term negative effects on individual prey and their food and cover due to machinery. While whole tree yarding would reduce the amount of activity slash in units, current levels of mortality across a significant portion of the project area would require the use of machine piling and burning of piles to reduce fuel loading to levels consistent with the project design features and safe underburning. Disturbance to understory plants, ground cover and hypogeous below-ground fungi may reduce some habitat elements over the short term.

Dusky-footed woodrat densities generally appear to follow stages influenced by habitat quality. They include: unsuitable (recently burned clearcuts) to optimal habitat (sapling/bushy pole timber that is 15-40 years old), with a gradual decline to marginal and poor quality habitat (small and large saw timber stands/intermediated-aged forests). There is a possible second peak in abundance in older forests as canopy openings form, creating patches of stable, brushy understory (Carey et al. 1999; Courtney et al. 2004; Hamm 1995; Hamm and Diller 2009; Sakai and Noon 1993). As described in the NSO Prey section of Appendix D, woodrats are likely the primary NSO prey species in the project area and the reduction of woody debris and small trees which provide cover for this species, will likely affect woodrat numbers until trees and brush regenerate (Carey 1991) while openings will create habitat conditions that are favorable.
For mice and voles which are strongly associated with woody debris, fuels treatments will likely result in a local decline of these species immediately after treatment, but the following year, numbers are expected to rebound as more fine woody debris and herbaceous vegetation becomes available (Carey and Wilson 2001; Converse et al. 2006, Manning and Edge 2008).

Where mixed conifer/foraging stands are thinned, piled and burned; or thinned and burned in 297 acres of NSO foraging habitat, there will also be short term impacts to tree squirrels and potentially flying squirrel (there are no red tree voles in the project area). While flying squirrels are not likely abundant in the project area, treatments will increase canopy openings that may have some effect on survival within treatment units (Wilson 2010). Treatments are not expected to adversely affect short or long term prey forage or prey availability however, as they would not significantly reduce the understory or overstory density (Wilson 2010; Manning et al. 2012). The variable density thinning approaches, unthinned patches, RA32 stands, and tree selection criteria (see Table 5) would maintain some high density patches and structural occlusion in the mid story to reduce predation and detection rates of flying squirrel (Wilson and Forsman 2013). Also, the best available habitat for flying squirrel would be retained in an unthinned and un-piled condition, but be subject to low-intensity fire. While tree and flying squirrel forage based may be impacted in the short term from ground-based thinning, piling and burning, since arboreal lichen primarily occurs in larger, older living trees, it is expected to be largely unaffected by these treatments. One study in dry mixed conifer of northeastern California also found that while flying squirrels were not old growth specialists, they occurred in lower densities in shelterwood stands. This is likely due to the heavy logging and extensive site preparation that can negatively affect individuals (Waters and Zabel 1995). None of the NSO foraging habitat would be subject to such treatments, and this same assessment found that flying squirrel density was positively correlated with a higher frequency of hypogeous fungi (truffles) and conditions that support it. The project’s measures for burning in cool prescriptions would help maintain soil moisture, substrate and nutrients for prey forage (Table 6, WL-42). Mechanical piling is also not proposed in unthinned patches, high value NSO habitats, or the Riparian Reserves along Ash Creek that support NSO habitat and prey.

In the remaining 400 acres of foraging stands that are treated and habitat function is degraded, the post-treatment condition would continue to provide habitat for other tree squirrels and NSO prey in the short term. The increased growth and vigor of medium and large trees, supported by the FVS modeling and the basic knowledge that thinning predominantly smaller trees provides resources for the resilience and accelerated growth of residual large overstory trees, as well as creating growing space for development of increased structural diversity, will contribute toward recruitment of larger snags and down wood over time (Carey 2003; Carey et al. 1999; North et al. 2009; Latham and Tappiener 2002; Garman 2003; Kolb 2007). Creating ‘gaps’ in the canopy, coupled with disturbance to the surface litter and exposure of mineral soil from pile burning, will also promote patches of dense shrub and conifer seedling re-growth that can provide forage and cover for NSO prey (Hayward et al. 2011, Zabel et al. 1993, 1995; Courtney et al. 2004).

Current densities of other prey species may decrease due to the combination of thinning, machine piling and burning piles, and follow-up underburning for the first season, or up to 3-5 years following treatment as many species are positively related to cover and woody debris that these treatments will reduce, including woodrats. Woodrat middens are highly flammable and can burn in low-severity fires. While a short term decrease in prey habitat quality and microsite-availability may occur; the scale and intensity of this effect is not considered significant to populations as treatments and effects will be spatially and temporally separated (discussed above in
the **Fuels Treatments in Dispersal Habitat** section). Prey species habitat that is not mechanically treated will remain available, including adjacent untreated early- and mid-seral forest, shrublands and brushfields, and dense unthinned patches with large trees, snags, down logs and shrub openings that provide habitat for woodrats, flying squirrel and other potential prey.

Effects to NSO prey in oak release areas are not expected to result in adverse short or long term population effects. These areas would be thinned and oaks released, but no machine piling or pile burning is proposed. The effects of low-intensity fire on prey are also not expected to be adverse. What fire may do to benefit the stand in general is not well understood, and monitoring is proposed to evaluate the effectiveness of the release treatment and underburning (see monitoring section of Table 6). When California black oak woodlands shift to conifer-dominated stands, treatments to restore remnant oaks are energy intensive as conifer trees become large and more fire resistant. While removal of relatively large diameter conifer can be successful at restoring structure and vigor of encroached Oregon white oak woodlands (Devine and Harrington 2006, 2013), this treatment has not been intensively evaluated in California black oak ecosystems. Prescribed fire is one potential tool to aid in restoring the oak component, but as the residual encroaching conifer mature, it may become increasingly ineffective at maintaining the oak element (Engber and Varner 2012, Cocking *et al.* 2013).

While there will be a reduction in prey base elements, the project design features that retain unburned piles for small mammal habitat; large snags and down wood; understory layering and vertical structure; and 30-50% cover of shrubs during underburning and other fuels treatments, will assure that important elements for NSO prey are well-distributed and maintained across foraging and dispersal habitats in treatment units. There may be adverse effects to individuals, and local prey densities and distribution are likely to shift due to disturbance, but populations are not expected to be adversely or significantly reduced. The short and long term benefits include healthier residual stands of larger overstory trees, snags and down wood and reduced fire behavior and intensities. Based on the rationale above, neither measureable direct nor indirect adverse effects are expected to occur on any NSOs that may use the project area from short term, site specific changes in prey density or availability.

**Effects in NSO Cores and Home Ranges**

The one core and home range in the action area, ST-215 (Elk Flat) is assessed for direct and indirect effects and potential changes to habitat over time from Alternative 1. As previously described in this document with respect to levels of suitable habitat in a core and home range that better support NSO survivorship and productivity, the ST-215 home range is below recommended levels of habitat at both spatial scales. There is with 37% suitable in the total home range and 69% suitable in the core, with N/R habitat at about half the recommended amount in the core. A more detailed account of existing conditions in the home range is included in the **Habitat Quantification in the Action Area** section of **Appendix D**, which discusses land management at both spatial scales.

The home range currently contains 1,256 acres of NRF and 958 acres of dispersal; with 334 acres of capable habitat and 850 acres of non-habitat. At these levels, 65% of the home range area provides for ‘sufficient’ dispersal function (inclusive of NRFD). The larger proportion of suitable habitat on NFS lands at both core and home range scales, and the management direction for the Elk Flat LSR (contrasted with past and ongoing private lands management), affords an opportunity to positively influence structural and compositional changes that increase habitat resilience and long term suitability. This includes actively managing the capable habitat on NFS lands.
The home range has not been occupied by a reproductive or territorial NSO pair in 25 years, or a verified resident single NSO in 12 years, based on the best available survey data (see Table 32 in Appendix D). Three seasons of 2012 protocol, 6-visit surveys have been completed, with one year of modified 3-visit spot checks (2012-2015). Activity center stand searches have been completed annually since 2007. Surveys and stand searches will continue prior to and during implementation. The Forest’s NRIS and CNDDB layers were checked in October 2015 for any new data, and private landowners were contacted again in November 2015 for annual survey results. Private land surveys were negative for both barred owl and NSO in 2015, with no new activity centers established, or verified barred or spotted owls detected, in the action area. The CNDDB was re-checked on March 7, 2016 to see if any updates had been made and there were none. Outputs for activity center history from the CNDDB near, but outside the action area, are included in the project record. All other sites listed in the CNDDB that are not known to be occupied and in proximity to the action area are either considered abandoned or are not a valid activity center (CNDDB 2016).

There are no other established NSO activity centers or home ranges in the action area at this time based on the CNDDB and private land/USFS survey results.

The interim guidance and prioritization for treatments under Recovery Action 10, and consultation with the FWS, resulted in prioritization of the ST-215 home range for active management (USDI-FWS 2011 pp. III-44 to III-45). The following prioritization guidance and rationale is included for reference.

Land managers should prioritize vegetation management and silvicultural treatments intended to enhance habitat conditions based on the following (FS rationale is provided for each recommendation).

- **Status as follows:**
  - Unoccupied stands: Assessed through surveys, currently unoccupied.
  - Miscellaneous observations sites: Not currently applicable; last observation in 2003 (confirmed) with probable feather observed in June 2011 (Farber 2013).
  - Historic sites: ST-215 is considered a historic activity center based on survey data.
  - Known sites – resident singles: Not currently applicable; last confirmed resident single NSO in 2003.
  - Known sites – resident pairs: Not currently applicable; last confirmed nesting NSOs in 1990.
  - Known sites with <40% in the provincial home range and <50% habitat within the core home range: ST-215 meets the <40% in the provincial home range, but contains 69% suitable habitat in the core. Habitat in the core would not be downgraded or removed.
  - Ability to affect meaningful structural change in <30 years: This is predicted based on the expected short and long term effects of the proposed vegetation management activities on foraging and capable habitats, and to a limited extent dispersal habitat, in the home range. Habitat effects are based on the existing stand conditions, prescriptions, project design features that maintain high value habitats (N/R and high quality foraging), the effects of variable density thinning treatments, radial thinning around legacy pine, black oak release, small gap creation in white fir, mechanical fuels management, three entries of prescribed fire (most impacts to potential prey species and habitat, and the FVS stand growth modeling.

The Recovery Plan recommends land managers should generally avoid activities that reduce nesting, roosting and foraging habitat in provincial home ranges (1.3 mile radius) of reproductive pairs. Activities that address threats
from stochastic disturbance (insect, disease, wildfire) by restoration action will generally be consistent with the intent of RA10 even if short-term effects would occur to NSOs.

The project meets these recommendations, based on current survey data, the existing conditions in the Elk Flat LSR, and the purpose and need to reduce the risk of losing early, mid and late-successional habitat and accelerate development of late-successional habitat. Within activity centers, treatments should be prioritized by habitat quality as follows, such that nesting/roosting habitat would be the last to be considered for treatment:

1. Capable/non-capable: Addressed through prioritization of proposed treatments in older ponderosa pine plantations in the core and home range on NFS lands that comprise 19 and 10 percent, respectively. These stands have interspersed remnant natural stands/foraging habitat pockets and these mixed species areas would not be thinned, but would be underburned. These areas are integrated into the unthinned patches under the project’s design and consistency with the Forest’s Late-Successional Reserve Assessment.

2. Dispersal: A minor component of the home range at 64 acres in natural stands with ongoing ponderosa pine mortality from overstocking combined with root disease and bark beetle attacks, and therefore is proposed for treatment to reduce stocking, promote pine where it is healthy.

3. Foraging: Prioritized in areas of high stand density with a lack of overall structural and species diversity, homogenous stand conditions, and dense understory regeneration of white fir, incense cedar and ponderosa pine that precludes foraging. Treatments would occur in such stands in the core and home range. Treatments are also prioritized in small (1/10 to 0.25 acre) and large (~27 acres) areas where black oak release can increase this stand element and habitat suitability over time (prey), though with a short term adverse effect to critical habitat elements of foraging PCE3.

4. Nesting/roosting: Low-intensity prescribed fire is prescribed in these stands, as well as high quality foraging habitat which was evaluated as a separate high value habitat type for meeting the intent of RA32. The purpose of underburning in N/R habitat is to restore conditions that allow for the natural, frequent low-intensity fire return interval to be returned to the project area landscape. Underburning is proposed in conjunction with close monitoring of effects to assure conformance with the levels of acceptable mortality of trees, shrubs and down wood developed through consultation with FWS (Tables 8, 9).

Proposed actions are likely to be considered inconsistent with the intent of RA10 if:

- Treatments remove or downgrade suitable habitat (at the stand level) from sites with priority for conservation:

The ST-215 activity center and home range is not considered a priority for conservation under the terms that it supports long-term occupancy or annual/semi-annual reproduction of NSOs – that is not supported based on survey results. Rather, it is important to promote and maintain this site for juveniles or subadults dispersing from other territories on the Unit or non-territorial adults NSOs (the likely function this activity center would provide, given current habitat levels, stand conditions and ongoing management on surrounding private lands and the overall pine-dominated stand conditions).

The thinning prescriptions in foraging habitat have been designed to maintain (degrade) habitat function, though there would be a short-term reduction in quality from reduced canopy closure, reduced within-stand layering, and general disturbance to snags and down logs. Black oak release and radial thinning of predominant legacy pine
would downgrade 46 acres of foraging habitat function to dispersal. These effects do not occur at a “stand” level and would be interspersed throughout the larger foraging unit/area. This effect does not occur in the core, but the outer ring of the home range. The function of suitable habitat would not be removed, though proposed new landings would remove elements (see Table 31 in the Interrelated and Interdependent Actions section below).

- Treatments degrade a significant proportion of suitable habitat in core areas and/or home ranges of sites with priority for conservation (significant as determined by local level 1 team).

As described above, the ST-215 home range/activity center is not considered a priority for conservation. The amount of mechanical thinning and fuels treatments in the core and home range, including repeated burn entries, is considered significant in terms of temporal and spatial disturbance and cumulative effects of one entry for thinning, an additional entry for mechanical piling and burning, and a subsequent entry for underburning with two proposed follow-up underburning entries within 30 years.

ST-215 is not currently occupied by a reproductive pair or territorial single/resident NSO, based on the best available survey data and about 51% of the current home range configuration (1.3-mile circle) is in private lands management. The proposed treatments would improve lower quality, and strive to maintain and protect higher quality, habitats for any potential dispersing NSOs (or future territorial NSOs) that may use or recolonize the home range. This site likely provides, or could provide, an important role for dispersing juveniles and subadults or non-territorial adult NSOs and is considered a priority for treatment to increase habitat suitability and resilience. The closest active/reproductive activity center is about five miles south/southeast in the Algoma LSR (ST-225).

ST-215 Core Treatments

Table 19 displays the treatment types, habitat in each treatment area, and the total potential piling/burning acres for capable and foraging habitat in the core. No mechanical treatments (thinning or fuels treatments), or road actions would affect N/R habitat or high quality foraging habitat. These habitats would not be removed, downgraded or degraded but are expected to be maintained and benefitted over the short and long term from low-intensity prescribed fire on about 144 acres.

Foraging habitat function would not be downgraded or removed. Foraging habitat elements would be removed during new landing construction on 4.25 acres, but these openings would not preclude the use of the surrounding stand for foraging.

Approximately 133 acres of foraging habitat would be degraded through variable density thinning (thinning to a 125-175 sqft/ac basal area range, though resultant stand basal area would be closer to 125-200+ from retained roost clumps and unthinned patches), small-area oak release, and ~0.25-acre gap creation in homogenous white fir (units 151, 153). Habitat function would be maintained based on the rationale described in the general Foraging Effects Summary section of this document. Machine piling and burning of piles would occur on up to 23 acres of foraging habitat to reduce surface and activity fuels and all areas would be burned with low-intensity prescribed fire.

Approximately 82 acres of capable habitat would be improved and moved toward dispersal and low quality foraging habitat condition by thinning older (40+ year old) ponderosa pine plantations, placing 2-acre group selections that increase tree species diversity, and radial thinning around predominant pine, up to two TPA. An additional 6 acres of older plantation/capable habitat would be similarly improved, but would not include group selections. Machine piling and burning of piles would occur on about 10 acres of older plantation and all areas would be burned with
low-intensity prescribed fire. Variable density and young plantation thinning in capable habitat on 4 acres is expected to move this habitat in the core toward dispersal condition. An additional 4 acres of capable habitat would be underburned only and improved.

All treatments in the core are designed to: address dense tree stocking and insect attacks in the pine component of foraging habitat and stagnant growth and homogeneity in some foraging stands (dense, small white fir in units 153, 161, 151); increase hardwood diversity in small patches; address increasing fuel loads from dying pine in older plantations and small mortality pockets in natural stands; and increase variability and reduce density and risk in older plantations, moving them toward suitable and dispersal habitat conditions.

Over the short and long term in the core, about 268 acres of foraging and capable habitats combined would be more resilient to disturbances, and 144 acres of higher value habitats would be maintained and benefitted through low-intensity prescribed fire (Table 19). Benefits of fire would be reduced surface fuel concentrations and fuel ladders and a likely increase in understory vegetation growth in pockets, with no more than five percent loss of trees >14” DBH. The current higher quality foraging habitat that is currently trending toward N/R condition would likely function as N/R within 15-20 years, resulting in 144 acres of N/R habitat in the core. About 82 acres of thinned plantations are expected to be functioning as lower quality foraging habitat (and 6 acres as dispersal) within the 20-year post-treatment period, resulting in about 254 acres of foraging habitat in the core. Barring any additional large-scale disturbance event(s), it is expected that the core would contain about 405 acres of suitable habitat on NFS lands 20 years after the initial thinning treatments are implemented.33

Table 19. Acres of habitat in the ST-215 activity center at the core scale by treatment area

<table>
<thead>
<tr>
<th>Unit</th>
<th>Treatment</th>
<th>Machine Pile/Burn</th>
<th>N/R</th>
<th>HQFG</th>
<th>FG</th>
<th>DI</th>
<th>CA</th>
<th>NON</th>
</tr>
</thead>
<tbody>
<tr>
<td>214</td>
<td>Underburn Only</td>
<td>0 0 0 0 0 0 7</td>
<td>216</td>
<td>Underburn Only</td>
<td>0 0 0 0 0 0 11</td>
<td>150</td>
<td>Underburn Only</td>
<td>0 114 0 23 0 5 0</td>
</tr>
<tr>
<td>208</td>
<td>Thin Young Plantation</td>
<td>0 0 0 2* 0 0 25</td>
<td>233</td>
<td>Thin Young Plantation</td>
<td>0 0 0 0 0 1 1</td>
<td>7</td>
<td>Thin 40+Pl / Radial Thin / Groups</td>
<td>0 0 0 2* 0 5 0</td>
</tr>
<tr>
<td>151</td>
<td>VDT (variable density thinning natural stand), Small Gaps</td>
<td>19 1* 0 39 0 1 0</td>
<td>153</td>
<td>VDT, Small Gaps</td>
<td>0 0 0 45 0 1 0</td>
<td>154</td>
<td>VDT, Small Oak Release</td>
<td>3 0 11* 6 0 0 0</td>
</tr>
</tbody>
</table>

33 Accounting for the existing suitable habitat, and the transition of 84 acres of thinned, older capable habitat toward low quality foraging.
Road actions listed in Table 20 below would not remove, downgrading or degrade NSO habitat function in the core. The estimated two acres of route decommissioning across suitable habitat is beneficial, but not significant. Reduced access on 1.35 miles is a beneficial effect in terms of reducing potential for noise disturbance, fuelwood gathering or other disturbance.

Table 20. Road actions in ST-215 core by habitat type reported in miles

<table>
<thead>
<tr>
<th>ST-215 Core Road Actions</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NR</td>
</tr>
<tr>
<td>Maintenance</td>
<td>0.56</td>
</tr>
<tr>
<td>Use Existing Temporary Road &amp; Decommission</td>
<td>0.14</td>
</tr>
<tr>
<td>Decommission</td>
<td>0.00</td>
</tr>
<tr>
<td>No Action</td>
<td>0.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.70</td>
</tr>
</tbody>
</table>

ST-215 Home Range Treatments

Table 21 below displays treatment and habitat types in each treatment area in the home range and the total potential piling/burning acres for foraging, dispersal or capable habitat (note that this table lists the total acreage and treatments for the home range, and therefore includes some of the treatments described above for the core).

There are no mechanical treatments (thinning or fuels treatments), or road actions that would affect N/R habitat or high quality foraging habitat in the home range. These habitats would not be removed, downgraded or degraded but are expected to be maintained and benefitted over the short and long term from low-intensity prescribed fire on about 206 acres of natural stands in the entire home range (58 ac in the outer ring); and about 43 acres in plantations (see Table 12).

Foraging habitat function would not be removed at the stand scale, though foraging habitat elements would be removed during new landing construction. Based on the estimated need and placement, new landings would impact 5.5 acres of foraging habitat in the home range, exclusive of the core. The estimated foraging habitat affected by new landings in the entire home range is 9.75 acres.

Foraging habitat would be downgraded on 46 acres in the outer portion of the home range due to radial thinning of pine on 19 acres, and black oak release on 27 acres – these treatments are not located in the core. As previously described for these subtreatments in foraging habitat, they are not expected to result in a significant negative effect
to foraging or dispersing individuals or overall habitat function in the home range due to the: 1) small scale of habitat affected and spatial separation of the two treatment types, 2) the position of treatments in the outer portion of the ST-215 home range, and 3) the predicted long term benefits from increasing large pine resilience, an important late-successional stand component in the LSR, and the likely long term increases in prey species diversity.

Approximately 457 acres of foraging habitat in the entire home range (324 ac in the outer ring) would be degraded through variable density thinning, small-area oak release, and ~0.25-acre gap creation in homogenous white fir. While stands would be thinned to an approximate 125-175 sqft/ac basal area depending on species, average stand basal areas would be closer to 125-200+ from retained roost clumps and unthinned patches. Habitat function would be maintained based on the previously described rationale in the general Foraging Effects Summary section of this document. Machine piling and burning of piles would occur on up to 117 acres of foraging habitat to reduce surface and activity fuels as a pre-treatment to underburning. All areas would be burned with low-intensity fire.

Approximately 292 acres of capable habitat in the home range (204 ac in the outer ring) would be treated and would trend toward dispersal and low-quality suitable foraging habitat from thinning older (40+ year old) ponderosa pine plantations, placing 2-acre group selections that increase tree species diversity, and radial thinning around predominant trees. About six acres of capable habitat in the core would remain as dispersal over the longer term, given current stand conditions of predominant pine and no intermixed mixed-conifer, and the fact that there would be no group selections. Reforestation would occur on ~28 acres of older plantation and all areas would be burned with low-intensity prescribed fire.

Variable density thinning to a lower basal area in the pine component would modify and maintain dispersal habitat on 55 acres in the home range, including one acre in older plantation. Post-thinning basal areas would range from 100-150 sqft/ac in the three dispersal units that have pine with some white fir and incense cedar mix. Portions of these units provide cover from predators, forage base and roost sites. Canopy closure would be reduced, mainly in the mid and lower canopy, but dispersal habitat function would not be precluded as it would remain at about 40-60%. Roost sites would also remain available, but occur at a lower density in dispersal when compared to foraging habitat. These treatments are spread across the outer portion of the home range, with 31 acres in portions of units 163, 169 and 206 where extensive pine mortality is ongoing (i.e. by the time treatments are implemented, the habitat may not be functioning for dispersal). Radial thinning around legacy pine in more open-canopied dispersal conditions would remove 9 acres of dispersal habitat in unit 152-1 in the home range. Adjacent trees (white fir, smaller ponderosa pine) would be removed, and the treatment may remove some potential roost sites.

The project design features and RPMs limit the amount of treatment in suitable habitat in the NSO home range and cores, thus, effects to NSO prey species abundance and distribution are expected to be minimal and within the ranges described in the NSO Prey Effects Summary section above.

As described for treatments in foraging and capable habitat in the core, all proposed treatments in the home range are designed to: address dense tree stocking and insect attacks in the pine component of foraging and dispersal habitats, decrease homogeneity in portions of the under and midstory in some foraging stands (dense, small white fir patches in units 153, 161, 151, 152-1, 170 and 178), increase hardwood diversity in small patches where oak occurs, address increasing fuel loads from dying and dense pine in older plantations and small mortality pockets in natural stands, and increase variability and reduce density in older plantations, moving them toward more suitable or dispersal conditions for NSO.
Over the short and long term, a combined total of 940 acres of foraging, dispersal and capable habitat in the home range would be more resilient to disturbance (not accounting for the 46 acres of downgraded foraging and 9 acres of removed dispersal habitat), and 202 acres of higher value habitat would be maintained and benefitted through low-intensity prescribed fire.

While there would be an immediate reduction in foraging habitat and dispersal habitat availability on three percent of these available habitats in the home range, over the long term, the treatments result in higher levels of suitable and dispersal habitat due to larger, more resilient trees and increased heterogeneity within and between stands. There would be about 200 acres of N/R habitat in the home range within 15-20 years. About 286 acres of the total thinned, older plantations in the home range would be functioning as lower quality foraging (6 as dispersal), resulting in about 889 acres of foraging habitat in the home range, and 1,089 acres of suitable habitat on NFS lands in the home range (1,539 total suitable acres or 45% of the home range, assuming private land operations do not remove or downgrade foraging habitat in western or northern extents of the home range and barring any short term stochastic natural events that remove or downgrade habitat).

Table 21. Acres of habitat in the ST-215 activity center at the home range scale by treatment area (incl. core)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Treatment</th>
<th>Machine Pile/Burn</th>
<th>N/R</th>
<th>HQFG</th>
<th>FG</th>
<th>DI</th>
<th>CA</th>
<th>NON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-U</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>112</td>
<td>Underburn Only</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>150</td>
<td>Underburn Only</td>
<td>0, 114</td>
<td>0</td>
<td>23</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>152-2</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>168-2</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>27</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>214</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>216</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>231</td>
<td>Underburn Only</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Thin Young Plantation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Thin Young Plantation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>Thin Young Plantation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Thin Young Plantation</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>Thin Young Plantation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>208</td>
<td>Thin Young Plantation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>233</td>
<td>Thin Young Plantation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Thin 40+Pl / Radial Thin / Groups / Small Oak Release</td>
<td>7</td>
<td>0</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Thin 40+Pl / Radial Thin / Groups</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Thin 40+Pl / Radial Thin</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Thin 40+Pl / Radial Thin</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Thin 40+Pl / Radial Thin / Groups</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Thin 40+Pl / Radial Thin</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Page | 76
<table>
<thead>
<tr>
<th>Unit</th>
<th>Treatment</th>
<th>Machine Pile/Burn</th>
<th>N/R</th>
<th>HQFG</th>
<th>FG</th>
<th>DI</th>
<th>CA</th>
<th>NON</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Thin 40+P / Radial Thin / Groups</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8*</td>
<td>0</td>
<td>49</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Thin 40+P / Radial Thin / Groups</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>14*</td>
<td>0</td>
<td>66</td>
<td>4</td>
</tr>
<tr>
<td>155</td>
<td>VDT (variable density thinning natural stands)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>161</td>
<td>VDT</td>
<td>0</td>
<td>3*</td>
<td>5*</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>163</td>
<td>VDT</td>
<td>49</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>166</td>
<td>VDT</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>167</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>169</td>
<td>VDT</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>171</td>
<td>VDT</td>
<td>0</td>
<td>2*</td>
<td>0</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>172</td>
<td>VDT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>174</td>
<td>VDT</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>235</td>
<td>VDT</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>17</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>151</td>
<td>VDT, Small Gaps</td>
<td>12</td>
<td>1*</td>
<td>0</td>
<td>48</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>170</td>
<td>VDT, Small Gaps</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>154</td>
<td>VDT, Small Oak Release</td>
<td>58</td>
<td>0</td>
<td>43*</td>
<td>71</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>165</td>
<td>VDT, Small Oak Release</td>
<td>7</td>
<td>0</td>
<td>7*</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>168-1</td>
<td>VDT, Small Oak Release</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>152-1</td>
<td>VDT, Groups, Small Gaps, Radial Thin (in dispersal)</td>
<td>30</td>
<td>0</td>
<td>6*</td>
<td>68</td>
<td>30</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>153</td>
<td>VDT, Oak Release, Small Gaps, Radial Thin (in foraging)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>178</td>
<td>VDT, Small Oak Release, Small Gaps</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>27</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>206</td>
<td>VDT, Aerial Burn</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td><strong>Foraging Habitat Degraded or Downgraded, Dispersal Modified or Removed, Capable Habitat Improved</strong></td>
<td><strong>503</strong></td>
<td><strong>64</strong></td>
<td><strong>327</strong></td>
<td><strong>212</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Where high quality foraging habitat (or N/R) is in a thinning or plantation thin unit, it is part of a RA32 stand/unthinned patch and would not be mechanically treated – it would be subject to underburning. Foraging habitat in plantations would also not be thinned.*

Road actions listed in Table 22 below would not remove, downgrade or degrade NSO habitat function in the outer portion of the home range. The estimated total 2.7 acres of route decommissioning across suitable habitat in the entire home range is beneficial, as the majority of this also occurs in critical habitat, but is also not significant. Reduced access on approximately 2.4 miles in the home range is also beneficial in terms of reducing the potential for noise disturbance, fuelwood gathering or other disturbances, though road density in the home range would not be significantly reduced.
Table 22. Road actions in outer ring of ST-215 home range by habitat type reported in miles

<table>
<thead>
<tr>
<th>ST-215 Home Range Road Actions</th>
<th>NR</th>
<th>HQFG</th>
<th>FG</th>
<th>DI</th>
<th>CA</th>
<th>Non</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>0.00</td>
<td>0.30</td>
<td>1.65</td>
<td>0.02</td>
<td>0.98</td>
<td>0.68</td>
</tr>
<tr>
<td>Use Existing Temporary Road &amp; Decommission</td>
<td>0.00</td>
<td>0.00</td>
<td>0.38</td>
<td>0.00</td>
<td>0.23</td>
<td>0.20</td>
</tr>
<tr>
<td>Open for Project, Maintain, Close</td>
<td>0.00</td>
<td>0.00</td>
<td>0.15</td>
<td>0.00</td>
<td>0.17</td>
<td>0.39</td>
</tr>
<tr>
<td>Decommission</td>
<td>0.00</td>
<td>0.00</td>
<td>0.05</td>
<td>0.00</td>
<td>0.20</td>
<td>0.00</td>
</tr>
<tr>
<td>No Action</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.00</td>
<td>0.30</td>
<td>2.23</td>
<td>0.02</td>
<td>1.58</td>
<td>1.27</td>
</tr>
</tbody>
</table>

The following two tables display the amount of suitable, dispersal and capable habitats in the ST-215 home range and core analysis areas prior to and immediately post-treatment. They do not account for the long term habitat projections that are described above.

Table 23. Summary of suitable habitat pre- and post-thinning and fuels treatments in home range

<table>
<thead>
<tr>
<th>AC ID</th>
<th>0.5mi Radius</th>
<th>Entire 1.3mi Radius</th>
<th>Acres Removed</th>
<th>Acres Downgraded</th>
<th>Acres Degraded</th>
<th>Post-Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5mi</td>
<td>1.3mi</td>
<td>0.5mi</td>
<td>1.3mi</td>
<td>0.5mi</td>
<td>1.3mi</td>
</tr>
<tr>
<td>ST-215</td>
<td>125</td>
<td>220</td>
<td>126</td>
<td>1130</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 24. Summary of dispersal and capable habitat pre- and post- thinning and fuels treatments in home range

<table>
<thead>
<tr>
<th>AC ID</th>
<th>0.5mi Radius</th>
<th>Entire 1.3mi Radius</th>
<th>Acres Removed</th>
<th>Acres Modified</th>
<th>Acres Improved</th>
<th>Post-Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5mi</td>
<td>1.3mi</td>
<td>0.5mi</td>
<td>1.3mi</td>
<td>0.5mi</td>
<td>1.3mi</td>
</tr>
<tr>
<td>ST-215</td>
<td>9</td>
<td>96</td>
<td>958</td>
<td>334</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

NSO Critical Habitat

General information on the 2012 Critical Habitat Rule for the Northern Spotted Owl and the East Cascades unit (Unit 8) and East Cascades South subunit (ECS-3) is included in the Critical Habitat section of this document, including a summary regarding active management. Primary Constituent Elements (PCEs) of Critical Habitat are specific characteristics that make areas suitable for nesting, roosting, foraging and dispersal. PCEs are defined as:

1. Forest types that may be in early-, mid- or late-seral stages and that support the northern spotted owl across its geographical range (PCE 1);
2. Nesting/roosting habitat (PCE 2);
3. Foraging habitat (PCE 3); and
4. Dispersal habitat (PCE 4).

*PCE 1 must occur with PCE 2, 3 or 4.*
The function of the ECS-3 subunit is to provide demographic support in an area of sparsely distributed, high-quality habitat and Federal land, and to provide for population connectivity between subunits to the north and south. The FWS determined that all unoccupied areas in the subunit are essential for the conservation of the species to meet the recovery criterion in the Recovery Plan which calls for continued maintenance and recruitment of NSO habitat (USDI-FWS 2011 p. ix). Increasing and enhancing NSO habitat in the ECS-3 subunit is especially important for providing essential connectivity between currently occupied areas to support successful dispersal of NSOs, and may also help to buffer NSOs from competition with the barred owl (USDI-FWS 2012 p. 71931). Special management considerations in the subunit are “required to address threats to the essential physical or biological features of critical habitat from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls” (p. 71931). Maintaining connectivity and recruiting additional high-quality habitat for the NSO is especially important in this subunit.

The ECS-3 subunit consists of approximately 112,179 acres in Siskiyou County, all of which are Federal lands managed by the Forest Service. As described in the Existing Environment and Habitat Status section of this document, due to the climate, topography and location at the eastern extent of the NSOs range, and the “eastside” vegetation characteristics (Mayer and Laudenslayer 1988), ecological conditions that support long-term NSO territory occupancy and reproduction are limited in distribution.

Based on the Region 5 corporate data vegetation layer (USDA-FS 2007) and NSO habitat queries developed from field reviews and vegetation types surrounding NSO activity centers (USDA-FS 2013; NSO EVEG layer), the ECS-3 subunit consists of approximately 20,358 acres of nesting/roosting, 38,317 acres of foraging, and 11,338 acres of dispersal (USDI-FWS 2013). This information provides the best current estimate of NSO baseline habitat in the ECS-3 subunit at the time of this analysis. More recent relative habitat suitability models have been completed and the baseline condition in the subunit may be updated, including an accounting for any other ongoing or completed projects in the subunit. As the FWS maintains the baseline for NSO habitat and critical habitat, that exercise would be undertaken during preparation of Biological Opinions for federal actions.

In the ECS-3 subunit on the Shasta-McCloud Management Unit, there are several ongoing and completed projects that were designed to enhance and protect habitat for the NSO. These projects include the Mudflow Vegetation Management Project, Algoma Vegetation Management Project, Porcupine Vegetation and Roads Management Project, Bartle Underburning-Additional Entry, and the Parks Eddy Watershed Restoration Project. The effects of these project’s activities on PCEs of critical habitat were consulted on with the FWS from 2012 through 2015. Reasonably foreseeable projects on the Unit in ECS-3 include the Highway 89 Safety Enhancement and Forest Ecosystem Restoration Project.

**Project Area Critical Habitat**

There are 797 acres of critical habitat in the NSO action area, and 720 acres in the project area. For purposes of this analysis, approximately 629 acres of PCE1, 2, 3 and 4 would be treated. The remaining 91 acres do not contribute to PCEs of critical habitat (where critical habitat was designated in roadways, or in 10-20 year old plantations or barren openings that would be burned, but do not currently function as PCEs per definitions in the Rule, pp. 71904-71908). In the remaining 77 acres of critical habitat in the action area, no federal activities are ongoing or reasonably foreseeable. Critical habitat is not designated on adjacent private lands.
The ongoing complex of overstocking, root disease in ponderosa pine, and bark beetle attacks in the Elk Flat LSR and project area have largely occurred outside of critical habitat, though have impacted portions of stands (units 169, 235) and the older plantations. These impacts have not largely altered the amount or types of critical habitat, but have exerted a constant negative influence in portions of these stands by reducing foraging habitat to dispersal habitat, and eventually non-habitat, that does not support NSO life history functions. The dense stocking conditions, ongoing mortality and continuous fuel loads in the older plantations that are between and adjacent suitable habitat, and account for 23 percent of the critical habitat in the project area, place the surrounding higher value and foraging habitats at risk of loss.

In the natural stands in critical habitat, stand conditions are variable as previously described in this document. The stagnated growth and dense under and midstory conditions and fuel loading from fine and heavy surface and ladder fuels also place the surrounding critical habitat at risk of loss.

The preliminary modeling in the FVS-FFE program for the project area of existing stand conditions and a fire start under 97th percentile weather conditions predicted up to 40% mortality in the natural stands from passive crown fire, with flame lengths of 4-6 feet.\(^{34}\) Approximately 63 percent of this area is situated in the portion designated as critical habitat. In the older plantations (in both critical habitat and project area outside critical habitat), and some younger plantations, flame lengths would likely be 6-10 feet (Riegle 2010; map 6 data set in Appendix B). The high heat and potential for torching and spotting in the event a natural or human-caused fire start occurs in, or spreads to, the heavy mortality areas also presents a risk to the current and developing late-successional habitat and critical habitat in the project area.

**Active Management**

The Final Rule describes that in the drier, more fire-prone regions of the NSOs range, habitat conditions will likely be more dynamic and active management may be required to reduce the risk to the essential physical or biological features from fire, insects, disease, and climate change, as well as to promote regeneration following disturbance. While the FWS recommends conserving high quality and occupied NSO habitat, it asserts that long-term recovery could benefit from forest management where basic goals are to restore or maintain ecological processes and resilience (USDI-FWS 2012 p. 71908). Management actions should be considered to balance short-term adverse effects with long-term beneficial effects. Suggestions from the Final Rule in regard to active forest management in critical habitat include:

1. Focusing in younger forest and lower quality NSO habitat, or where ecological conditions are most departed from the natural or desired range of variability;
2. In dry forests, following the NWFP guidelines and focusing on lands in or outside reserves most “at-risk” of experiencing uncharacteristic disturbance, and where the landscape management goal is to restore more natural or resilient forest ecosystems;
3. Avoiding or minimizing activities in active NSO territories (or high-quality habitat in these territories);

\(^{34}\) Per discussion with the silviculturist and fuels specialist regarding the modeling results, this 40% level represents an estimate of full mortality; it does not mean that 40% of an affected stand would be lost under a fire in the 97th percentile weather conditions with 60% remaining, but that 40% of the natural stands in the project area would be completely lost (McRae, Payne 2014, 2015)
4. Ensuring transparency of the process, so the public can see what is being done, where it is done, what the goal of the action is, and how well the action leads to the desired goal; and

5. Practicing active adaptive forest management by incorporating new information and learning into future actions to make them more effective, focusing on how these actions affect NSOs and their prey (pp. 71882-71883).

To ensure treatments proposed in critical habitat are consistent with the recommendations for management described in the Final Rule, several field reviews were conducted with the FWS and Forest Service personnel to the majority of natural stands designated as critical habitat, and some of the older plantation units (see Appendix C that describes consultation to date). The specific treatments in units 151 (small gap creation), 153 (oak release, radial thinning of pine, small gap creation), and other units proposed for variable density thinning and prescribed fire were reviewed by both agencies and were deemed consistent with management objectives within the East Cascades Province (p. 71907).

**Project Effects in Critical Habitat**

**Critical Habitat Effects Summary**

Table 25 below lists the types of treatments and connected road actions in critical habitat by PCE type. All effects to PCEs occur in the ST-215 home range, and portions of the core. The preceding analysis for project effects to nesting/roosting, foraging, dispersal and capable habitats are not repeated here in terms of effects to critical habitat; but the actions, project design and RPMs, and effects rationale are used to make determinations of influences and effects to the primary constituent elements.

While proposed actions would reduce individual structural components of PCE2; and remove individual structural components of PCE1, PCE3 and PCE4 through low-intensity prescribed fire, variable density thinning and other restoration treatments, machine piling/burning piles, and new landing construction - the overall habitat function when assessed at the stand scale would not be removed or appreciably reduced. Stands that provide nesting/roosting and dispersal habitat, and most stands providing foraging habitat, prior to treatment would continue to provide the same habitat function post-treatment. Treatments are expected to facilitate a higher likelihood of long term habitat value and potential long term use by NSO(s) due to increased resilience, improved and larger tree growth, larger snags and down wood, and increased within- and between-stand heterogeneity.

Table 25. Acres of treatment proposed in PCEs of critical habitat

<table>
<thead>
<tr>
<th>Critical Habitat</th>
<th>Acres in Treatment Area</th>
<th>Variable Density Thinning$^*$ (may include small gaps in white fir, small area oak release)</th>
<th>Radial Thinning of Legacy Pine and Oak Release$^*$</th>
<th>Thinning with Group Selection$^*$</th>
<th>Machine Pile / Burn Piles$^*$</th>
<th>Low-Intensity Prescribed Fire Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCE1</td>
<td>164</td>
<td>130$^*$</td>
<td>0</td>
<td>28$^{**}$</td>
<td>19</td>
<td>6</td>
</tr>
<tr>
<td>PCE2</td>
<td>120</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>PCE3</td>
<td>330</td>
<td>224</td>
<td>46</td>
<td>0</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>PCE4</td>
<td>15</td>
<td>14</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

$^*$ Treatments include follow-up low-intensity prescribed fire; $^*$Includes six older plantations and four natural stands; $^{**}$In 40+ year plantations only. Machine piling acres are not additive, but would occur within high mortality/down wood areas within thinned stands.
In portions of foraging habitat (46 acres), habitat function would be downgraded to dispersal. Even though these areas (27 acres of oak release and 19 acres of radial thinning around legacy pine) will not meet the physical measurements commonly associated with foraging habitat, these areas and those directly adjacent, are expected to be used initially\(^{35}\) and over the long term by NSO as they would still provide cover and prey base habitat for dispersing (and foraging) opportunities. These minor treatments that support foraging and dispersal should not impede any movement of NSO through the area (Irwin et al. 2007, 2012, 2015) and would continue to support essential life history functions. As previously described in this document, these areas would likely not return to foraging habitat until oaks and residual conifer trees in the oak stand, and gaps around legacy pine, fill in with continued oak/conifer growth and regeneration that contribute to increased layering and canopy cover more representative of foraging conditions. While repeated underburning entries would prolong understory development in small patches, due to burning in a mosaic pattern at different heat intensities, these treatments are considered to have a short term adverse effect on PCE3 from initial release and radial thin treatments with underburning effects that are neutral to beneficial extending for about 20-30 years. See below for further discussion on effects to PCE3.

**Critical Habitat Treatment Effects Discussion**

Table 26 below displays the effects to treated critical habitat at the project area/home range and core scales and Table 27 at the end of this section displays the pre- and post-treatment critical habitat values in the project area. Approximately 187 acres of critical habitat (120 acres PCE2, 60 acres PCE3, 1 acre PCE4 and 6 acres PCE1) would be maintained and benefitted through carefully applied low-intensity prescribed fire treatment. This represents 26 percent of the critical habitat in the project area being maintained and benefitted with stand-alone low-intensity fire. A component of these acres includes areas designated under RA32 for no mechanical treatment. Prescribed fire may consume or char individual trees, could reduce lower and midstory canopy cover, or consume or create snags and down wood through flare-ups (Harrod et al. 2009). Because of the low-intensity burn objectives and design features for burn timing and protection of trees, down wood and snags, the function of these habitats at the stand level is expected to remain intact and also be improved. Any reductions in habitat components of PCEs are likely to be discountable and insignificant (not meaningfully measured, detected or evaluated; see the Effects to Nesting/Roosting and High Quality Foraging Habitat and Low-Intensity Prescribed Fire sections of this document). While there is an element of uncertainty, treatment is not expected to appreciably reduce the function of nesting/roosting, high quality foraging, foraging, dispersal or capable habitats at the stand or sub-unit level.

\(^{35}\) If/when NSOs disperse through or recolonize the ST-215 home range or project area
Table 26. Summary of treatment effects in critical habitat

<table>
<thead>
<tr>
<th>Critical Habitat</th>
<th>Treatment Area Total</th>
<th>Maintained/Benefitted through low-intensity prescribed fire only</th>
<th>Improved through thinning treatments in plantations or natural stands</th>
<th>Degraded</th>
<th>Downgraded</th>
<th>Removed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>HR</td>
<td>Core</td>
<td>Total</td>
<td>HR</td>
<td>Core</td>
</tr>
<tr>
<td>ST-215 Home Range*</td>
<td>Total</td>
<td>HR</td>
<td>Core</td>
<td>Total</td>
<td>HR</td>
<td>Core</td>
</tr>
<tr>
<td>PCE1</td>
<td>164</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>158</td>
<td>158</td>
</tr>
<tr>
<td>PCE2</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PCE3</td>
<td>330*</td>
<td>60</td>
<td>60</td>
<td>53</td>
<td>224</td>
<td>224</td>
</tr>
<tr>
<td>PCE4</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Total CH Affected</td>
<td>187</td>
<td>187</td>
<td>178</td>
<td>158</td>
<td>158</td>
<td>86</td>
</tr>
</tbody>
</table>

* All critical habitat affected by the project is within the home range
* 22 ac of this amount is considered high-quality foraging and would be treated only with low-intensity prescribed fire
** Downgraded by variable density thinning with black oak release (27 ac); or variable density thinning with radial thinning of pine (19 ac)

Approximately 270 acres of foraging (PCE3) would be thinned and of this amount, 224 acres would remain functional as foraging habitat and 46 acres would function as dispersal habitat over the short and long term. As trees continue to grow in around released pine, and as black oaks increase in size and canopy density on the 46 acres, habitat for prey species would trend toward a higher suitability over the long term (see also the Critical Habitat Effects Summary above).

The 224 acres of PCE3 affected include 114 acres in the core where variable density thinning, small gap creation in white fir and fuels treatments would remove or reduce some components of foraging PCE3 (trees, canopy closure, layering, snags, down wood). While individual habitat components would be removed, reduced or variously affected, the effect is not at a scale that would significantly reduce the residual PCEs value in critical habitat or the overall ability of the foraging habitat PCE to function.

Regardless of the 224 acres of stands remaining functional for foraging NSOs, there would be some short-term and minor adverse effects to PCE3 because treatments result in reductions of canopy closure, basal area and habitat layering (vertical and horizontal structure); and reductions in snags and coarse wood, shrubs and forest floor vegetation from fuels treatments (USDI-FWS 2012 pp. 71939-71940). These short term, minor adverse effects would affect prey species and reduce foraging habitat components, regardless of the resource protection measures and treatment designs that maintain habitat function and important habitat features, simply because the cumulative effect of thinning treatments, machine piling/burning piles, and underburning all result in disruption, modification or reduction of trees, snags, down logs, canopy closure, layering and shrubs that comprise PCE3, including short term effects to prey. These effects would occur in 68% of the PCE3 in the project area.

The 27 acres of oak release and 19 acres of radial thinning around legacy pine would not occur in the ST-215 core, but in the outer portion of the home range distant from nesting/roosting and higher value habitats (southwestern portion of unit 153). There is no machine piling/pile burning in this unit. The short and long term reduction in PCE3 habitat function and reduced components would occur in 14% of the PCE3 in the project area. The effects to PCE3
components from oak release and radial thinning around predominant legacy pine in unit 153 would occur over both the short and long term, due to the initial release treatments and follow-up underburning. There would be a short-term adverse effect on these 46 acres, also regardless of resource protection measures, as the combined treatments of variable density thinning with radial thinning or oak release would remove large and small conifer trees that comprise PCE3. With follow-up prescribed fire in these areas, small tree and shrub regeneration and snags/down logs may also be consumed during repeat burn entries, and these effects would occur over a one-season to 30-year timeframe, delaying development of essential physical or biological features. While the majority of the effects would be short term and immediately following the thinning and release treatments, the underburning within one season to five years of initial treatment would add to this effect, consuming small trees, regeneration and impacting down logs and prey base in these stands. With the longer term prescribed fire entries and longer term increases in black oak canopy and tree size, the effects from prescribed fire are expected to transition towards being more beneficial, but similar, insignificant reductions in down wood and regeneration would occur during these second and third entries.

The treatments in PCE3 affect and maintain 68 percent of PCE3 in the project area, and result in 14 percent of PCE3 being converted to PCE4 in the short term. Dispersal PCE4 would transition back to PCE3 over the 20-30 year period, with a long term improvement in foraging suitability and increase in hardwood and prey species diversity.

While the treatments would result in both a short and long term beneficial effect to NSO habitat and critical habitat, they are not considered insignificant or discountable in the short term. These effects would occur in 82% of the PCE3 in the project area, in a home range that is 59% on private lands and currently below the recommended levels of suitable habitat to better support survivorship and productivity (37% suitable in the total home range; 69% in the core but with N/R habitat at half the recommended amount in the core; see Table 35). While there would be short term and minor adverse effects to components of PCE3 and prey base, the larger proportion of suitable habitat on NFS lands at both core and home range scales, all critical habitat being designated on NFS lands, and the management direction for the Elk Flat LSR (contrasted with past and ongoing private lands management) affords an opportunity to positively affect structural and compositional changes in the components of PCE3 over the long term, increasing its resilience and long term capability to support NSO life history functions. Also, while the effects of degrading and downgrading a small proportion of foraging habitat may not significantly affect the activity center in the action area, the currently unoccupied habitat is expected to provide a key area for dispersing juveniles and subadults or non-territorial NSOs. Therefore the value of the current suitable and critical habitat in the project area, home range and action area is considered important to any NSOs that may use it in the future (Dugger et al. 2009, Forsman et al. 2012; USDI-FWS 2011, 2012).

**PCE4**

Approximately 14 acres of dispersal (PCE4) would be modified through variable density thinning treatment and would remain functional to provide dispersal opportunities for NSO(s). These treatments are not located in the ST-215 core – they are in unit 153 (2 acres) and unit 169 (12 acres). Modification would primarily occur from thinning ponderosa pine-white fir dominated areas to an average basal area of 125-135 sqft/ac to attempt maintaining and promoting the residual pine. Given the variable stand conditions in unit 169, and the ongoing reductions in current canopy cover occurring under no action from pine mortality, it is not certain if these 12 acres would be providing
dispersal habitat at the time of treatment, or post-treatment. Given *current* stand conditions in dispersal habitat in both units at the time of this analysis, average canopy cover post-treatment is expected to range from 45-55%. The unthinned patches and roosting habitat clumps in and near these dispersal areas would continue to contribute toward habitat suitability and any reductions in dispersal habitat components of PCE4 are likely to be discountable and insignificant (not meaningfully measured, detected or evaluated.

This treatment affects and maintains 93 percent of the PCE4 in the project area, and two percent of all critical habitat.

**PCE1**

Approximately 158 acres of capable habitat (PCE1) would be improved through thinning, group selection and radial release of predominant trees in 152 acres of six older plantations, and variable density thinning in 6 acres across four natural stands (see Table 26). These treatments of PCE1 would contribute toward the long term health and resilience in the larger stands of foraging habitat, and plantation stands would transition over time toward dispersal and low-quality foraging, contributing to PCE4 and PCE3 over the short and long term. Within the 152 acres of older plantations, approximately 28 acres of group selection would be reforested with a mix of native conifer species and California black oak that will increase the within-stand resilience, diversity, heterogeneity and structural complexity. All 158 acres of PCE1 would be subject to low-intensity prescribed fire approximately one season to five years after thinning, piling, and reforestation treatments are completed. Treatments in the older plantations and natural stands that support capable habitat and PCE1 are specifically designed to accelerate development of NSO habitat, and also reduce the risk of losing adjacent high value habitats. These areas do not currently provide suitable or dispersal habitat due to species composition and structure, though may provide *some limited* dispersal opportunities. The effects of the thinning and subtreatments would be insignificant and discountable to any current dispersal capability in these stands, and are considered wholly beneficial.

This treatment affects and benefits/improves 96 percent of PCE1 in the project area, and 22 percent of all critical habitat.

<table>
<thead>
<tr>
<th>Critical Habitat in the Project Area</th>
<th>Pre-Treatment</th>
<th>Post-Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total / HR</td>
<td>Core</td>
</tr>
<tr>
<td>PCE1*</td>
<td>165</td>
<td>91</td>
</tr>
<tr>
<td>PCE2</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>PCE3</td>
<td>330</td>
<td>167</td>
</tr>
<tr>
<td>PCE4</td>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

Critical Habitat not associated with a PCE (where critical habitat was designated in roadways, or in 10-20 year old plantations or barren openings that would be burned, but do not currently function as PCEs per definitions in the Final Rule at pp. 71904-71908)

|                                     | 90            | 46             | 90          | 46   |

Total Critical Habitat in Project Area 720 424 720 424

*Post-project, the 152 acres of thinned capable habitat in older plantations and 6 acres in natural stands that currently function as PCE1 would be considered PCE4, trending toward low-quality foraging (PCE3) over the long term. The remaining 6 acres of underburned capable habitat in younger plantations or natural stands would be considered as trending toward PCE4 over the long term, and for purposes of this analysis, is considered PCE1 pre- and post-treatment.
Fuels Treatments and Prescribed Fire in Critical Habitat

Mechanical piling and burning of piles is estimated in about 85 acres of critical habitat across four older plantations and four natural stands, affecting 55 acres of PCE3, 10 acres of PCE4 and 19 acres of PCE1 (see Table 25). Up to two piles per acre in natural stands with PCE3 would be left unburned for small mammal habitat (Table 6, WL-37).

In addition to the 187 acres of low-intensity prescribed fire addressed at the beginning of this section, the other treated acres of PCE3, PCE4 and PCE1 would be underburned. Spatial and temporal measures that limit the amount of underburning done in any season or year in the ST-215 core and home range directly affect and benefit critical habitat (Table 6, WL-38) as not all acres would be burned at the same time.

The effects of these treatments to prey and habitat suitability were previously addressed in this document and while this activity disturbs, reduces or removes elements of down wood, shrubs, and soil; the combined effects with the thinning would not remove or reduce habitat function (habitat where machine piling/pile burning is conducted is either degraded (function maintained), or improved (older plantations). Any reductions in habitat components of PCEs are likely to be discountable and insignificant (not meaningfully measured, detected or evaluated.

There are scattered pockets of dead and dying ponderosa pine and white fir in critical habitat units. These snags and trees may be felled to allow for safe working conditions. None of the 87 acres of proposed hazard reduction treatment along roads and private property boundaries occur in critical habitat, but to conduct safe burning operations, about four miles of fire line (either hand line or mechanical line that is ~8 feet wide) would be required in/around critical habitat. As previously described, fireline construction does not remove or cut trees, but may crush saplings or small trees, and would displace soil, down logs, and ground cover.

Road Actions and Landings in Critical Habitat

Effects from construction of temporary roads and landings in NSO habitat are discussed in the Interrelated and Interdependent Actions section below, and in the Effects in NSO Cores and Home Ranges section above.

Effects specific to critical habitat are quantified in Table 28. There is an approximate need for 17 new landings in critical habitat, ranging from 0.5 to 0.75 acre. Nine of these landings may be needed in the home range, and eight in the core. The acreage assessed accounts for the larger 0.75 landing size, in order to evaluate what the potential maximum effect could be, but based on review of units and stand conditions, most landings in critical habitat are expected to be closer to 0.5 acre.

<table>
<thead>
<tr>
<th>Spatial Scale</th>
<th>NR</th>
<th>HQFG</th>
<th>Foraging</th>
<th>Dispersal</th>
<th>Capable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Habitat</td>
<td>PCE2</td>
<td>PCE3</td>
<td>PCE3</td>
<td>PCE4</td>
<td>PCE1</td>
</tr>
<tr>
<td>Home Range (9)</td>
<td>0</td>
<td>0</td>
<td>4.5</td>
<td>0</td>
<td>2.25</td>
</tr>
<tr>
<td>Core (8)</td>
<td>0</td>
<td>0</td>
<td>3.75</td>
<td>0</td>
<td>2.25</td>
</tr>
<tr>
<td>Total in Critical Habitat (17)</td>
<td>0</td>
<td>0</td>
<td>8.25</td>
<td>0</td>
<td>4.5</td>
</tr>
</tbody>
</table>

^Amount is not inclusive of the core (i.e. there are 17 landings proposed in the home range, and additional 8 in the core)

There are no identified needs for new temporary roads in critical habitat, but construction of landings may require about 0.35 mile of landing driveways associated with the new landings. Like other landings and access routes (main skid trails), these would be decommissioned upon completion of project activities. These effects are widely
dispersed and are considered insignificant at the stand level and immeasurable at the landscape scale. The created openings would not preclude an owl’s ability to utilize the habitat and would not alter the function of existing habitat at the stand or landscape level. These openings would affect about two percent of the critical habitat in the project area.

Approximately 5.36 miles of road actions including use, maintenance or decommissioning of NFS or existing unauthorized routes would be completed in PCEs of critical habitat (Table 29). No new road construction or reconstruction and use of closed roads is proposed.

Table 29. Road actions in critical habitat at the ST-215 home range and core scales reported in miles

<table>
<thead>
<tr>
<th>Road Actions in Critical Habitat</th>
<th>NR</th>
<th>HQFG</th>
<th>Foraging</th>
<th>Dispersal</th>
<th>Capable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ST-215 core</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>0.56</td>
<td>0.26</td>
<td>1.02</td>
<td>0.00</td>
<td>0.45</td>
</tr>
<tr>
<td>Use Existing Temporary Road &amp; Decommission</td>
<td>0.14</td>
<td>0.01</td>
<td>0.47</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Decommission</td>
<td>0.00</td>
<td>0.00</td>
<td>0.20</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>No Action</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total in Core</td>
<td>0.70</td>
<td>0.27</td>
<td>1.69</td>
<td>0.00</td>
<td>0.50</td>
</tr>
<tr>
<td><strong>Remainder of ST-215 home range</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>0.00</td>
<td>0.16</td>
<td>0.69</td>
<td>0.02</td>
<td>0.65</td>
</tr>
<tr>
<td>Use Existing Temporary Road &amp; Decommission</td>
<td>0.00</td>
<td>0.00</td>
<td>0.20</td>
<td>0.00</td>
<td>0.23</td>
</tr>
<tr>
<td>Decommission</td>
<td>0.00</td>
<td>0.00</td>
<td>0.05</td>
<td>0.00</td>
<td>0.20</td>
</tr>
<tr>
<td>No Action</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total in Home Range outside of Core</td>
<td>0.00</td>
<td>0.16</td>
<td>0.94</td>
<td>0.02</td>
<td>1.08</td>
</tr>
<tr>
<td><strong>Total in Critical Habitat</strong></td>
<td>0.70</td>
<td>0.43</td>
<td>2.63</td>
<td>0.02</td>
<td>1.58</td>
</tr>
</tbody>
</table>

The road actions listed in Table 29 would not remove or appreciably reduce PCEs of critical habitat at any meaningful or significant scale. The estimated 2.6 acres of existing route decommissioning in critical habitat is beneficial, but is not significant. Reduced access on 1.6 miles in critical habitat is also a beneficial effect in terms of reducing potential for fuelwood gathering or other disturbance.

**Critical Habitat Effects Conclusion**

The foregoing treatments are considered consistent with the ecological forestry principles discussed in the Recovery Plan and 2012 Final Critical Habitat Rule where long-term NSO recovery will benefit, even if short-term impacts may occur (Franklin et al. 2006). The treatments are proposed to improve the resiliency of the landscape in light of the threats to NSO habitat from the existing risk conditions in the project area that are exacerbated by prolonged drought. Treatments are intended to promote spatial heterogeneity within patches, restore underrepresented species (oak, aspen, Douglas fir, sugar pine) and structural diversity. While some of these management actions may degrade habitat in the short-term, they are considered beneficial in the long-term as they would reduce future losses of ecosystem structure or result in a higher resilience to future disturbance events (USDI-FWS 2011 p. III-14).
Over the short and long term, beneficial habitat effects include high quality foraging habitat (PCE3) that would not be mechanically treated transitioning toward nesting/roosting habitat (PCE2). There would be an increase of approximately 173 acres of dispersal (PCE4) over this same time span from thinning older plantations, residual dispersal habitat in areas where pine is radially thinned, and from capable stands that are burned transitioning toward stand conditions that can support dispersing NSOs.

It is not reasonable to estimate that the older plantations would be fully functional as foraging habitat (PCE3) over the 20-year time period, as these stands would still be primarily ponderosa pine with inclusions of 60-100 year old-mixed conifer elements, and a second age class of mixed conifer within the group selections. These stands would fully provide for dispersal however, and may be considered low-quality foraging habitat over the long term.

Over the short and long term, thinning and fuel reduction treatments are expected to enhance the function of the ECS-3 subunit (and the Elk Flat LSR) by improving the long-term quality of nesting, roosting, foraging and dispersal habitat. One of the primary threats to NSO is identified as past and current habitat loss and barred owls may be the primary negative influence on population recovery (Davis et al. 2015; Dugger et al. 2015; USDI-FWS 2011, 2012). While loss from timber harvest has slowed considerably since the subspecies’ listing in 1990, NSO habitat loss from high severity fires in some portions of the range remain high. The 20-year monitoring report for the NWFP and ‘Status and Trend of Northern Spotted Owl Habitat’ describes that large wildfires continue to be the leading cause for loss of NSO habitats on federal lands and that most of these fire-related losses have occurred in the network of large reserves designed for the protection and restoration of habitat for long-term NSO conservation (Davis et al. 2015). Range-wide, the nesting/roosting habitat lost from fire (505,800 acres) represents about 31 percent of the total habitat loss. The report further describes that loss rates in fire-prone portions of the NSOs range exceeded the expected 2.5% rate for the 20-year period at rates of 3.9 to 7.4% per decade, including the California Cascades province. Climate change is also expected to expand the area of fire-prone landscapes and an increased frequency of large wildfires this century has already been observed (Davis et al. 2015).

The FVS-FFE stand and fire behavior modeling indicates that the indirect effects of combined thinning and subsequent fuels treatments would reduce the potential for passive crown fire and create conditions that maintain a surface fire type with flame lengths less than four feet. This would significantly reduce the predicted stand mortality in the event of a fire start under 97th percentile weather conditions. Even if such a fire does not occur, the thinning treatments result in longer term persistence of forested conditions in the LSR and critical habitat, as displayed for the modeled trends in tree size increases in Table 15 and Table 17 (McRae 2015; Payne 2015). If a fire does occur, opportunities to manage it safely would be considered; as it is not the purpose of the project to prevent or stop fire, but reintroduce a low-intensity, more frequent fire regime that is representative of the historical conditions and range of variability (Skinner and Taylor 2006; Miller et al. 2012; Long 2009; Franklin et al. 2002, 2007).

The more significant change in fire behavior is expected to occur from reduced stocking in older plantations and portions of the under and midstory, and reductions of existing mortality pockets in the project area (mostly in the eastern portion, outside of critical habitat). The thinning and fuels treatment activities would reduce brush, dense understory trees, and stand density; reducing ladder fuels and increasing canopy base height in areas. These changes would assist in reducing the potential for surface fire(s) to transition into tree crowns and for torching (passive) or active crown fire to occur. This would significantly reduce the predicted stand mortality in the event of a fire start, thereby resulting in a longer-term persistence of forested conditions in the Elk Flat LSR and project area. In the event a wildfire does occur from either natural causes or a human-caused ignition, the post-treatment stand and fuel
loading conditions would allow for either management of the ignition and letting it burn or, better suppression effectiveness through direct attack vs. indirect attack methods (McRae 2015). These results indicate that in the long term, forest stands would be more resilient to fire but are also expected to burn with sufficient intensity to create small openings. This type of pattern would reflect the historic natural frequent low-intensity fire regime, contributing to a mosaic of stands and vegetation types in different successional stages. The overall effects of thinning, fuels treatments and returning low-intensity fire to the landscape are expected to be within the range of natural conditions historically found in the California Cascades Province where fire was more frequent, less intense, and an integral part of the internal dynamics of a typical stand (USDA-FS and USDI BLM 1994 p. B-4; Skinner and Taylor 2006; Mallek et al. 2013).

These treatments, over the long term, are expected to afford protection to the Elk Flat LSR, and enhance habitat function by increasing tree health and growth. Treatments favor retention of species important to NSO and other wildlife (black oak, Douglas fir, sugar pine), and do not create uniform stand conditions. They would maintain and promote declining legacy elements (sugar and ponderosa pine), provide horizontal and vertical diversity, increase (to a limited extent) the amount of hardwoods, create mosaics of small openings, leave clumps and larger blocks of unthinned areas, and retain small groups of tightly spaced trees and roosting habitat sites. Structural diversity would be enhanced through variable thinning that retains species of multiple ages and classes, gap creation and use of prescribed fire to stimulate herbaceous growth and understory and midstory regeneration. While thinned stands would be less dense with larger trees, average tree diameters would increase over the short and long term (see Tables 15, 16 and 17) and the average basal area ranges and other habitat conditions (canopy closure, down logs, understory, large snags) would be retained within the range of use by foraging NSOs (Irwin et al. 2007, 2012, 2015).

Effects at the ECS-3 Subunit Scale

Approximately 164 acres of PCE1 would be transitioned toward PCE4 and PCE3 through thinning and group selection treatments; 120 acres of PCE2 would be benefitted and maintained through low-intensity prescribed fire; and 224 acres of PCE3 and 15 acres of PCE4 would be maintained and improved, with 46 acres of PCE3 being reduced to dispersal over the short and long term. Underburning only treatments would improve habitat on 6 acres of PCE1, 60 acres of PCE3, and one acre of PCE4 (see Table 25 and Table 26). The prescribed fire treatments in PCE2, and the variable density thinning and other treatments in PCE1, PCE2, PCE3, and PCE4 are not expected to significantly or appreciably reduce the function of suitable or dispersal habitats or habitat connectivity at the NSO action area, project area or ST-215 home range or core scales, or significantly affect the ability of NSO to forage or disperse across the landscape.

Conversely all treatments, despite removing, reducing or disturbing components of PCEs, are considered a short and long term improvement to the existing habitat conditions. They affect less than one percent of the ECS-3 subunit and would not significantly reduce the value of primary constituent elements of critical habitat. There will some short-term and minor adverse effects on 270 acres of PCE3, with longer-term effects on 46 acres of PCE3, but the treatments result in a greater assurance of long-term maintenance of suitable foraging habitat. All treatments contribute positively to the overall function of the ECS-3 subunit, which is to provide demographic support in an area of sparsely distributed high-quality habitat and Federal land, and provide for population connectivity between subunits to the north and south. The project would not result in a measurable change in the ECS-3 subunit’s ability to provide the functions for which it was designated.
The types of direct and indirect effects to vegetation and habitat elements would be spatially and temporally separated during implementation. However given that some level of treatment occurs in every part of the project area, and all PCEs of critical habitat, there would be short term and minor adverse effects to NSO prey, short term adverse effects to components of critical habitat PCE3, and long term beneficial effects to habitat function, development of PCEs and protection of critical habitat in the Elk Flat LSR. As described in the 2012 Final Critical Habitat Rule, some management activities may have short term adverse effects and long term beneficial effects on physical or biological features of critical habitat. The Revised Recovery Plan recommends land managers actively manage portions of both moist and dry forests to improve stand conditions and forest resiliency, which should benefit the long-term recovery of the northern spotted owl (USDI-FWS 2011 p. III–11).

The variable density thinning treatments, small gap creation in single-story uniform forest stands, hardwood release, and reintroduction of prescribed fire are all intended to promote development of multistory structure and increase habitat resilience, but would also result in a minor and short term adverse impact to the habitat’s current capability to support owl foraging or dispersal on 270 acres. These treatments do have long term beneficial effects of creating higher quality habitat that is more resilient to disturbances or that better support dispersing individuals, resident singles or NSO pairs, but there are still minor adverse effects in critical habitat. The treatments in PCE3, and other PCEs of critical habitat, have been carefully designed to maintain important elements of critical habitat such as large trees and snags, down logs, under and midstory layering and broom structures, and per the project’s resource protection measures, will also be implemented in a manner that minimizes the short-term negative impacts. The project’s short term adverse effects are balanced with the long term beneficial results.

**NSO Indicator Summary**

The following summarizes the measurements for how project activities affect NSO, its habitat and critical habitat:

**Potential for direct disturbance to breeding pairs, young, and/or dispersing individuals**

Disturbance will be minimized, if not eliminated by:

- Conducting NSO surveys, spot checks or activity center stand searches prior to and during operations so that the status of previously occupied ST-215, or any new sites occupied by NSOs, is accurately identified and areas can be avoided as necessary.

- Implementing LOPs that reduce the potential for disturbance and direct/indirect effects from noise, smoke, and overall operations during the critical pair-bonding, breeding and fledging periods; implementation of the LOPs will start at the given time each season and lifting of LOPs will be based on survey results.

- Precluding mechanical treatments in nesting/roosting habitat, and high quality foraging habitat.

- Limiting the amount of the core and home range that can be underburned in any season or year.

**Amount of suitable habitat (NRF) benefitted/maintained, degraded, downgraded or removed in a core and home range**

- 120 acres of Nesting/Roosting habitat in the ST-215 core would be benefitted and maintained through low-intensity prescribed fire. There is no N/R habitat in the outer portion of the home range. N/R habitat function in the core and home range would not be degraded, downgraded or removed. There would be no new landings or temporary roads in N/R habitat.
• 63 acres of foraging habitat would be benefitted and maintained through low-intensity prescribed fire in the ST-215 core, with 37 acres similarly benefitted in the outer portion of the home range.

• 133 acres of foraging habitat would be degraded in the ST-215 core with 324 acres in the home range through thinning and other restoration treatments. No foraging habitat would be downgraded in the core. 46 acres of foraging habitat would be downgraded in the outer portion of the home range to dispersal from variable density thinning, oak release on 27 acres and radial thinning around predominant legacy pine on 19 acres.

• Foraging habitat function in the core and home range would not be removed.

• New landing construction would affect 4.25 acres of foraging habitat in the core and 5.5 acres in the home range, a total of 9.75 acres of landings that are spatially and temporally distributed in foraging habitat. This habitat would continue to function for foraging and dispersing NSOs.

**Amount of dispersal habitat modified or removed in a core and home range**

• All treatments occur in the outer portion of the ST-215 home range, there is no dispersal habitat treated in the ST-215 core.

• One acre of dispersal habitat would be modified and improved through older plantation thinning, with 54 acres in natural stands modified through variable density thinning treatments. Post-treatment conditions would continue providing opportunities for dispersal.

• 9 acres of dispersal habitat would be removed through radial thinning around predominant legacy pine in natural stands.

**Amount of capable habitat maintained/benefitted by fire or moved toward dispersal or suitable condition**

• 4 acres of capable habitat would be benefitted and improved through low-intensity prescribed fire in the ST-215 core, with 3 acres similarly improved in the outer portion of the home range.

• 6 acres of capable habitat would be improved toward dispersal only.

• 4 acres of capable habitat would be benefitted, improved and moved toward dispersal and low-quality foraging habitat conditions through variable density thinning in younger plantations and natural stands in the ST-215 core, with 26 acres similarly improved in the outer portion of the home range.

• 82 acres of capable habitat in the ST-215 core would be improved and moved toward dispersal and low-quality foraging habitat through older plantation thinning, with 204 acres in the outer portion of the home range similarly benefitted.

**Amount and quality of suitable and dispersal habitat affected at the project area scale**

• 120 acres of N/R habitat benefitted with low-intensity prescribed fire.

• 98 acres of foraging habitat downgraded to dispersal function through oak release and radial thinning around predominant legacy pine.
• 697 acres of foraging habitat degraded through variable density thinning, small gap creation in white fir, and small area oak release; including about 11 acres degraded from group selection in low-quality foraging habitat.

• 76 acres of dispersal habitat benefitted/maintained with low-intensity prescribed fire.

• 4 acres of dispersal habitat improved through young plantation thinning.

• 180 acres of dispersal habitat modified and function maintained through variable density thinning and group selection.

• 41 acres of dispersal habitat removed from variable density and radial thinning around predominant legacy pine.

**Amount and quality of suitable and dispersal habitat affected in the Elk Flat LSR**

• The effects in the LSR are the same as those reported for the Project Area above, with the following reductions:
  
  o 5 fewer acres of foraging habitat would be degraded (total of 692 acres degraded, with habitat function maintained, in the Elk Flat LSR).

  o 18 fewer acres of dispersal habitat would be modified (total of 162 acres modified, with habitat remaining functional post-treatment, in the Elk Flat LSR).

**Critical habitat indicators are reported in Table 26**
### Table 30. Summary of effects to NSO habitat at all project scales from vegetation and fuels treatments

<table>
<thead>
<tr>
<th>Analysis Area</th>
<th>Pre-Treatment Suitable and Dispersal Habitat Acres</th>
<th>Post-Treatment Suitable and Dispersal Habitat Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/R</td>
<td>Foraging (incl HQF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action Area</td>
<td>265</td>
<td>3,418</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>265</td>
<td>3,320</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>1,142</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>1,044</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST-215 1.3-mile Home Range (does not include core)</td>
<td>126</td>
<td>1,130</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>126</td>
<td>1,084</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST-215 0.5-mile Core</td>
<td>120</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSR</td>
<td>120</td>
<td>1,139</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>1,041</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Units</td>
<td>120</td>
<td>1,133</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>1,035</td>
</tr>
</tbody>
</table>

^ Treatments in core are separated from home range

* An additional 294 acres of capable habitat treated in older plantations would trend toward functioning as dispersal post-treatment and toward low quality foraging over 20 years following treatment (at all scales with exception of the core where the improvement is on 88 acres, and home range where it is 292 acres).
VII. Effects of Alternative 1 on Gray Wolf

Common factors biologists consider when evaluating potential effects on wolves include: 1) disturbance to dens and rendezvous sites, 2) loss of security habitat that can lead to greater human conflict and potential mortality, 3) impacts to prey species availability and distribution, and 4) livestock grazing if assessing a grazing allotment.

There are limited studies that address the effects of landscape changes and vegetation management (logging, prescribed fire, or other management activities implemented by resource managers) on wolf survival or reproductive success. While wolves may be temporarily displaced during or after a vegetation management project (Kovacs 2015, Foust 2015) it is difficult to attribute wolf movements, impacts to individual wolves or reproductive success to any specific activity and determine an impact, if one occurred. Because the scale of most forest management activities are small relative to the normal range and movements of wolves, spatial displacement or disturbance from an activity is also expected to be within the normal behavior of wolves. Wolves may avoid or not be present in a particular area during logging or prescribed fire operations, but they may also avoid the area initially due to other ongoing uses and activities such as camping, mushroom harvest, competition with other carnivores (mountain lions, bears), prey species distribution or other factors. In other words, there are a multitude of factors that can influence a wolf’s or a pack’s use of the landscape, and attributing avoidance of an area by wolves as a response to any particular activity in most cases, is not feasible. Therefore, this effect is not generally considered detectable or meaningfully measurable.

Because wolves do not have a tight ecological niche; are generalist predators not closely correlated to specific habitat types, vegetative structure, or composition; and because they are a wide-ranging carnivore with primary prey that is mobile and migratory, effects may be more meaningfully evaluated at a larger scale (i.e. regional scale). Due to these reasons, it is also difficult to make a link between project-specific vegetation management activities, changes in prey species forage, and effects to wolves at any ecologically meaningful scale. As demonstrated by the scientific literature, wolves are closely tied to prey and primarily prey on deer and elk, but are not likely currently limited by prey species in the action area given their flexibility for prey utilization. The existing road density and lack of security habitat in the project and action areas are the main likely limiting factors to population and long term territory establishment in the action area.

The following analysis does not purport to estimate potential suitable habitat for wolves in the future, or hypothesize on how members of the Shasta Pack, future packs or dispersing individuals may colonize, or not, the action or project area. Given the new information regarding the Shasta Pack in summer 2015 and the potential for adults or the pack to conduct hunting forays in or near the project area, the analysis is merely undertaken to ensure that proposed activities under Alternative 1 will not likely jeopardize the continued existence of this listed species or adversely modify critical habitat, as mandated by the ESA.

Gray Wolf Indicators

Potential direct, indirect and cumulative effects (as defined under the ESA) of Alternative 1 will be evaluated using a combination of qualitative and quantitative indicators to address three of the four factors above, as grazing is not an activity that is being authorized or reauthorized by this project. These indicators help determine the degree to
which project actions may affect gray wolves and their breeding, feeding and sheltering behaviors, or their habitat components, including changes in security habitat.

Gray wolf indicators include:

- Potential for direct disturbance to breeding pairs, young, dispersing individuals or packs.
- Potential for direct changes to security habitat.

Measurements for how project activities will inform the above gray wolf indicators include:

- The distance from activities to dens/rendezvous sites and known or suspected use areas.
- Road density in the project and action area before, during and after the project is completed.

Alternative 1 includes multiple activities that would create noise or smoke in and near the project area (silviculture and fuels treatments, follow-up site preparation, temporary road construction, road maintenance and road decommissioning, and follow-up prescribed burning for a period of 30 years). Activities include harvesting and fuels treatments (noise generated from heavy equipment to fall, process, load and haul trees/chips; construct skid trails and landings; masticate/chip biomass; pile surface and activity fuels), smoke generation from pile burning and underburning (impacts to air quality); and noise from temporary road construction, road maintenance and decommissioning activities. Human presence and road use is associated with all of these activities.

These activities will occur on approximately 3,483 acres over a time span of one season to 30 years, with most effects occurring during one season to 10 years after project implementation begins. For the purposes of this analysis, all activities are expected to be completed in 2036 (see the Timing of the Project section of this document). Some acres may be re-entered 2 to 4+ times (e.g. initial harvest of sawlogs, follow-up biomass treatments, follow-up piling of activity and surface fuels and burning of piles, prescribed fire or site-preparation actions). Depending on snow levels, and if roads are plowed to permit access, treatment activities could occur year-round (over snow logging is common on the McCloud Flats and is done in accordance with standard operating procedures for soil impacts and other resource protection measures).

**Direct and Indirect Effects to Gray Wolf**

**Direct Disturbance**

Besides disturbance at den and rendezvous sites, and effects of road density on security habitat, scientific evidence of direct or indirect effects of forest management activities on wolves is scarce. However, wolf biology and relationships with habitat, prey and disturbances are sufficiently well-established in the scientific literature to adequately assess and disclose possible effects. Project-related human presence and the operation of equipment would result in noise that may temporarily displace individuals or packs by causing an avoidance of the project area or treatment unit(s). While this effect is probable, any effects are expected to be temporary, not meaningfully evaluated, minor and not adverse. A temporary alteration of hunting or traveling patterns is expected to have an insignificant effect on a wolf’s overall foraging and hunting efficiency. Factors contributing to this determination are as follows, and are *generally* dependent on the Shasta Pack remaining in the area where they were detected in summer 2015:

- The estimated proximity to the Shasta Pack and their potential use areas makes it probable that individuals may use or travel through or past the project area during: foraging forays in spring and summer (adults), the
nomadic hunting period (pack) in fall and winter, or during dispersal (generally lone individuals).

- No wolves or wolf sign has been detected in or within one mile of the project area to date (no confirmed observations of individuals, dens, rendezvous sites or other known areas of activity) including the Shasta Pack. The other closest confirmed wolf pair is associated with the Keno Area of Known Wolf Activity in southern Oregon.

- The limited spatial and temporal extent of the activities relative to the wolf’s wide ranging habits and resilient nature (Fuller et al. 2003; Haight et al. 1988; Creel and Rotella 2010).

- The mobility of and the large territories used by wolves. It is almost impossible to separate and measure the potential ‘effect’ of a wolf’s avoidance of an area due to project actions from similar avoidance behaviors due to non-project-related traffic and activities on surrounding roads and lands in the action area. Territorial and dispersing wolves can travel long distances on a daily to weekly basis (30 to 600+ miles) during the fall and winter nomadic hunting season and likely encounter noise and other disturbance factors.

Only during the denning and rendezvous season do wolves concentrate activity in one area and even then, foraging forays by the adults can be wide-ranging (within 20+ miles). Therefore, disturbance concerns to wolves when implementing vegetation treatments are primarily associated with den sites in late winter/early spring and effects to reproductive success and pups. In general, and given the right conditions, several areas could be used as rendezvous sites by a breeding pair throughout the summer. This makes it difficult to determine where these areas might be located in advance to effectively implement protection measures.

The likelihood of wolves denning or establishing rendezvous sites in or within one mile of the project area is low due to the high levels of human use, roads and activity in and on all sides of the project area (Thiel 1985; Mech et al. 1988) and the absence of security habitat. Though as described in the Denning and Rendezvous Sites section of Appendix D, wolves can and will tolerate some limited human disturbance of dens, including when pups are younger than six weeks, and will regularly continue using disturbed den sites in subsequent years (Thiel et al. 1998).

If a den or rendezvous site is detected in or near the project area during the project’s implementation timeframes, site-specific protection measures would be implemented (see Table 6, WL-44 for a complete list).

In summary, all noise and smoke-generating activities will be restricted within one mile of a den from April 1 through June 30; and within one mile of active rendezvous site(s) from April 1 through August 31. Further discussion and coordination with the FWS may result in modified distances, or more flexible dates, for this specific project design feature. These design features will avoid or minimize disturbance at active den or rendezvous sites that could disrupt reproductive success or result in adverse effects.

Given: 1) there are no den or rendezvous sites currently in or within one mile of the project area based on surveys and available data to date, 2) the use of LOPs, 3) the high road density and the overall lack of security habitat in and near the project area, the likelihood of disturbance to a den or rendezvous site from project activities is extremely unlikely to occur and is considered discountable. Factors contributing to this determination include:

- The Shasta Pack is the only known breeding wolf pack in California to date and its future den and territory use are not known at this time. Based on survey data, it is known that the Shasta Pack was not denning, and does not have rendezvous sites, in or within one mile of the project area.
• Early rendezvous sites are typically in close proximity to dens (generally one mile or less) and implementing a LOP within one mile of den sites will generally eliminate or reduce the potential for direct or adverse effects to early rendezvous sites when wolf pups are still vulnerable.

• The Keno Area of Known Wolf Activity is approximately 50 to 60 miles north of the project area, and to date, does not have confirmed breeding and the individuals are not known to be within California (ODFW 2015; Figura 2016).

**Changes to Security Habitat**

The recommended variable to evaluate effects on **Security Habitat** is road density and the duration and location of increased motorized use (Mladenoff *et al.* 2009 and Merrill 2000). There would be an increase in motorized use and maintenance on the roads in and near the project area that permit access for equipment and workers during implementation. There would also be an increase in total road density during project implementation from construction and use of approximately 2.9 miles of new temporary road. These new segments are widely distributed across the project area and are proposed to limit adverse effects of long skidding to soils and other resources. Approximately 2.85 miles of closed NFS roads would be reopened and used to access and implement treatments, but these roads would not be open to the general public as use of these roads by the public is prohibited per the Forest’s Motor Vehicle Use Map. Regardless, there would be a slight increase in open roads and motorized use to complete the project over the short term, but the current open road density of 2.72 mi/mi² will not change as a result of project implementation. The new temporary roads would be decommissioned and the NFS roads would be re-closed to motorized vehicular traffic upon completion of project activities.

The project’s travel analysis process identified opportunities for decommissioning 6.3 miles of existing unauthorized routes that are not necessary for NFS land management or access to private lands and that would benefit from being decommissioned to reduce negative impacts to hydrology and wildlife resources (Bonivert 2015). Approximately 5.8 miles of these routes would be used as temporary roads to complete the project, and once all project activities are completed, they would be decommissioned. The project also adds about 0.10 mile of an existing route to the System. Open road density in the project area will increase slightly from 2.72 to 2.74 mi/mi² with the addition of 0.10 mile of road to the System. While this action increases road density, it does not reflect an increase in general accessibility as this route is currently ‘in place’, known and well-used by the public, Tribes and special use permit-holders. Total road density would increase from 3.39 mi/mi² to 3.41 mi/mi².

The predicted beneficial effects of decommissioning existing routes, though very minor, are a reduced potential for: noise disturbance and traffic in portions of the project area, off-road vehicle use, fuel wood collection and human-caused fire starts. While meaningful at the project scale and to species known to occupy the project area (northern goshawk, fisher.), the total road density in the project area will remain above 1 mi/mi² and would not meaningfully contribute to security habitat for wolves in the project area.

The action area is does not contain valuable security habitat for gray wolves, due to the road density of 3.6 mi/mi² (Navarre 2015). While existing unauthorized routes would be slightly reduced through decommissioning, these actions would not significantly increase the amount of security habitat at the project area or action area analysis scales.
Because the changes in road density, and the duration and location of increased motorized use, are so slight in relation to the existing road system in the project area and action area, the effects of using and maintaining ~18 miles of existing roads; constructing, using and decommissioning ~2.9 miles of new temporary road; and the route decommissioning will result in little benefit or consequence for wolves. The short term and slight increases increase in road density and use are not expected to result in any significant increased risk to wolves from potential negative human-wolf interactions. Factors contributing to this determination include:

- There are currently no known wolves in the project area (no dens, rendezvous sites or other known areas of activity).
- During project implementation, the ongoing use of through-roads in and near the project by the public and private landowners is expected to remain at the moderate to high use levels represented by the existing condition (ambient).
- New temporary roads and re-opened NFS roads would not be open to the general public during project implementation per the MVUM and new temporary roads would be widely spaced throughout the project area.
- Open road density in the project area would not be changed during project implementation.

Interrelated and Interdependent Actions

**Road Actions**

Proposed road actions that result in noise above ambient noise levels would be subject to the LOPs for disturbance (Table 6, WL-34 for NSO and WL-44 for gray wolf). The proposed haul routes are within a 0.25 mile of the ST-215 activity center.

**Temporary Roads** – would be constructed for short-term access to reduce log skidding distances to less than 0.25 mi and reduce associated impacts to soils and other resources. New temporary roads may be constructed through: ~0.5 mi of suitable NSO foraging habitat (to treat portions of units 152-1 and 154, an estimated <1-acre effect based on an average road width of 14 feet); ~0.5 mi of NSO dispersal habitat (to treat units 163 and 152-1, also <1-acre effect); and ~0.10 mi of NSO capable habitat (to treat unit 18; <0.20 acre effect). These temporary roads are not in the ST-215 core or critical habitat. They would be situated in the eastern extent of the ST-215 home range. All other temporary roads would be in non-habitat for NSO. All temporary roads would be decommissioned upon completion of project activities. These new temporary roads would be constructed in a combination of NSO foraging habitat, more open non-forested areas, and through a plantation of 16-20” DBH trees. Temporary roads would not be constructed in unthinned patches, RA32 areas or Riparian Reserves. Per project design feature RM-16, they will be kept to a minimum and routed through non-late-successional or low quality late-successional habitats as feasible (Table 6). All other proposed temporary roads would be situated in non-habitat.

**Route Decommissioning** – will be completed on an approximate 0.14 mi portion of existing unauthorized route in NSO N/R habitat; 1.91 mi in NSO foraging habitat; 0.54 mi in NSO dispersal habitat; and 0.48 mi in NSO capable habitat. This includes the use of some existing routes and decommissioning post use (U41N46A, U41N46B and U41N09B routes near units 150, 161 and 154). While these are exiting routes that contribute to the overall road density in the project area, the decommissioning would not result in any meaningful reduction that benefits gray wolf security habitat in the project or gray wolf action area (road density would remain above the recommended 1
mi/mi² density). Decommissioning methods would be determined on a route-by-route basis and may include seeding or mulching with a native mix of pollinator-friendly forbs and grasses, mulching with certified weed-free straw, or other approved fine slash (Table 6, Invasive Plants-15). All other road decommissioning activities occur in areas classified as non-habitat for the NSO.

**Road Maintenance** – NFS roads open to the public would be maintained during the project (~15 mi). This includes approximately 4.4 mi in suitable, 1.25 mi in dispersal, and 1.52 mi in capable NSO habitat. Road maintenance is not expected to remove, downgrade or degrade suitable or dispersal NSO habitat or wolf source habitat. New System road construction is not proposed. Road maintenance does not result in habitat alteration, or beneficial effects like decommissioning can, though activities may result in noise stressors, depending on where (proximity to occupied core/den) and when they occur (during pair bonding/nesting season/rearing). The LOPs would reduce the potential for any road maintenance noise above ambient levels to have direct or indirect effects on breeding individuals.

**Open or Reconstruct for Project, Maintain, Close** – Approximately 1.18 mi of currently closed roads that bisect NSO foraging, 0.26 mi NSO dispersal, and 0.17 mi NSO capable habitats would be re-opened for the project, maintained and re-closed to vehicular traffic when project activities are completed. About 0.6 mi of these road actions are located in the southeastern extent of the ST-215 home range outside the core and critical habitat. The closure method would block the entrance with an earthen berm, guardrail barricade or natural obstacle with consideration for cost, effectiveness and resource protection (41N96, 41N96A, 41N02Y, portion of 41N77). These roads were recently closed/bermed under a prior NEPA decision for the Pilgrim Vegetation Management Project and were not ripped, seeded or mulched. NSO and gray wolf source habitat would not be removed, downgraded or degraded for these activities.

About 0.15 mi of existing road that bisects NSO foraging habitat would be reconstructed, used for the project and closed (41N01YB that accesses plantation unit 126). This road is not in the ST-215 core, home range or critical habitat. Per field review, this road was blocked, ripped and seeded/mulched. The roadbed is still fairly obvious and while it bisects about 0.15 mi of foraging habitat, habitat would not be removed, downgraded or degraded to reconstruct this road. Reconstruction entails pulling the berm, clearing/brushing and reconditioning the surface. The roadbed consists of grass and sapling ponderosa pine and white fir regeneration.

**Add Existing Route to System** – An approximate 0.10 mi segment at the northeastern edge of the meadow at Elk Flat would be added to the System (41N12D). This route is in matrix allocation, is ‘in place’ and is frequently used by Forest visitors and special use permit holders. It requires no reconstruction or other habitat-altering activities to add it to the System. It is outside the ST-215 core, home range and critical habitat. Open road density in the project area would increase from 2.72 to 2.74 mi/mi² with this route addition. This slight increase in road density does not meaningfully reflect any additional access, given the route is already ‘in place’, known and frequently used. Total road density in the project area would increase from 3.39 to 3.41 mi/mi².

None of the road actions change the open or total road density in the Elk Flat LSR (Bonivert 2015).

**Landings**

Approximately 78 landings would be needed to implement the project and existing landings or natural openings would be used as feasible to reduce new disturbance. Use and new construction would be in accordance with all
Based on field review, there are ~38 existing landings that could be used. Landings are generally along roads, in turnouts or wide areas, or in treatment units. New landings are estimated to be 0.5 to 0.75 acre, and would be contingent on material conditions (i.e. areas with heavy mortality, excessive breakage or biomass processing may require the larger landing). Landing needs are based on an estimated one landing per 30 acres treated and units smaller than 30 acres may require their own landing. While this analysis provides an estimate of where landings may be needed, and the potential habitat effects, final landing location is approved during sale administration.

No landings would be constructed or used in N/R habitat, high quality foraging habitat or unthinned patches, and no new landings would be constructed in the Ash Creek Riparian Reserve. Existing landings in the Reserve may be used. Of the estimated new 40 landings, approximately 14.25 acres may be constructed in NSO foraging habitat, 1.5 acres in dispersal habitat, 6.25 acres in capable habitat, and the rest in non-habitat. There is an estimated need for 17 new landings in the ST-215 home range, and 10 in the core (total of 27 new in the entire home range). Table 31 below displays the estimated number of new landings at various project scales, and NSO habitat types that might be affected from new construction (refer to the **NSO Critical Habitat** section above, and Table 28 for estimated new landing needs in NSO critical habitat).

Landings are not contiguous openings where habitat function is removed. They would be distributed throughout the project area, home range and core. While removal of 0.5-0.75 acre areas of vegetation and canopy cover occurs when constructing new landings, because of their small size, spatial distribution across a larger area and placement outside high value habitats, these openings are considered inclusions in forest stands and are not considered a significant removal of foraging or dispersal habitat function.

<table>
<thead>
<tr>
<th>Spatial Scale</th>
<th>NR</th>
<th>HQFG</th>
<th>Foraging</th>
<th>Dispersal</th>
<th>Capable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Area (40)</td>
<td>0</td>
<td>0</td>
<td>14.25</td>
<td>1.25</td>
<td>6.25</td>
</tr>
<tr>
<td>ST-215 Home Range (17^)</td>
<td>0</td>
<td>0</td>
<td>5.5</td>
<td>0.75</td>
<td>4.5</td>
</tr>
<tr>
<td>ST-215 Core (10)</td>
<td>0</td>
<td>0</td>
<td>4.25</td>
<td>0</td>
<td>2.75</td>
</tr>
<tr>
<td><strong>Total Home Range (27)</strong></td>
<td>0</td>
<td>0</td>
<td><strong>9.75</strong></td>
<td><strong>0.75</strong></td>
<td><strong>7.25</strong></td>
</tr>
</tbody>
</table>

^Amount is not inclusive of the core (i.e. there are 17 landings proposed in the home range, and an additional 10 in the core)

After the project is completed, landings and main skid trails within 200 feet of landings would be decommissioned. Decommissioning typically involves physically blocking the entrance at a minimum, and may include ripping to promote natural revegetation or water bars to prevent erosion when necessary.

**Site Preparation**

The project will not use any gopher baiting or poison during site preparation activities that could result in an adverse effect to potential prey or individual wolves, or other substance that may directly or indirectly affect
wolves. Note that this practice had been utilized in the past by the Forest Service during site preparation and reforestation/culture activities for controlling gophers, but is no longer utilized.

**Borate Fungicide Application**

The application of a registered borate fungicide to freshly cut stumps is not expected to have adverse effects on wildlife or surrounding plants, invertebrates, or microorganisms (USDA-FS 2006; Dost et al. 1996). Sporax, liquid Cellu-Treat or possibly other brands or formulations may be used and within four hours of cutting, would be applied to stumps >14” diameter to reduce the spread of *Heterobasidion* root disease (annosus). Application would follow all state and federal rules as they apply to pesticides and would not be applied during precipitation events. Based on the analysis of where the compound may need to be applied (stands with expected stumps >14”), approximately 2,040 acres may receive treatment under Alternative 1. If Sporax is used, it would be applied at a rate of approximately one pound/acre treated. The existing data on Sporax indicates that adverse effects to wildlife from its use on stumps are not likely and the risks to terrestrial species are low, with most acute and chronic risk quotients well below levels of concern (USDA-FS 2006).

**VIII. Cumulative Effects**

Under the ESA, cumulative effects include “those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation” (50 CFR 402.02). It should be noted that the definition of cumulative effects under ESA is different from cumulative effects as interpreted under the National Environmental Policy Act and the two should not be confounded or confused.

There are no State-administrated lands in the gray wolf or NSO action area. Private lands owned and managed by Sierra Pacific Industries (SPI), Olympic Resource Management, Rome Creek Timber, LLC, Lawrence Smith Trust, and TC&I Shasta, LLC, and private rural residential areas, account for all of the non-NFS lands in the action area. Private lands in the NSO action area are managed by SPI and Olympic Resource Management; with about 59 percent of the ST-215 home range and eight percent of the ST-215 core in private lands ownership and management.

Activities on private lands have included commercial thinning, salvage, clearcutting, shelterwood harvests, plantation management and other forest stand treatments (refer to the *Past Influences on Existing Conditions* section of Appendix D). Similar to treatments on NFS lands, the effects of these activities are reflected in the existing conditions for the gray wolf and NSO action area. While the FWS does not review individual THPs in many cases, it has provided Technical Assistance when requested by CALFIRE or the CDFW. Private timber harvest plans (THPs) are reviewed under section 9 of the Endangered Species Act for the possibilities of prohibited take and private take of listed species is prohibited under California State law and prosecutable under both Federal and State law. These THPs are subject to the California Forest Practice Rules (Sections 919.9 and 939.9) that were modified shortly after the NSO was listed in 1990 to create a process that when implemented correctly by the State, will avoid unauthorized ‘take’ of NSOs unless authorized by a federal Habitat Conservation Plan or HCP. The THP planning and review process incorporates survey results into THPs, comparing results with the State’s CNDDB NSO database and ensuring adequate amounts of habitat are retained around NSO activity centers in accordance
with the FWS 2009 take avoidance provisions (USDI-FWS 2009) and the California Forest Practice Rules (2014, or current year if updated).

Temporal bounding for this analysis is defined by the timeframe when proposed actions on private lands are reasonably certain to occur along with the likely effects of the proposed federal action. As the project is expected to begin in 2016, and take up to 30 years to implement all activities, the temporal bounding for private actions that could contribute to cumulative effects, known at the time of this analysis, is 30 years. To determine future forest management actions on private lands within the action area within that timeframe, a review of timber harvest plans submitted for approval or that are ongoing was conducted by querying the Timber Harvest Plan database. In the gray wolf action area, there are at least 11 THPs ongoing or planned that cover ~10,071 acres or 12 percent of the gray wolf action area. In the NSO action area there are currently three THPs ongoing or submitted for approval.

Extensive hauling on roads and routes through the project area and in the action areas (to complete THPs) occurs near or through suitable habitat for NSO in the project area and NSO action area, and near and through source habitat for the gray wolf in the gray wolf action area. This noise is considered part of the ambient environment. The project will cumulatively contribute to ongoing and predicted future road use, noise and other habitat disturbance by private land management in about 22 percent of the NSO action area during implementation and about four percent in the gray wolf action area. While NSOs are not confirmed or known to occupy any portion of the NSO action area at this time, and the Shasta Pack gray wolves are the only confirmed gray wolves in that action area to date, dispersing individuals may occur in the respective action areas. Wildlife and individuals occupying a project area, or larger action area, are generally habituated to haul noise in general and the disturbance associated with roads or harvest activities and may completely avoid these sources of disturbance. These impacts, should they occur on any new individuals in the project area or within 0.25-mile to one mile of the project area, are not predicted to result in any significant cumulative effects to breeding individuals, provided the project’s LOPs for noise-generating and habitat altering activities during critical breeding periods.

The LOPs prescribed for the Elk LSR project that prohibit smoke- and noise-generating activities within 0.25-mile of N/R and high value NSO habitats (or nest sites if detected), during the critical breeding period for NSO; and for gray wolf if dens or rendezvous sites are located within one mile of project actions, would reduce, if not eliminate, the potential for direct, indirect or cumulative effects from project noise or habitat disturbance in combination with that from private activities (e.g. log haul on cost share roads, logging, road construction that may occur on private lands).

Based on the action area habitat typing, the THPs in the NSO action area in the home range are primarily focused in dispersal or areas classified as non-habitat. Outside of the home range, treatments would occur in dispersal and suitable foraging habitat. THP activities may remove habitat currently functioning as foraging or dispersal for the NSO, or may downgrade foraging to dispersal, further reducing the overall availability of suitable or dispersal habitat in the northern extents of the action area. As suitable foraging habitat would not be removed under the federal action, cumulative effects to suitable habitat would not occur. Private lands in the NSO action area currently contribute little toward maintaining the viability of the ST-215 core and home range, with 29 acres of suitable habitat in the core and 450 acres of suitable in the home range. The Elk LSR project would not remove or

38 THP query conducted for the gray wolf action area on December 10, 2015
http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html
downgrade NSO habitat in the ST-215 core, or significantly downgrade suitable habitat in the home range (46 acres of foraging would be downgraded to dispersal). In the action area, the federal action would downgrade 98 acres of foraging to dispersal, resulting in 3,585 acres of suitable habitat in the NSO action area; and would remove 41 acres of dispersal, resulting in 3,858 acres of dispersal habitat in the NSO action area (see Table 30). The dispersal habitat in the action area would not be appreciably reduced with the federal action (remains at about 47 percent). Any THPs in the reasonably foreseeable future are expected to include vegetation management activities similar to those in the past such as commercial thinning, even aged management, alternative prescriptions, shelterwood harvests and plantation management. The Elk LSR Enhancement project is expected to contribute beneficial direct and indirect effects to NSO habitat development, protection and resilience over the long term, but is not expected to cumulatively benefit from any activities that might occur on private lands.

As described in Table 3 of this document, private lands account for about 52 percent of the gray wolf action area, and in the area of more suitable denning and rendezvous sites for wolves, land ownership is mostly checker-boarded with private industrial timberlands and NFS lands. There are no large continuous blocks of security habitat for gray wolf in the action area, as overall road density is ~3.6 mi/mi² (Navarre 2015). The northern third has the highest level of security habitat. Road density within one mile of the project area averages 3-4 mi/mi². No portion of the project area is considered security habitat and the project would not reduce or increase open or total road density such that security habitat would be significantly increased or reduced.

THPs may include new road construction that can increase the potential for additional traffic and potential negative human-wolf interactions. Typically, if private roads are not cost share roads with the Forest Service, they are usually gated and locked and activity on them is reduced. Private lands are also typically closed to the recreating public, including hunters and wood gatherers.

The timing of private land THPs and Forest Service activities are not coordinated between ownerships and private land work is likely more dependent on market conditions. The ongoing (and any future proposed) THPs would include resource protections and provisions for any new observations (e.g. den site protections similar to those prescribed for the Elk LSR project), though there is no current direction in the 2015 Forest Practice Rules specific to gray wolf or protection measures. The Elk LSR project activities, combined with activities on private lands (road use, noise) could potentially temporarily disrupt gray wolves, either through eliciting a direct avoidance response, disrupting breeding or pup rearing activities, or via disturbance to ungulates and other prey in the action area. Individuals are likely habituated to noise in general and the disturbance associated with roads or harvest activities, or may completely avoid these sources of disturbance. This potential effect is generally considered undetectable or not meaningfully measurable relative to gray wolf behavior. As stated above, the Elk LSR project in combination with any activities associated with private actions will cumulatively increase road use, noise and disturbance in about four percent in the gray wolf action area during implementation.

The activities associated with the ongoing (or any future) THPs may also displace individual wolves, deer and other prey for the duration of the associated activities, or reduce or increase forage, cover and fawning habitat quality through treatments. These activities would occur off of existing open roads, as well as closed/gated private roads, and are not expected to cumulatively increase (or decrease) the open road or meaningfully affect the total open road density or wolf security habitat in the action area.
The potential noise and area-avoidance by hunting or dispersing individuals, or packs, is not predicted to result in any detectable or meaningfully measurable effects to any wolves in the action area, and therefore cumulative effects are considered insignificant. Based on the carnivore survey data to date from the Forest, and monitoring data shared with the FWS by CDFW, roads are not a concern for any den or rendezvous sites at this time. Because the Elk LSR project would not: 1) construct any new permanent roads, and open road density will not significantly change during or after the project, and 2) there is no anticipated construction of new open roads under ongoing THPs, the roads associated with present and reasonably foreseeable future management actions are not expected to have any effect on wolves that could result in an increased potential for human-wolf conflicts, mortality, reduced fitness or reproduction.

Given their wide-ranging foraging and dispersal habits, their ability to avoid human use areas and their tolerance of most human-related activities outside the denning and pup rearing period, the combined effects of activities on federal and private lands in the gray wolf action area are not expected to result in any meaningful or significantly cumulative effects to gray wolf.

While future forest management actions on private lands are likely to occur within the 30-year timeframe, reasonable effects cannot be evaluated in the absence of a proposed THP with information on road construction or other activities. While it is reasonable to base potential future actions on private lands on past or ongoing actions and effects, this cumulative effects analysis for the ESA is completed based on the best available current information at the time of this analysis. It is expected, however, that THPs will continue to have similar protection measures in place for NSO nest sites and maintaining habitat near NSO cores, and gray wolf den site protections.

As there is no designated critical habitat for the NSO or the gray wolf on private lands, there are no cumulative effects to critical habitat assessed under the ESA (USDI-FWS 2012, USDI-FWS 1978).

**IX. Determination**

Based upon the best available scientific and commercial data at the time of this document’s preparation, and evaluation of the potential effects, it is my determination that Alternative 1 of the Elk Late-Successional Reserve Enhancement Project:

- May affect, but is not likely to adversely affect the northern spotted owl or gray wolf;
- May affect and is likely to adversely affect designated critical habitat for the northern spotted owl; and
- Will have no effect on designated critical habitat for the gray wolf.

The determination for the NSO and its critical habitat is based on the following general rationale:

- Based on the annual 2007 to 2015 protocol surveys completed by the Forest Service and private landowners in the action area, and stand searches in the ST-215 activity center, NSOs have not been verified or detected in the action area or ST-215 activity center.
- A pair of barred owls was removed from the project area in fall 2014, though it is possible that barred owls may recolonize the project area regardless of project implementation.
- Regardless of removing barred owl(s), or project implementation, it is possible that juvenile, subadult or non-territorial NSO(s) may disperse through the project or action area; recolonize the ST-215 activity center or other
portions of quality habitat in the project area; or be present in the project area or action area, but be non-responsive during survey efforts.

• A combination of surveys, spot checks and stand searches for NSO will continue and LOPs will be utilized to reduce the potential for any direct or indirect effects during the critical breeding period on NSOs that may recolonize the ST-215 activity center.

• The project is designed to protect and enhance late-successional and NSO habitat at the landscape scale, specifically to reduce the ongoing risk of large-scale habitat loss from natural disturbances and stressors such as drought, disease, insects and fire; to increase resilience and diversity; and to promote and accelerate development of late-successional and old-growth habitat characteristics.

• The project conserves the limited high-value NSO habitat in the project area, including nesting/roosting and high quality foraging habitats. While limited in their distribution and scale across the project area, all areas of high value habitat have been excluded from mechanical treatments.

• Nesting/roosting and high value habitat for the NSO will be maintained and benefitted over the short and long term with low-intensity prescribed fire.

• Treatments that degrade 697 acres of foraging habitat are designed to improve stand health and habitat conditions over the short and long term, increasing the resiliency of foraging habitat while retaining components that continue to provide foraging opportunities for NSOs immediately post-treatment. Thinning and fuels treatments are expected to result in variable short term effects to habitat quality due to reductions in canopy closure and layering, snags, down logs and coarse wood, and shrub cover, reducing the quality of habitat in the short term. The range of conditions that support foraging habitat for NSOs, such as basal areas of 125-200+ sqft/acre in mixed conifer and white fir-pine stands; conifer and hardwood species diversity; large trees, snags, and down wood; 40-60% or more canopy closure; understory layering and vertical and horizontal heterogeneity would be retained and enhanced post-treatment. These forest stand conditions would continue to provide foraging opportunities for any NSO(s) that may recolonize or disperse through the project area.

Treatment of the 697 acres of foraging habitat represents approximately 61 percent and 20 percent of the available foraging habitat in the project area and action area, respectively.

• Treatments that downgrade 98 acres of foraging habitat to dispersal (including 46 acres in critical habitat and the ST-215 home range) are intended to increase hardwood diversity of California black oak, and help maintain and protect important components of late-successional habitat such as predominant, legacy sugar and ponderosa pine. Downgrading the 98 acres of foraging habitat to dispersal represents approximately 9 percent and 3 percent of the available foraging habitat in the project area and action area, respectively.

• Treatments that modify and maintain 180 acres of dispersal habitat are not expected to preclude habitat function or significantly affect the ability of NSOs to disperse across the project area and action area. The treatments are widely spaced across the project area and would be in proximity to either retained foraging habitats, or non-habitat for NSO. This treatment represents approximately 57 percent and 5 percent of the dispersal-only habitat in the project area and action area, respectively. At the project scale of all dispersal habitats (NRFD), it affects 11 percent.

39 Based on the amount of foraging habitat only, as suitable nesting/roosting habitat can also be utilized for foraging.
• Treatments that remove 41 acres of dispersal habitat are intended to protect important components of late-successional habitat such as predominant, legacy sugar and ponderosa pine trees. This treatment affects 13 percent of the dispersal-only habitat in the project area, 3 percent of all dispersal habitat in the project area and less than one percent in the action area.

• Treatments that improve 329 acres of capable habitat will reduce the risk of high-intensity fire in older, dense ponderosa pine plantations that are directly adjacent to high value NSO habitats, and will increase dispersal and suitable habitat over the long term in the ST-215 core and home range, including 26 percent of PCE1 (164 acres). This treatment affects 100% of the capable habitat in the project area.

• 629 acres of Primary Constituent Elements of critical habitat (nesting/roosting (PCE2), foraging (PCE3), dispersal (PCE4) and forest types in early and mid-serial stages that support the NSO across its geographical range (PCE1)) in Unit 8, Subunit 3 (East Cascades South [ECS-3] will be treated.

• No PCE functions will be removed. Though individual elements will be reduced, removed or variously affected in treatment units, the reduction of PCEs is not at a scale that would significantly reduce their value in critical habitat or the overall ability of the PCEs to function.

• Most effects to PCEs are considered beneficial in the short and long term, though components (small and medium size-trees, plantation ponderosa pine trees, snags, down wood, shrubs) will be:
  • Disturbed or reduced during low-intensity prescribed fire in 120 acres of PCE2 and 60 acres of PCE3;
  • Disturbed, reduced or removed through variable density thinning or prescribed fire in 15 acres of PCE4 including machine piling/burning of piles on 10 acres; and
  • Disturbed, reduced or removed during thinning, group selection and radial thinning of pine in PCE1 (older plantations), including machine piling/burning of piles on 19 acres.

• There will be a minor and short term adverse effect to components of PCE3 on 270 acres (82% of PCE3 in the project area) from cumulative treatments of variable density thinning, small gap creation in white fir, black oak release, radial thinning around predominant legacy pine, machine piling/burning piles and prescribed fire on all acres that will reduce or remove elements of PCE3:
  • 224 acres (68% of PCE3) will be in areas where foraging habitat is degraded (function maintained) by thinning and other restoration treatments, including 55 acres of machine piling and burning of piles. These treatments are considered a short term and minor adverse effect to components of PCE3, including NSO prey species and habitat.
  • 46 acres (14% of PCE3) will be in areas where foraging habitat is downgraded to dispersal function from black oak release and radial thinning around legacy predominant pine. These treatments are also considered a short term adverse effect, with longer term effects to the function from follow-up prescribed fire entries that would reduce small tree and shrub regeneration and snags/down logs. The effects from the second and third prescribed fire entries, and longer term increases in black oak canopy and tree size, are expected to transition towards being more beneficial, but similar reductions in down wood and regeneration would occur during these second and third entries.

• Project activities in PCEs are not expected to significantly or appreciably reduce the function of nesting/roosting, foraging or dispersal habitat or habitat connectivity at the project area, project area- critical habitat, or NSO action area scales or have a significant adverse effect on the ability for NSO(s) to utilize the landscape for life history functions.
- Project activities will result in short and long term benefits to all PCEs of critical habitat in the project area, including an increase in late-successional habitat and resilience; a reduced likelihood of losing high and moderate quality owl habitat from disease, insect impacts or stand-replacing fire; and acceleration of additional nesting/roosting, foraging and dispersal habitats in the ST-215 core and home range, and critical habitat. Any adverse effects are expected to be minor, for the reasons described in the detailed analysis sections of this document. The project’s benefits result in both short and long term enhancement of NSO habitat, as well as short and long term protection of habitat from epidemic losses due to disease, insects or uncharacteristic fire effects. These losses have or are currently occurring at a larger scale in other portions of the project area outside of suitable owl habitat, but in and near dispersal habitat, and at a smaller scale within suitable habitat.

- Project activities will not result in a measurable change in the ECS-3 subunit’s ability to provide the functions for which it was designated. PCE1 would be improved through thinning and diversity treatments; PCE2 would be maintained and benefitted from low-intensity prescribed fire; and the effects to PCE3 and PCE4 are described above. The effects to all PCEs represent less than one percent of ECS-3 subunit and the project actions will not significantly reduce the value of these primary constituent elements of critical habitat.

- Because mechanical treatments are primarily focused in lower quality habitat stands, are expected to result in a greater assurance of long-term maintenance of late-successional habitat over time, are not located in a higher quality NSO habitat area in general, and will not remove PCEs, the function of ECS-3 to provide demographic support in this area of sparsely distributed high quality habitat and Federal land, and to provide for population connectivity between subunits to the north and south, is not expected to be measurably impeded. The project is expected to improve the capability of the ST-215 home range, the project-area critical habitat and portions of the Elk Flat Late-Successional Reserve to support dispersing or potential territorial single or NSO pairs over the long term, providing a point of connectivity between currently occupied areas to support dispersal of NSO(s).

- There is no new permanent road construction, and new temporary roads would affect less than one acre of NSO foraging habitat (outside critical habitat). These roads would be decommissioned upon completion of project activities.

- Of the estimated new 40 landings, approximately 14.25 acres may be constructed in foraging habitat, with 1.5 acres in dispersal, 6.25 acres in capable, and the remaining 6.5 acres in non-habitat. Landings would also be decommissioned upon completion of project activities. Landings would not be constructed in N/R or high quality foraging habitat or Riparian Reserves of Ash Creek.

- Landing effects in critical habitat are estimated at 4.5 acres in PCE1, and 8.25 acres in PCE3. New landings of 0.5 to 0.75 acres in size would be widely dispersed across the project area and are considered insignificant at the stand level and immeasurable at the landscape scale. The created openings would not preclude an owl’s ability to utilize the habitat and would not alter the function of existing habitat at the stand or landscape level.

- In addition to the Forest Plan standards and guidelines, and the Late-Successional Reserve Assessment recommendations for unthinned patches and retention of snags and coarse woody debris, multiple project design features and resource protection measures were developed to help retain and protect habitat elements that contribute to NSO nesting, roosting, foraging and dispersal habitat, and other late-successional species habitat. Tables 5, 6, 7, 8 and 9 and the Project Design Features section of this document outline the tree selection criteria, general project design in NSO habitat, and the applicable resource protection measures.
• Management recommendations for technical assistance or reinitiation of consultation are included, as is monitoring of the prescribed fire effects in nesting/roosting habitat, and other thinned areas.
The determination for the gray wolf and its critical habitat is based on the following general rationale:

- The Shasta Pack has been detected in northern California and based on proximity, could potentially engage in foraging forays or nomadic hunting behaviors in the project area or gray wolf action area. No wolves or wolf sign have been detected in or near the project area to date.

- Disturbance concerns to wolves when implementing vegetation treatments are primarily associated with den sites in late winter/early spring and effects to reproductive success and pups. There is no current evidence to indicate there are breeding wolves (known dens or rendezvous sites) in, or within one mile of the project area (Kanim 2015, 2016; Figura 2016). With the planned monitoring and coordination with FWS and CDFW, and the provisions for implementing LOPs around den and rendezvous sites as described in Table 6, the likelihood that wolves or pups would be exposed to project actions and their environmental consequences is extremely unlikely.

- Vegetation management activities and road use under Alternative 1 could: (1) result in a disturbance and potential avoidance of the project area or treatment unit(s) by a wolf during spring/summer foraging forays, fall/winter nomadic hunting, or dispersal, or (2) result in a direct effect to ungulate prey from disturbance (affect vulnerability). These effects are either extremely unlikely to occur or are very small in scale relative to the to the gray wolf’s biology and ecology. Implementation of the vegetation treatments and road actions is expected to result in discountable and insignificant effects to gray wolf individuals and their prey.

- There is relatively low security habitat (~12%) in the action area, and no security habitat in the project area. The project’s route decommissioning, and addition of an existing 0.10 mile route to the System would not increase or decrease security habitat for wolves at any significant level.

- Surveys conducted by the Forest Service on National Forest System lands have not detected any wolves in or near the project area. Surveys and monitoring will continue prior to and throughout project implementation.

- The provisions for den and rendezvous site LOPs, wolves’ well-documented resilience to disturbance, and the fact that wolves are wide-ranging, generalist predators results in an insignificant and discountable likelihood that any individuals will be directly or indirectly exposed to disturbances from the project.

- There is no critical habitat designated for gray wolf in California (USDI-FWS 1978).

### X. Management Recommendations

If circumstances surrounding the project design or information used to evaluate project effects should change during the implementation period, the Forest will coordinate with the local Level 1 team and evaluate the need for reinitiating consultation under the provisions of the ESA. As described in Table 6, if barred owls are detected in the NSO action area prior to or during project implementation, the Forest will also coordinate with the local Level 1 team to discuss technical advice or reinitiate consultation based on the specific circumstances. For the gray wolf, interagency coordination and close collaboration with the FWS and CDFW is an essential conservation measure, given the new development of the Shasta Pack’s establishment in northern California in summer 2015. If wolves, dens or rendezvous sites are confirmed in or near the project area, wolf action area or on the Management Unit, it will be reported to CDFW and the FWS so follow-up investigations can occur. The CDFW is responsible for
contacting private landowners (CDFW et al. 2012). The Forest Service will continue to coordinate and communicate with the FWS and CDFW on their monitoring efforts.

XI. Contributors

David Topolewski – FWS consulting wildlife biologist (currently with USDA Forest Service)
Katherine Fitzgerald – FWS consulting wildlife biologist
Chad Anderson – FWS consulting wildlife biologist
Nadine Kanim – FWS wildlife biologist
Keith Paul – FWS consulting wildlife biologist
Cindy Diaz – Project IDT leader and planner
Annette Navarre – SMMU GIS specialist
Emelia Barnum – SMMU Natural Resources Planning Officer
David Riegle – TEAMS enterprise fuels specialist
Rick Baxter – TEAMS enterprise wildlife biologist
Steve Clark – SMMU fuels specialist
Heather McRae – SMMU and project fuels specialist
Lauren Payne – VMS enterprise and project silviculturist
Craig Sewell – SMMU silviculturist, project counterpart

XII. Literature and Personal Communications


California Department of Fish and Wildlife. 2011. Information on gray wolf in California.


Clark, S. 2014. Post-treatment unit reviews for piling needs and underburning effects; Algoma, Mudflow and Edson Vegetation Management Projects. Various dates and IDT field trips.


Courtney, S.P.; J.A. Blakesley; R.E. Bigley; M.L. Cody; J.P. Dumbacher; R.C. Fleischer; A.B. Franklin; J.F. Franklin; R.J. Gutiérrez; J.M. Marzluff; and L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute, Portland, OR.


Figura, P. 2016. Email correspondence from Pete Figura (CDFW biologist) to C. Jordan regarding general information on the Shasta Pack and other information regarding wolves. February 16 and March 11, 2016.

Fitzgerald, K. 2015. Email correspondence from Katherine Fitzgerald (Level 1 FWS biologist) to C. Jordan regarding upcoming changes in methods for procuring a species list and the use of IPaC (in regards to the Elk LSR Enhancement Project consultation). March 12, 2015.


Franklin, J. 2013. Personal communication between Dr. Jerry Franklin and the Elk interdisciplinary team. July 2013.


Hanna, Z. 2014. Email correspondence from Zachary Hanna, PhD student conducting research on barred owl and spotted owl hybridization. Correspondence specific to the barred owl removal on the Forest in fall 2014.


Kanim, N. 2016. Report out at January and February Level 1 meetings regarding CDFW having no updates on the Shasta Pack or other confirmed wolves in the state. Notes on file in the project record.

Kanim, N. 2015. Email correspondence from Nadine Kanim (FWS biologist) to C. Jordan regarding the estimated proximity of the Harris project to areas likely used by the Shasta Pack. December 1 and 2, 2015.


Krueger, P. and T. Nicolaaysen. 2015. Email correspondence from USDA Forest Service Region 5 Threatened and Endangered Species Coordinator and USDI-FWS staff regarding training opportunities for procuring an official species list from the IPaC system. June 2, 2015.


McRae, H. 2014 and 2015. Unit reviews to assess machine piling needs. Data on percentage of each unit that may require piling prior to underburning is presented in EIS Appendix A.


Navarre, A. 2015. GIS assessment of gray wolf and northern spotted owl cumulative effects analysis areas and action area. Unpublished data on file in the project record.


Sewell, C. 2014. Marking inspection memorandum to the project file. Denotes various review and meeting dates and overall marking inspection of the contracted marking crew. Notes course corrections based on marking guidelines and field reviews by/with the project biologist, FWS biologists, team leader and silviculturist. November 2014.


USDA Forest Service. 2007 Forest Vegetation Simulator Staff Report. Found online at: [http://www.fs.fed.us/fmsc/annual_report/FVSsupport.shtml](http://www.fs.fed.us/fmsc/annual_report/FVSsupport.shtml)


USDI Fish and Wildlife Service. 1994. Biological opinion for the preferred alternative (9) of the supplemental environmental impact statement of habitat for late successional and old-growth forest within the range of the northern spotted owl. Appendix G. In USDA Forest Service and USDI Bureau of Land Management (eds). Final environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl, Portland, OR.


Wiens, J.D. 2012. Competitive Interactions and Resource Partitioning between Northern Spotted Owls and Barred Owls in Western Oregon [Dissertation] [Corvallis, OR]: Oregon State University. 142p.


Appendix A – Official Species List

The following Official Species List was obtained from the FWS IPaC online system at

The gray wolf action area shapefile was utilized to bound the species list as it is the larger of the two action areas considered in this Biological Assessment.
Appendix B – Maps

*Note that maps are large file size and may not print well on 8x10

Map 1 – Alternative 1 Proposed Treatments – Thinning Treatments and Road Actions

Map 1a – NSO Habitat with Alternative 1 Thinning Treatments and Road Actions

Map 1b – NSO Habitat with Alternative 1 Fuels Treatments, Connected Actions and Road Actions

Map 2 – Gray Wolf Action Area and Project Area displaying general land ownership

Map 3 – NSO Action Area and Project Area displaying the ST-215 AC, core and home range with 2012 NAIP imagery and general land ownership

Map 4 – NSO Action Area Habitat Map

Map 4a – NSO Habitat Displaying the Critical Habitat Subunit ECS-3 (East Cascades South) in the western portion of the project area

Map 5 – NSO 6-Visist Survey Call Point Map for 2012, 2013 and 2014 (per Regional Office direction) – 2015 call points were those within 0.25 mile of suitable habitat

Map 5a – Baited camera locations on the McCloud Ranger District in 2014, 2015 and 2016 to date (several map sets). The Elk LSR Enhancement project area is displayed on each map.

Map 6 – Predicted crown fire behavior map based on 2007 Common Stand Exams and 2010 Flammap modeling

Map 6a – Predicted flame length map based on 2007 Common Stand Exams and 2010 Flammap modeling

Map 7 – Alternative 1 Proposed Treatments – Fuels Treatments
Appendix C – Consultation to Date

What follows is a summary of the consultation process between TEAMS and the Red Bluff FWS field office, and the detailed streamlined consultation process between the Forest and the Yreka FWS field office that concluded in April 2016. Throughout the planning process, potential treatment units or areas have been added or numbering changed. The units listed here correspond to the current preferred alternative. This information is based on IDT meeting notes and field reviews, email correspondence, phone conversations, Level 1 meetings, and FS-FWS consulting biologist discussions.

**August 25, 2009:** Initial IDT meeting with TEAMS wildlife biologist Rick Baxter and fuels specialist David Riegle and other TEAMS specialists; silviculturist Lauren Payne from Vegetation Management Solutions enterprise unit (VMS); SMMU counterparts, resource specialists, and applicable staff; and FWS biologists Keith Paul and Michelle Havens from the Red Bluff FWS field office. Discussions relevant to NSO center on the: past, ongoing and future surveys; 2000 NSO Baseline habitat map (USDA-FS 2000) that requires field verification and updating; 2008 critical habitat rule [vacated]; importance of retaining vertical structure and tree height diversity at 10 and 15 feet for NSO roosting/thermoregulation sites; and retaining understory (brush, small trees), the majority of large snags and logs, and 0.25-0.5 acre mortality patches for prey base. FWS made a recommendation for no-treatment patches every 3-5 acres. The Team discussed balancing the short and long term impacts for both the short and long term needs to provide (maintain) and develop habitat for NSO use. Existing stand conditions, common stand exam results (USDA-FS 2007), preliminary growth modeling by the Forest Vegetation Simulator (FVS), and cumulative effects from private and Forest Service projects were also discussed.

**August 26, 2009:** Field review in portions of project area by Baxter, Riegle, Payne, other IDT members, and Paul and Havens. Field discussions relevant to NSO focused on mortality in the pine component and ongoing loss of foraging habitat (unit 162); and the high stand density and habitat value in nesting/roosting habitat (unit 150 in ST-215 core). The group discussed the potential to thin this area, now since it was not being used by NSO, or to leave the stand to grow/stagnate while treating all around it. The potential to underburn only with some hand thinning pre-burning, or creating fuelbreaks along the roads surrounding unit 150 was also discussed. Group reviewed a mixed conifer stand with some legacy pine and cedar and dense understory of white fir, determining thinning would be beneficial in order to develop better quality foraging and nesting/roosting habitat for the future (unit 161 in ST-215 core).

**September 2009:** Baxter and Paul visit 22 stands to verify and update the 2000 NSO Baseline habitat map (Baxter and Paul 2009). They review initial thinning prescriptions from Payne and Paul provides feedback on what treatments would be beneficial for NSO habitat, and the integrity and progression of the LSR (Baxter and Paul 2009). These ideas are presented to Payne and Riegle at the October 20, 2009 IDT meeting to adjust certain thinning and fuels prescriptions.

**October 2009:** IDT conference call. Discussions include the preliminary Arc-based fuels modeling for no action where 90th percentile weather condition runs show a fair amount of the project area in passive crown fire (see the Map 6 sets in Appendix B of this document). Baxter discusses the September 2009 field work and describes the updated proposed treatments and NSO habitat map to the IDT. He shares Paul’s recommendations that non-NSO habitat should be treated aggressively, low-quality foraging habitat should be treated somewhat less aggressively, and nesting/roosting habitat has little or no mechanical treatment. The IDT discusses potential for prescribed burning, including opposing objectives in the project area where ladder fuels and down woody material are desirable for NSO habitat and the need to find an
appropriate compromise to reduce the risk of loss while maintaining and enhancing habitat function. Baxter describes Paul’s support for prescribed burning in some areas to reduce fine fuel accumulations, but is not generally supportive of burning in high-quality habitat. The need for new temporary roads is also discussed and protection measures to reduce these in high quality habitat.

**June 2010:** Payne, Greg Casselberry (IDT lead), Riegle and Debbie Derby (SMMU wildlife biologist counterpart) meet to discuss the modified thinning prescriptions provided by Baxter and Paul. Riegle completes FLAMMAP modeling of no action based on 2007 Common Stand Exam Data (see Map 6 datasets in **Appendix B**).

**October 2011:** Section 7 ESA consultation responsibility for the Forest is transferred to the Yreka FWS field office. All prior consultation records for the Project were transferred to the Yreka field office.

**November 2011:** Project is assigned to a SMMU IDT, with continued support from VMS silviculturist Payne, and TEAMS fuels specialist Riegle and biologist Baxter who continued consultation with FWS.

**December 1, 2011:** Christine Jordan presents the Draft Project Initiation Form (PIF) at the December Level 1 meeting on behalf of Baxter (general discussion of project planning since August 2009, estimated acreage of suitable, dispersal and non-habitat for NSO in project area per 2000 Baseline and September 2009 field verification by Baxter and Paul). The NSO survey history, existing stand conditions and increasing mortality in the southeast and eastern portions of project area’s pine-dominated stands, and the planned December 6, 2011 field review, are discussed. Jordan described that habitat typing in the action areas (including private lands) needs refinement and will be completed in 2012, along with continued left side planning by the IDT. This meeting starts the streamlined consultation process between the Forest and the Yreka FWS field office, as described in the Streamlining MOU (USDA-FS and USDI-FWS 2013).

**December 6, 2011:** Brief field review of project area by Jordan, Forest Biologist Kelly Wolcott, SMMU staff (District Ranger Carolyn Napper, Planning Officer Emelia Barnum, Timber Management Officer Ed Domanski) and FWS biologists Brian Woodbridge, Karen West, Dave Topolewski and Michelle Havens. Reviewed the extensive mortality area in units 158, 204, 206 to demonstrate ongoing and past mortality in ponderosa pine-dominated stands. Reviewed along Ash Creek near the NR habitat block (unit 150) to review mortality and fading condition of pine component in a mixed conifer stand. At unit 206, the group discussed NSO habitat use and the value of this area as prey base, but not as suitable NRF due to species composition, nor as functional dispersal due to the lack of overstory canopy cover. At the Ash Creek area, the group discussed the potential for salvage (as safely feasible) or machine piling and burning some of the dead trees, combined with follow-up prescribed fire in the NR habitat of unit 150.

**January 12, 2012:** Jordan and Derby coordinated with the FWS on SMMU’s annual NSO surveys, per recommendations in the survey protocol (USDI-FWS 2012 pp. 4-6). For this Project, the 2012 survey year is the start of implementing the revised survey protocol. We discussed that the last documented NSO nesting attempt in 1990 failed, and that recent logging had occurred on private lands in the ST-215 home range. We discussed NSO survey history (see the Surveys section in **Appendix D**), that the last verified aural and visual detection of NSO in ST-215 was in 2003 (single subadult female), and the adult barred owl detection in 2004. We mutually agreed to a 6-visit survey protocol in 2012 and 2013, and to revisit the survey plan in year three, depending on results. Adjacent landowners had not granted survey access to date, and Derby contacted Sierra Pacific Industries/Hancock to discuss data sharing and coordination.

**December 7, 2011–June 8, 2012:** Various IDT meetings, but no fieldwork with FWS. Both agencies identify/discuss information gaps and other NSO issues (Revised Recovery Plan, habitat typing, stand data) and discuss the proposed fall
In May 2012, the SMMU biologist role transitioned to Jordan, who continued consultation with FWS biologist Topolewski. Jordan transmitted the draft proposed treatment unit and ST-215 activity center maps with 2012 NAIP to Topolewski on June 8, 2012.

**June 12, 2012:** IDT meeting and field visit to discuss proposed prescriptions, habitat and refinements: Reviewed units 150, 152, 153, 155, 160, 161 and 166 (Payne, Craig Sewell-SMMU silviculturist, Jordan, Topolewski, Steve Clark-SMMU fuels specialist and Domanski). Given the location of unit 160 outside the home range (near Elk Flat meadow), lower quality foraging habitat, _Heterobasidion_ root disease in white fir and dying ponderosa pine, group decided to change the proposed thinning treatment of 150 sqft/ac of basal area to 125-150, but to not thin biomass and retain it as feasible. The original prescription also included ≤ 2-acre group selections to reduce root disease and promote age class and species diversity, and this element was retained. Discussed that within groups, foraging and dispersal elements (primarily dying trees and stagnant conditions) would be removed, but the overall stand would continue to function as foraging habitat (degrade). In unit 161 (in ST-215 core, foraging and critical habitat with pockets of dense white fir and roosting sites) the group decided to implement the proposed thinning treatment of 150 sqft/ac of basal area, retain biomass, not machine pile/burn and drop the proposed radial thinning, which could remove roosting elements. Discussed incorporating roost site element retention in marking guides and that the overall treatment, followed by prescribed fire, would degrade foraging habitat function. In unit 153 (part in ST-215 core/home range), discussed the foraging habitat quality (moderate to low), black oak, and pine mortality where it was occurring. The proposed treatment of thinning to 150 sqft/ac basal area was modified to a more variable prescription of 125-175 sqft/ac, species dependent. The need for and benefits of black oak release were discussed, but not in detail for treatment design or protection measures. Within the stand portions that have a legacy pine component, and ~12-18” DBH dense white fir, radial thinning and the potential for small (<0.25-acre) gap creation was discussed, given that small gaps could increase diversity and heterogeneity over time (no replanting of gaps). The variable thinning and gap creation would degrade foraging habitat function. Topolewski and Jordan noted that more specific measures for radial thinning around pine and oaks need to be developed (e.g., limit the trees per acre or TPA, add protection measures to retain certain species/size classes) and that these treatments could likely downgrade habitat, depending on specifics. The group discussed prescribed fire use in unit 150 and a portion of unit 152 (NR habitat in ST-215 core) and the benefits. In unit 152, discussed radial thinning around legacy pine, large tree and biomass retention, group selection in dense white fir, and modified the 150 sqft/ac basal area to a variable density of 125-175. Group noted that complex marking guides are needed here (and elsewhere) to assure habitat function is maintained. In units 155 and 166, discussed the dense understory and overstory stand conditions and using variable density thinning here and similar stands. In general, the group discussed trade-offs of thinning or retaining dense biomass (fire effects); the need to develop some measures for mortality during prescribed fire and retaining understory and coarse woody debris (CWD) for prey base; the location of and impacts to then-designated critical habitat (2008); the potential for DBH limits; and developing oak/ and pine radial thinning measures. Decision point that Jordan would continue reviewing each natural stand to prioritize where treatments were needed and determine if biomass retention, radial thinning pine, prescribed fire, or machine piling would contribute to or hinder habitat function.

**June 26, 2012:** Jordan transmitted Payne’s initial draft prescriptions to Topolewski, noting the June 12 modifications had not been incorporated. Jordan also conducted field reviews for habitat typing and treatment effects in units 151, 154, 156, 165, 168, 173, 182, and a separate portion of 155. Some units should be excluded from mechanical treatment either by deferring entirely (156, 173, 182) or including portions in unthinned patches (per the LSRA) or using marking guides to
direct ‘skipping’ treatment in a stand given existing large or small trees, decadence and vertical/horizontal structure and heterogeneity (151, 154, 165, 168). Also reviewed areas of private land in home range to update the NSO habitat map.

**July 2 and 9, 2012:** IDT meetings and field reviews with FWS participation, primarily to discuss Riparian Reserve conditions, potential mechanical thinning and prescribed fire, and consistency with the Aquatic Conservation Strategy objectives in Reserves (George-hydrologist, Snyder-Forest entomologist, Jordan, Topolewski and other IDT specialists). Reviewed units 152 and 157 along Ash Creek and discussed *Heterobasidion* root disease impacts, no treatment and treatment areas to maintain cool-air refugia along the creek, the existing large down wood that benefits fisher, and the likely effects of prescribed fire without pre-treatment of machine piling/burning. Decision point to likely develop a linear area along the creek where no mechanical treatments would occur, and measures for prescribed fire and CWD retention. Within rest of unit, thinning to 125-175 sqft/ac basal area, maintaining biomass and radial thinning a limited number of legacy pines would degrade foraging habitat function. Group also reviewed units 162 and 176 to discuss *Heterobasidion* and blackstain root disease in these ponderosa pine-dominated stands, NSO habitat (non-habitat with pockets of potential dispersal at that time) and snag retention feasibility. The treatment of thinning to 80-140 sqft/ac basal area (what could be thinned at time of implementation), interplanting and retaining snag pockets in the interior away from roads was also discussed. Snyder reiterated that where blackstain vascular wilt occurs, opening the pine stand to direct sunlight can warm and dry the soil and greatly reduce progression of the disease within residual trees.

**July 26, 2012:** Stewardship Collaboration Field Trip 1 of 2: The Shasta Valley Resource Conservation District, several local participants, Project IDT, SMMU staff members and Topolewski reviewed five locations in the project area to discuss existing conditions and potential treatment options. The second field trip occurred August 9, 2012 but FWS did not attend. The feedback from the FWS (and other participants) that was not already being considered was integrated into the Project’s design.

**July 27 and 31, 2012:** Jordan and Topolewski emailed regarding his comments from the July 26th field trip on designing the project to treat 30% or less of the foraging habitat designated as critical habitat. This discussion clarified that the recommendation was for “mechanical treatments that would notably degrade or downgrade/remove [foraging] habitat quality”.

**August-November 2012:** Jordan continued habitat typing and stand identification for Recovery Action 32, biomass and treatment assessments, and several field reviews with various IDT members.

**August 27-31, 2012:** Jordan transmitted to Topolewski the September 2009 NSO habitat map and spreadsheet from Baxter and Paul regarding treatments in NSO habitat; Jordan’s updated NSO habitat notes for key areas in the core (150, 151, 153, 161, 168) and home range (155, 165, 169, 173) and updated habitat map (to date); and the 2007 common stand exam summary, data and inventory maps.

**September 6-7, 2012:** Jordan conducted additional habitat typing on private lands in the ST-215 core and home range, and a field visit with FWS and FS biologists Derby and Susan Thomas to treatment and no –treatment areas in the core and home range (units 14, 151, 153, 165, 168, 173, 178). The group reviewed the updated NSO habitat map (to date) and discussed capable, dispersal, and non-habitat and treatments, suitable habitat treatment prioritization, RA10 prioritization guidance from the Yreka FWS for home ranges, and the variable density thinning approaches. Topolewski and Jordan also discussed separating habitat typing by Roosting and Nesting/Roosting, given the variability of this habitat type within portions of the project area. It was mutually decided that because potential roosting habitat was dispersed throughout potential treatment areas that were: 1) either not functioning as quality foraging (i.e., habitat elements are
present, but stands are too dense for owls to fly through), or 2) were in an area of more dispersal or capable habitat, that a project design feature that retains roost site habitat components would be a better approach. Jordan and Topolewski also mutually agreed that habitat typing for the Project would consist of Nesting/Roosting, High Quality Foraging, Foraging, Dispersal, Capable and Non-Habitat due to the variability and proposed treatments in older plantations that are ‘capable’ of becoming dispersal or suitable foraging. Topolewski agreed with the proposal to not treat units 156, 173, 182, portions of 151, 165 and 168 (based on Jordan’s field work on June 26, 2012) and to move forward with the previously-discussed thinning, small gap creation and groups in natural stands and the ‘capable’ habitat in older plantations (14, 16, 18, 6, etc.).

**September 19 and 29, 2012:** Jordan received a PDF file of an NSO habitat map and GIS shapefiles for the ST-215 core and home range from Jim Wolter of Hancock Forest Management (adjacent private lands owner) and Stu Farber (consulting biologist for Hancock Forest Management). This map/data was shared with Topolewski and utilized by Jordan, in combination with field reviews for habitat characterization of private lands in the NSO action area. During field review, and GIS work for the final NSO habitat map, it was observed on private lands that some typing differed in the core and home range analysis. The private lands map primarily designated dispersal habitat as low quality foraging, and several barrens (based on 2009 and 2012 NAIP) were also typed as foraging, potentially due to their proximity to foraging. For the most part, the designated non-habitat and foraging habitat in the home range on the private lands map matched with the USFS habitat typing.

**October 2012:** Jordan, Topolewski and other FWS biologists (Fitzgerald, Hellekson), Payne, Sewell and Clark re-reviewed NSO habitat in units 165 and 168 to provide the new FWS staff familiarity with the Project and habitat conditions. We discussed that portions of these units would be deferred, as they are considered high quality foraging trending toward NR of cedar, fir, and pine, ~10+ TPA >26” DBH, abundant large down wood and snags, tree size differentiation, understory perching structure, and small openings of bush chinquapin, manzanita and whitethorn. These areas would not be mechanically thinned, but would be underburned. Reviewed unit 154 to discuss variable stand conditions (mixed conifer with dying pine), dense incense cedar biomass in portions of the stand, large tree retention, no-treatment areas, and radial thinning. Decision made that radial thinning would not be used (similar rationale for unit 161 as the majority of roost habitat could be removed with this treatment). Group discussed that thinning to 125-175 sqft/ac basal area and thinning biomass would degrade foraging habitat. Biomass thinning was not excluded, given the dense conditions of cedar and fir in the understory in 70% of the unit (average 350 TPA in the <4” and 4-9.9” DBH size classes). Other portions of this unit are going to be excluded from mechanical treatment due to N/R characteristics, higher quality foraging and fisher habitat near Ash Creek. Reviewed the extensive mortality areas in units 158, 159, 204 and 206 to discuss habitat (non/some dispersal of ponderosa pine with prey base due to abundant down wood and natural regeneration, small pockets of white fir foraging in 158/159), snag retention as feasible, radial thinning around predominant legacy pine, and thinning to 80-140 sqft/ac basal area where it could be safely done during implementation. The group also discussed oak release treatments and how release distances would be larger on southern aspects, that predominant trees would not be cut and how diameter limits would be used in critical habitat. October 12, 2012, Topolewski transmitted the Northwest Forest Plan NSO relative habitat suitability map (completed by Raymond Davis) to Jordan for a comparison.

**December 4, 2012:** Revised Final Rule for NSO Critical Habitat was published in the Federal Register, resulting in 720 acres of critical habitat in the northwestern and western portions of the project area.
February 26, 2013: Jordan meets with FWS staff and adjacent private landowners to discuss annual survey coordination on the SMMU. 2013 is the second year of 6V surveys for the Project, and private landowners and the FS will continue data sharing and coordinating stand searches for ST-215.

March 21, 2013: Jordan presented the Final PIF at the March 2013 Level 1 meeting with a broad-scale project area habitat map, an estimated project timeline and details from the February 2013 proposed action and scoping document. Jordan provided the meeting participants with stand photos and maps and discussed the proposed variable density thinning, biomass retention, gap creation, and the process for prioritizing treatments under RA10 and RA32. General protection measures for LOPs, snag and CWD retention, and roost/rest site retention were described. At this time, specifics on machine piling and burning had not been worked out by the IDT, nor had some of the finer-scale protection measures. Discussed the field work and treatment modifications in 2012 by the IDT and FWS; the coarse levels of habitat in the project area, core and home range based on revised habitat typing; the preliminary effects determinations made in the field with FWS and the IDT; and the preliminary effects within the ST-215 core, home range and critical habitat. Discussed that the current unoccupied status, 32% plantation stands on NFS lands in the core and 15% in the home range, and ability to meaningfully affect structural and quality change in habitat in the core and home range in less than 30 years with treatment make this a prime candidate for treatment prioritization under RA10 (USDI-FWS 2011 p. III-45). Noted concerns included the large proportion of the home range in private lands (~60%), the logical shift of home range use to be within more of the LSR should NSOs re-occupy the activity center, and the timing and cumulative effects of proposed treatments (i.e., thinning, followed by potential piling and burning in some areas, followed by prescribed fire entries). Concerns were noted by Jordan regarding the wide range of habitat variability in stands (169, 235) and the effects of proposed treatments to foraging and dispersal. Both FS and FWS personnel contributed input (e.g., suggested a finer scale GIS representation of NSO habitat, additional reviews to discuss treatment concerns, and finalizing areas that would be subject to machine piling and burning). There was sufficient data available for the FS to present a draft determination that the Project was not likely to adversely affect the NSO (based on occupancy) and that it would have an adverse effect on designated critical habitat (primarily PCE3).

March 26, 2013: Second public meeting for Project scoping (Robert Carey of the Yreka FWS office attended as FWS could not attend the initial public meeting on March 5, 2013). No comments were provided at or after this meeting by the FWS regarding the scoping document/proposed action.

May 9, 2013: Jordan receives ST-215 stand search information from Stu Farber that dates back to June 16, 2011. It includes information about a probable NSO feather found in the core area (unit 150) that same day (Farber 2013). This information is transmitted to Topolewski on May 10, 2013.

November 2013: FWS Level 1 consulting biologist role transitioned to Katherine Fitzgerald. Jordan provided a list of draft project design features that were developed and discussed with Topolewski. These include LOP dates and survey/spot check plans, unthinned patch design, RA32 stands/elements, roost/rest habitat retention, diameter limits in oak release areas and NSO critical habitat and damage minimization measures for oak, limits on annual prescribed fire within a home range and general tree mortality levels during underburning (~10%), snag and down wood retention and CWD piling measures and monitoring. These measures were discussed, revised as needed (e.g., the FS desired specifics for underburning-see below) and fully incorporated into the Project’s design features and resource protection measures. Those specific to NSO are included in Table 6 and all measures are included in EIS Chapter 2.
November 12, 25 and 26, 2013: Field reviews with Fitzgerald, Sewell and IDT leader Cindy Diaz; and Clark, Sewell and Heather McRae (project fuels specialist). Re-briefed Fitzgerald on purpose and need and natural stand/plantation thinning prescriptions and discussed habitat types and prior agreements on effects determinations in suitable and critical habitat (degrade for majority, downgrade in oak release areas, short-term adverse effects in critical habitat PCE3-similar to the March 2013 PIF presentation). Discussed variable density thinning, group selection, radial thinning and underburning-only in detail; established a realistic percentage of acceptable mortality for the <4-10, 10-15, 16-20 and >20-inch DBH tree size classes during prescribed fire and how this would maintain/benefit habitat function; discussed existing project design features and RA10/RA32 and how the Forest perceives meeting recommendations; and discussed the NSO survey plan. In addition to re-verifying habitat conditions in units 150, 151, 152, 153, 161, 168-2 and 178 with Fitzgerald, and discussing preliminary determinations for effects in nesting/roosting (maintain/benefit), foraging (degrade or downgrade, treatment dependent), and dispersal habitat (improve/modify), the group also reviewed units 169 and 235. These areas are in critical habitat and the southwestern portion of the home range, and consist of a mix of dispersal and foraging habitat with a dying pine component. Review was needed to clarify concern over treatment effects raised during the March 2013 PIF presentation and the strong variation in these units of mixed conifer, pine pockets, dying pine and legacy trees. It was determined that within dispersal and foraging habitat, the treatments of thinning to 125-175 sqft/ac basal area would degrade foraging in the short-term, and modify but maintain and improve dispersal function over the short and long term. Marking began in the plantations and continued through early winter 2015. While thinning, groups and radial thinning are planned in these non-suitable or capable NSO habitat areas, the measures developed for the natural stands to retain unthinned patches and roost/rest sites as they occur carried over to the plantations. Jordan, Sewell and the TEAMS marking crew met in unit 6 to discuss the thinning prescription, roost/rest clumps, and retention of larger decadent trees in plantations that contribute to late-successional habitat objectives for the Project. A sample mark was completed and reviewed, with few adjustments needed.

February 19, 2014: Field review with Fitzgerald, Sewell and Domanski to discuss treatment modifications and Jordan’s concern regarding prescribed fire in RA32 stands. Reviewed units 161, 165 and 167 (all within core/home range) for this purpose. Also discussed unthinned patch designation and mapping, which includes RA32 stands and elements. In unit 165, discussed the potential for an oak release-only treatment and prescribed fire, and consistency with RA32 when using prescribed fire. Decision made to thin portions of this stand in lower quality foraging (~10-18” dense white fir along the edges and oak release) and retain, unthinned, the central higher quality foraging habitat of 26-30”+ DBH trees of mixed species, abundant down wood, large snags and shrub openings. Reaffirmed with Fitzgerald that prescribed fire, depending on timing and ignition patterns, is a beneficial treatment. Re-reviewed unit 161 and Sewell’s inquiry to utilize radial thinning. As discussed by Jordan, Topolewski and others on June 12, 2012, unit 161 is in the core and critical habitat and radial thinning would significantly remove roost site elements (contributor to PCE2). The stand has numerous roost/rest microsites and radial thinning around the trees that comprise those sites would effectively remove them. Radial thinning will not be included as a prescription element in unit 161. Where white fir is dense in unit 161, the proposed thinning would improve foraging function, and in remaining portions, degrade it. Reviewed unit 167 to discuss prescribed fire and downed wood conditions (~28 tons/acre of jack-strawed 10-20” diameter, 20’ long white fir, pine and cedar in this 5-acre unit). Decision made that as long as underburning occurs within the parameters developed November 25, 2013, that foraging habitat function would be maintained. Fitzgerald and Jordan also discussed survey history and the (still) unknown location(s) of the barred owls.
March 20, 2014: Jordan, FWS and private landowners participated in the annual survey coordination for the SMMU. Fitzgerald and Jordan mutually decided that due to barred owl presence (detections in last two seasons) that a third year of 6V surveys is appropriate. Jordan coordinated survey plans with private landowners and both parties will continue sharing data and coordinating ST-215 stand searches.

July 30, 2014: Marking started in natural stands and Jordan invited FWS. Jordan, Payne, Sewell and the TEAMS marking crew met in unit 161 to discuss variable density thinning prescriptions and its application, roost/rest clump identification within natural stands as compared to plantations, the ST-215 core and home range area, critical habitat and to discuss overall late-successional habitat objectives for the Project. A sample mark is completed and reviewed, with few adjustments needed. Jordan also talked with the crew about oak release treatments in units 153 and 178 and diameter limits in critical habitat.

August 26, 2014: Jordan completed a post-marking field review of unit 153 (foraging habitat with oak release element in critical habitat) with Fitzgerald and FWS biologist John Morris, the project botanists (Rhonda Posey and Brenna Montagne), Sewell and Domanski. This review was to identify if there were additional leave trees for wildlife use in the mixed conifer/oak stand area within critical habitat. The group discussed trade-offs and benefits to oaks, prey base, critical habitat function, NSO and fisher and agreed on the overall effect determination that foraging habitat would be downgraded to dispersal habitat where oak is released. Additional leave trees and cut trees were identified by the group, including oaks/clumps of oaks. The group (minus Posey and Montagne) proceeded to another portion of unit 153 to review the marking for small (~0.20-acre) gaps in white fir, and overall variable density thinning from 125-175 sqft/ac basal area. Here, the determination was also re-affirmed that thinning would degrade foraging habitat function. While the small gaps would remove habitat elements (12-18” DBH white fir trees with short limbs and infection), the gaps do not downgrade the habitat function for the stand. One gap location was adjusted to be more centrally located in stagnant white fir, similar to the other gaps. The group also reviewed the initial marking in units 154 and 161. It was re-agreed that based on the mark in unit 161, foraging habitat function would be degraded post-thinning and underburning. For this stand, and stands similar to unit 153 that have similar conditions and variable density thinning treatments, the same determination of ‘degrading’ foraging habitat was agreed to. In portions of unit 154, the mark did not match the prescription that was developed in October 2012 and the group discussed these concerns. The stand was reviewed and areas were mapped that should have been left untreated. In other portions of unit 154, the mark met the prescription of variable density thinning to 125-175 sqft/ac basal area (combined with roost/rest habitat clumps, unthinned patches and biomass that will leave some areas at >200 sqft/acre post-thinning). It was re-agreed that these treatments would degrade foraging habitat function.

September 23, 2014: Additional leave tree marking was completed by Jordan, Sewell and the SMMU timber preparation shop in the previously-reviewed portions of unit 154.

November 10, 2014: Jordan is notified by Robert Feamster of Sierra Pacific Industries that the barred owls that were detected in the project area (and on private lands) during 6V surveys the past three seasons were removed. This information was discussed with the FWS at the November 20, 2014 Level 1 meeting.

March 3, 2015: Jordan met with FWS to discuss annual survey coordination for the SMMU (private landowners were contacted later). Jordan and Jan Johnson (FWS wildlife biologist) agreed that due to the barred owl removal in fall 2014, and the barred owl detections over the last three years of 6V surveys, that Project-level surveys for 2015 could consist of three “modified” spot check visits (USDI-FWS 2012a pp. 17-18). This consisted of three visits in and within a 0.25 mile
of suitable habitat in the project area. Jordan coordinated survey plans and the stand searches for ST-215 with private landowners, who continued to survey portions of the action area due to planned and ongoing THPs.

March 31, 2015: Jordan met with Fitzgerald, Carey and Laura Finley (FWS wildlife biologist) to discuss the proposed fisher\textsuperscript{40} analysis area and home range estimates based on previously collected home range data in similar habitat types. Since there are no telemetry studies in this part of the fisher’s range to base an average female home range size upon, the group agreed to use a habitat-based approach. The analysis would include: 1) the local population area on the SMMU; 2) an analysis area encompassing the entire project area. Then to the north, up to 6,500-foot elevation range, and to the west, east and south, delineating the extent there is likely reproductive habitat based on stand conditions, age class, species composition and cover. This approach would be biologically meaningful for this species, and is an estimated 10,100-acre analysis area which is likely adequate to support approximately three female home ranges. The “fine-scale” analysis would consist of the treatment unit, stand and resting/denning structure.

April-August 2015: Additional unit and marking reviews were completed by Jordan to verify that the prescription and habitat objectives were being met with the mark. Jordan emailed Fitzgerald on July 9, 2015, summarizing the season’s surveys, field review of the current marking and plans for adjustments, the IDT’s progress and treatment changes for machine piling/burning acre estimates, reforestation plans and methods, road action modifications and protection lines/methods during prescribed fire.

August 20, 2015: Forest Ecosystem Staff Officer, Kathy Roche, participated in a telephone conversation with Klamath National Forest staff, Klamath Falls Oregon FWS staff, and Yreka FWS Supervisor Erin Williams regarding the new information on the Shasta Pack. They discussed that only a few staff members and biologists from CDFW have the exact location information for the cameras that photographed the Shasta Pack, and that CDFW is not sharing specific location information at this time. No information was provided to FWS by CDFW on a den site, only a rendezvous site (photographs from August 9, 2015; CDFW 2015). They discussed typical den site timing restrictions as April 1-June 30, and that none of the animals are collared, so day-to-day information is lacking. They also discussed that while there is no conclusive genetic information to date; Shasta Pack individuals are not considered part of an experimental population. Draft conservation measures for range allotment permits were also discussed.

August 27, 2015: Jordan, Emelia Barnum (SMMU Natural Resource Planning Officer) and Roche participated in a telephone conversation with Williams and Nadine Kanim (Yreka FWS fish and wildlife biologist) to discuss a separate project and its ongoing treatments. Jordan inquired if FWS could share information on the Shasta Pack’s general location, or an estimated distance to known activity areas, from the separate project. Williams shared that CDFW staff had requested the locations of the remote cameras and Pack not be shared at this time, but did state that if the FS provided an action area map, FWS could likely share an approximate distance range from the action area to the Pack’s potential use area(s) and detection area(s). The group also discussed accepted distances and time periods for den site LOPs.

October 7 and 13-14, 2015: Additional leave tree and cut tree marking completed by Jordan and the SMMU timber preparation shop in units 151, 152-1, 153, 154, 163, 166 and 169 to meet the project’s purpose and need and design features in critical habitat, overall LSR objectives, and to assure that the NSO foraging habitat/fisher habitat treatment objectives would be met. No other units in NSO or fisher habitat required marking modifications. Additional leave trees

\textsuperscript{40} Project effects to the fisher are assessed in the project-level Biological Evaluation.
in unit 402 that contribute to LSR function (though outside suitable/dispersal NSO habitat) need to be marked for retention prior to implementation.

**November 30, 2015:** Per the August 27, 2015 telephone conversation, Jordan emailed Kanim and Morris the Project’s NSO survey map and proposed gray wolf action area map, requesting if an estimated distance to CDFW’s detection areas could be provided, and if the CDFW had provided any new releasable information to the FWS.

**December 1 and 2, 2015:** Kanim emailed Jordan, describing the distance from the detection area to the project area and the action area, based on the detection area maps provided by CDFW (Kanim 2015). Kanim also noted the wide error bars included on the CDFW detection area maps and that CDFW had not provided any additional information to the FWS.

**January 6, 2016:** Habitat layers and treatment data in GIS spatial format, alternative and land allocation maps, the 2014 NSO call point map, and specific treatment information for the project was transmitted to Chad Anderson of the Yreka FWS office.

**January 18, 2016:** The Draft BA was transmitted to Chad Anderson of the Yreka FWS office.

**February 8, 2016:** Anderson and Jordan discussed the Draft BA via telephone, including background on the determination of effects to NSO critical habitat (MALAA due to short term adverse effects to elements of PCE3) and on the NSO (MANLAA due to survey history, project design and protection measures). Discussed development of project design features in connection with FWS and proposed underburning and monitoring plans for burned habitats.

**February 11, 2016:** Level 1 meeting with Anderson, Jordan, Brenda Olson (FS Level 1 coordinator) and Cindy Diaz (project IDT leader). Jordan summarized the planned edits for the Final BA (updated maps for treatments and critical habitat, table clarifications, piling acreage estimates). Diaz summarized the project’s timeline and preferred alternative. Discussed the FVS-FFE modeling results and being on-site when underburning treatments are implemented. Also discussed overall uncertainty of effects that may occur from burning in unthinned habitat and planned monitoring for underburning treatments, adaptive management and feedback loops to inform implementers and future project planning and implementation. Anderson and Jordan planned a field visit for February 23, 2016 (weather dependent) so Anderson could review NR habitat, RA32 stands, and some of the natural stands and older plantations proposed for thinning.

**March 1, 2016:** Field review of units 165, 155, 150, 6 and 14 with Anderson, Jordan, Heather McRae (fuels specialist) and Craig Sewell (project silviculturist counterpart). Snow levels varied from none to ~2-foot depth. Could see understory trees and overall forest stand conditions, but majority of large down wood was not exposed. Habitat review and discussions focused on NR habitat and the planned underburning in this habitat type. Discussed the planned burning methods, burn timing, past effects from burning on the Unit, and tree-well burning. Also discussed designation of RA32 stands and their scattered placement across the western/central portions of the project area. Reviewed the marking in unit 155 and discussed dense stand conditions and lack of openings. Discussed the long term benefits of habitat protection and development compared with the short term impacts from thinning and fuels treatments, especially in regard to the potential for extreme fire behavior which is a given based on current stand conditions (i.e. high stocking of medium size-class trees which serve as ladder fuels). Discussed down wood configurations and how best to leave/achieve desired conditions on the landscape for large down wood structure when implementing treatments. Jordan and McRae described how this typically involves a pre-piling/pre-burning field review with the fuels crews. Discussed the historic logging practices in the project area and the LSR establishment/history. Discussed the overall NSO nest site history, barred owl
detections in 2012-2014 and where the detections occurred (unit 206, north/northeast of unit 152-1, near unit 174). Also discussed general NSO survey history, the land exchange directly north of the project area in the early 1990s, surrounding private lands and the checkerboard land ownership on the District. Jordan described the general distances to other occupied activity centers with higher quality NSO habitat and reproductive, territorial pairs on the District. These include the Algoma and Moosehead areas that are ~5 and ~15 miles south/southeast of the project, and the Lower McCloud area that is ~20 miles southwest of the project. These areas have: a higher density of Douglas fir/mixed conifer mesic forests with hardwoods, more slope, drainages associated with perennial and intermittent streams, and better quality, connected habitats for NSO. Discussed the likely critical function that the ST-215 and Elk LSR project area is expected to contribute to dispersing juvenile, subadult and non-territorial adult NSOs in the future.

March 4, 2016: Anderson, Jordan and Diaz discussed the FWS comments on the Draft BA including clarification of how the unthinned patches, NR habitat and RA32 areas contribute to residual large trees and snags in treatment units and the project area, and how the FVS modeling does not take these areas into account. Jordan added language to the Final BA (in the foraging effects section) regarding the percentage of these areas in the project area and how they would contain larger trees and snags; functioning in combination with the thinned stands and residual tree/snag size classes to support NSO foraging habitat post-treatment. The snag modeling information was also added to the Final BA. Discussed the submitted photo of an owl from August 2013 (the photo was included with a comment letter received from an environmental organization on the Draft EIS on March 3, 2016). Discussions centered on how this photo and information on the owl in the comment letter did not present new or significant information relative to the project’s design, effects, or determination. This is because the project and the analysis already: 1) includes provisions for LOPs and surveys/spot checks during critical breeding periods; 2) concedes that NSOs (or barred owl) may reoccupy or disperse through the project area regardless of implementation; and 3) acknowledges that single and non-territorial NSOs may be present but non-responsive during surveys. Jordan and Anderson also discussed recent research on barred owl removal and NSO re-colonization rates (Diller et al. 2016). Jordan submitted an updated draft BA and maps to Anderson on March 15.

March 17 and 30: Jordan and Anderson discussed the methodology for determining habitat acreage affected by treatments, and the FVS modeling results for thinned stands. Tables and FVS modeling information were added to the Final BA and sent to Anderson on March 24. On March 30, we discussed the carnivore monitoring to date and results. A map of camera locations for 2014, 2015 and 2016 (to date) was added to the Final BA.

April 1 and 4, 2016: Agreement on the Final BA and submittal to the Yreka FWS field office with final maps and appendices in PDF format.
Appendix D

Species Status, Surveys, Existing Environment and Past Influences on Existing Conditions

Species status refers to known occurrence or likely occurrence of NSO or gray wolf in the respective action areas and focuses on actual or assumed individuals likely to be affected by proposed activities. The larger biological and demographic issues of NSO and gray wolf status are best described in research literature, the Revised Recovery Plan and Final Rule for NSO Critical Habitat (USDI-FWS 2011, 2012); and FWS status reviews, listing documents, research literature, and state management plans for the gray wolf. The gray wolf does not have a recovery plan or designated critical habitat in California at this time.

The existing environment refers to the existing conditions and relevant conservation or analysis units in the action areas (LSR, NSO critical habitat). It is a component of the environmental baseline, which is maintained by the FWS. The environmental baseline includes “…the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process.” [50 CFR §402.02] The past and present impacts of all Federal, State and private activities in the respective action areas, in combination with natural disturbance events and in-growth of vegetation represent the existing conditions. The existing environment in the action area fully reflects the aggregate impact of all prior human actions and natural events that have influenced and contributed to the environmental baseline. It is the best representation of the species’ biological baseline relative to assessing project-related effects and can include other aspects as relevant to species level effects, such as the known or possible presence of competitors or predators.

Past influences generally refers only to those events and activities that occurred in the recent past, or that are ongoing, that may have some influence or effect on individuals. This may include disturbance to the same individuals which could reasonably aggregate to larger, or longer-term effects. Past influences exclude past vegetation management actions or natural events that individuals currently occupying an action area have either never experienced, or to which they have reasonably adapted. While past actions in an action area are not necessarily informative for the purposes of the ESA analysis of potential effects, they contribute to the existing condition. A summary of past Federal, State and known private actions in the action areas is included in the Past Influences on Existing Conditions section below.

Species Status

Detailed information on NSO life history and ecology is included in Appendix A of the Recovery Plan (USDI-FWS 2011) and his hereby incorporated by reference. A summary of the gray wolf’s biology, ecology, listing history, and population information is included in the project record and is incorporated by reference. This section describes local information applicable to the NSO and gray wolf action areas.
Northern Spotted Owl

For monitoring, management and regulatory purposes, the NSOs range is divided into 12 physiographic provinces (USDI-FWS 1992; Davis and Lint 2005), based largely on the regional distribution of major forest types and state boundaries from southern British Columbia, Canada, south to Marin County, California. Most of these physiographic provinces are assessed for demographic trends (USDI-FWS 2011 p. A-3). The Project is located in the California Cascades Province; the eastern extent of the NSOs range in California. This Province is characterized as having relatively gentle terrain, low annual precipitation and dry forest types; influencing the distribution and quality of suitable NSO habitat in the Province and project area (USDA-FS and USDI-BLM 1994).

There are no demographic study areas within the California Cascades physiographic province (or on the Shasta-McCloud Management Unit as described further below). The closest demographic study area in terms of distance, climate, vegetation and habitat similarity to the SMMU, and project area, is the Southern Cascades Study Area (SCSA) in southern Oregon41 (see Dugger et al. 2015, 2014, 2012 for the most recent annual reports).

These recent reports from the SCSA show similar results to the northwestern California demographic study area (Franklin and others, various years) and other reports from NFWP monitoring areas42 regarding barred owls increasing overall, and a steady decrease of NSO detections. The annual SCSA reports also show NSOs persisting within cores that have high value habitat (Dugger et al. 2012) and increased NSO reproduction in “better weather” years. While productivity in 2014 on the SCSA in 2014 was better than average, the total number of NSOs detected and the number of previously banded owls identified were the lowest recorded for the study (Dugger et al. 2015 p. 13). In summary, NSO detections at historic territories were unchanged from 2013-2014 within LSRs, with a double digit decrease in detections in the matrix. The authors state that this been the long-term trend across the SCSA as detections of NSOs have gradually declined. This, and the other recent SCSA reports, primarily focus on the effects of barred owl presence on NSO occupancy and responsiveness, and generally demonstrate what is already well-documented in the Revised Recovery Plan and other demographic study areas regarding barred owl and NSO interactions. Over the course of the study on the SCSA, the annual percentage of barred owl detections at the 171 NSO territories has increased from a low of 4.1% to a high of 38% in 2014 (p. 9).

Based on a review of all 2015 reports compiled for the 2014 monitoring season in the NWFP demographic study areas, NSO detections are declining and barred owl detections are increasing range-wide. While the SCSA and other study areas had some of the highest levels of reproduction in 2014; in other study areas reproduction was the lowest it has ever been.

The 2015 meta-analysis synthesizes the results of 11 study areas in the NWFP area from 1985-2013 and is discussed in further detail below in the Barred Owls section (Dugger et al. 2015).

41 While the Regional demographic Study Area (RSA), including the Willow Creek Study Area, are second closest in terms of distance to the project area; the vegetation, climate, and weather patterns that can affect prey, nesting success and survival are not similar. These study areas are located in the California Klamath Province.

42 Reports are available to the public online at http://www.reo.gov/monitoring/reports/northern-spotted-owl-reports-publications.shtml
Action Area Condition

The action area’s main geomorphic processes are mass wasting and fluvial erosion, with nearly level glacial outwash terraces and lava flows with timbered toe slopes (Rust, Courtney 2015). Soils are generally deep to very deep (40-60 inches), well-draining, volcanic sandy loams in the Shasta and Germany families. These soils, while well-draining, also have good fertility due to their depth and available water-holding capacity. This is one element that contributes to rapid tree growth in the project area (and on the McCloud Flats in general). The climate is characterized by cool, wet winters and warm dry summers with average annual precipitation of 48 inches (WRCC 2010). Approximately 90% of the annual precipitation occurs between October and April, primarily as snowfall depending on water year, and snowfall is common at all elevations during the winter months (George 2015).

Habitat suitability on NFS lands and private lands in the NSO action area are primarily non-functional, followed by dispersal, foraging and then small pockets of nesting/roosting (see Map 4 in Appendix B). Limited dispersal and primarily non-functional NSO habitat comprise the southern extent of the action area, including the eastern and southeastern portions of the project area, where stands are dominated by a higher proportion of ponderosa pine and where there is little to no perennial surface water. The dry site conditions, overall flat topography, openings (Elk Flat, Coonrod Flat) and predominance of ponderosa pine in natural stands or plantations prohibit contiguous areas of NSO habitat.

Surface water in other portions of the NSO action area is also fairly limited, though smaller ephemeral and intermittent tributaries and springs are located to the north and west (NSO habitat suitability increases in the action area as elevation and water sources increase). As elevation, slope and water increase, there is a higher proportion of mixed-conifer forest of Douglas fir, sugar pine, incense cedar, and white fir mixed with ponderosa pine and an increasing distribution of black oak in the understory and in openings. At higher elevations, true fir with red fir is present. Barrens and shrubfields comprise approximately 10 percent of the NSO action area.

Listing Status, Recovery, Critical Habitat and Threats

The NSO was listed as Threatened under the ESA throughout its range “due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms, and lack of adequate regulatory mechanisms to conserve the species” (USDI-FWS 1990). At listing, significant threats included low and declining populations, limited and declining habitat, poor distribution of habitat or populations, isolated provinces, predation and competition, a lack of coordinated conservation measures, and vulnerability to natural disturbance. Since listing, these threats persist, though loss of habitat from timber harvest has declined significantly, especially on federal lands as described in the Recovery Plan (USDI-FWS 2011).

The 2011 Recovery Plan identified the most important range-wide threats to the NSO as competition with barred owls; ongoing loss of NSO habitat as a result of timber harvest; habitat loss or degradation from stand-replacing wildfire and other disturbances; and the loss and reduced distribution of spotted owl habitat due to past activities (pp. vii, II-2).

Both the Recovery Plan and 2012 Final Critical Habitat Rule recommend active management in the dynamic, disturbance-prone forests of the eastern Cascades, California Cascades and Klamath Provinces in a manner that reconciles overlapping goals of NSO conservation, and response to climate change and restoration of the dry forest
ecological structure, composition and processes, including wildfire and other disturbances (p. III-20). The Final Rule describes that in the drier, more fire-prone regions of the NSOs range, habitat conditions will likely be more dynamic, and more active management may be required to reduce the risk to the essential physical or biological features from fire, insects, disease, and climate change, as well as to promote regeneration following disturbance (USDI-FWS 2012 p. 71908).

While the Service recommends conserving high-quality and occupied NSO habitat, they also stress that long-term recovery could benefit from carefully applied active management where the basic goals are to restore or maintain ecological processes, reduce future losses of NSO habitat, and improve overall forest ecosystem resilience to climate change, fire and other disturbance agents. The Service describes numerous methods of active management and silvicultural activities that restore, enhance or promote development of high value habitat should result in more NSO habitat retained on the landscape for longer periods of time (USDI-FWS 2011 pp. I-9, II-10 to II-12, III-13 to III-21; USDI-FWS 2012 pp. 71909, 71942-71943).

The Final Rule’s discussion of potential active management in designated critical habitat is intended to encourage land managers to consider the range of management flexibility already contained in the Northwest Forest Plan (USDI-FWS 2012 p.71889). It is obvious that site-specific conditions play a role in land and forest management decisions, but the Rule does recommend focusing active management in younger forest, lower quality habitat, or where ecological conditions are most departed from the natural or desired range of variability. In dry forests, it recommends following the NWFP guidelines and focusing on lands in or outside reserves where uncharacteristic disturbance has occurred and where the landscape management goal is to restore more natural or resilient forest ecosystems (pp. 71882-71883).

**Fire**

To track the status and trend of late-successional and old-growth forests, and population and habitat trends for northern spotted owls, effectiveness monitoring for the NWFP has been ongoing for 20 years. The 2015, 20-year monitoring report for the ‘Status and Trend of Late-successional and Old-growth Forests’ states: “some portions of the NWFP area have been setback by decades from achieving those outcomes [expectations for older forest abundance, diversity and connectivity] particularly resulting from large wildfires in the fire-prone portions of the NWFP area” (Davis et al. 2015). The 20-year monitoring report for the ‘Status and Trend of Northern Spotted Owl Habitat’ describes: “large wildfires continue to be the leading cause for loss of NSO habitats on federal lands. Most of these fire-related losses have occurred within the network of large reserves that were designed for the protection and restoration of habitat for long-term NSO conservation” (Davis et al. 2015). Range-wide, the nesting/roosting habitat lost from fire (505,800 acres) represents about 31 percent of the total habitat loss. The report further describes that loss rates in the fire-prone portions of the NSOs range exceeded the expected 2.5% rate for the 20-year period at rates of 3.9-7.4% per decade, including the California Cascades province. It further notes that most large wildfires and resulting habitat losses have occurred in the federally reserved land use allocations [including LSRs] designed for NSO conservation. Climate change is expected to expand the area of fire-prone landscapes and an increased frequency of large wildfires this century has already been observed (Davis et al. 2015).

**Barred Owls**

The recovery objectives in the Recovery Plan for dry forests include maintaining sufficient NSO habitat in the short-term to allow NSOs to persist in the face of threats from barred owl expansion and habitat loss from wildfires.
While large wildfires continue to be a leading cause of NSO habitat on federal lands, competition from barred owls is considered a significant, if not the primary current cause, of NSO population decline (Dugger et al. 2015, USDI-FWS 2011). Appendix B of the Recovery Plan contains numerous references regarding known barred owl competitive interactions with NSO, and is hereby incorporated by reference (similar information is included below in the Status of Predators and Competitors in the Action Area section of this document). Due to their similar dietary and habitat preferences, the barred owl is a competitor with NSO and potential predator (USDI-FWS 2011; Pearson and Livezey 2003). While details on habitat interactions are not well understood, they have a broader diet, may reduce NSO detectability and may occupy former NSO activity centers (Irwin et al. 2010; USDI-FWS 2011; Wiens 2012). Their range completely overlaps with the NSO's range (Gutiérrez et al. 1995) and they can negatively affect NSO site occupancy, reproduction and survival (Livezey et al. 2007). Similar effects may occur on any NSO from barred owls utilizing the action area, regardless of project implementation.

Based on the 2012 meta-analysis completed by Forsman and others (2011, 2012) and the monitoring at demographic study areas across the NSO's range from 1985-2008, the average annual rate of NSO population decline during that time span was estimated at 2.8 percent, with populations in Washington exhibiting the greatest declines. Based on the more recent December 2015 meta-analysis, NSO populations continued to decline in all parts of their range, even with maintenance and restoration of suitable habitat (Dugger et al. 2015). This recent meta-analysis indicates a range-wide average 3.8% annual decline rate of the population between 1985 and 2013 and concludes that the results indicate competition with barred owls may be the primary cause of NSO population decline across their range. It also concludes that nesting and roosting habitat loss and climatic patterns were related to NSO survival, occupancy, recruitment and fecundity.

Dugger’s and other findings in the 2015 meta-analysis provide support for the previous recommendations to preserve as much high-quality habitat in late-successional forest across the range of the subspecies as possible (Forsman et al. 2012, 2011; Dugger et al. 2011; USDI-FWS 2011, 2012). The December 2015 meta-analysis does caution that “barred owl densities may now be high enough across the NSOs range that, despite continued management and conservation of suitable NSO habitat on federal lands (Davis et al. 2011, 2015), the long-term prognosis for NSO persistence may be in question without additional [barred owl] management intervention” (Dugger at al. 2015 p. 99). The analysis also concedes that barred owl removal may be able to slow or reverse population declines on at least a localized scale, based on observations in the privately managed Green Diamond Resources study area. As described in a recent literature from a demography study area in coastal northern California, removal of barred owls resulted in increases in NSO occupancy with an estimated survival rate of 0.859 compared with 0.822 in areas where barred owls were not removed (Diller et al. 2016). The study area did have an overall lower density of barred owls compared with other portions of the NSOs range, but preliminary results suggest that NSOs are likely to recolonize their former territories following barred owl removal. This effect has not been demonstrated to date in the Elk LSR project area or ST-215 activity center (the barred owl pair was removed in October 2014), but as described earlier in this document, NSOs may recolonize the activity center, or use portions of the project area during dispersal. It is also possible that barred owls may recolonize the project area, regardless of project implementation.

43 One exception was the treatment area within the Green Diamond Resources study area, where NSO populations started increasing after barred owl removals were initiated in 2009.
It is recognized that when barred owls and NSOs do co-occur, a reduction in habitat availability and quality may exacerbate interactions between the two species. Reductions in NSO prey density and distribution, notably in landscapes that have been recently affected by large scale disturbance events (stand loss from fire, other disturbances), may also exacerbate competition for resources between barred owls and NSOs where the species co-exist. NSOs can be displaced because of fire or habitat reductions and may have increased difficulty in finding new territories to colonize or in expanding their home ranges to compensate for habitat reductions when barred owls are present on the landscape. Dugger and others (2011) suggested that in environments where the two species compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help NSOs to persist in the short term. This recommendation was re-supported in the 2015 meta-analysis summarized above. While the Recovery Plan also concedes there are still substantial information gaps regarding ecological interactions between NSOs and barred owls (p. III-62), the effects of forest management on their interactions is not fully understood or described (Courtney et al. 2004, USDI-FWS 2011) and ongoing and future monitoring may provide further understanding. While they can overlap in habitat selection (Wiens et al. 2014) and to some extent prey use, the more generalized food habits of barred owls, overall abundance of early seral habitats in and near the project area, and project design that leaves the best habitat for northern flying squirrel in an unthinned condition make it unlikely that competition for prey with barred owls would increase direct (or indirect) mortality of, or competitive interactions with, NSOs should either subspecies recolonize the project area. Refer to the barred owl analysis in the Direct Effects to NSO section of this document for a discussion on direct and indirect effects with barred owls, and the NSO Prey Effects Summary section for project effects on prey base and availability.

Management Unit NSO/Barred Owl Status

As described earlier, there are no NWFP demographic study areas on the SMMU, but when more intensive monitoring of NSO territories and project-level surveys began in the late 1980s/early 1990s, there were approximately 20 known territories on the McCloud Ranger District (with 35 Unit-wide). Approximately 12 of these 20 territories have been confirmed to be consistently occupied by single NSOs or reproducing or non-reproducing NSO pairs from before 1989 through 2013 (USDA-FS 1989-2013). For the remainder of the 20 territories, status was unknown due to lack of funding to complete annual surveys that were not project-specific, resulting in some incomplete information regarding NSO occupancy and reproduction over that time span. In the last three seasons, an annual average of seven territories have been confirmed occupied by NSOs, with only four of the 20 historic territories not being surveyed through either FS project-level, activity center stand search or private lands survey efforts. Since 1997, the earliest known presence of barred owls on the SMMU, three of the known NSO territories on the District have shifted their locations, presumably due to competition with barred owls. Barred owl/NSO reproduction was documented in 2009 and again in 2013 at one territory (ST-203). Numerous observations of hybrid spotted and barred owls have also been reported to the Forest in recent years (Jefferson Resources 2014; Feamster 2014, 2015) and active removal of barred owls near NSO territories by private land management and researchers has been ongoing since fall 2014 (Feamster, Hanna 2014; Feamster 2015). Whether the reduction in NSO aural and visual detections over the past three seasons in the prior consistently-occupied NSO territories is the result of barred owl competition, or other factors is unknown. Annual survey coordination and data

44 Based on years when surveys/activity center searches conducted between 1989 and 2013
sharing with private lands is ongoing and to the best of its limited ability, informs the larger NSO population and reproductive status on the District and Management Unit.

There is one NSO activity center (AC) in the action area; Elk Flat-ST-215. This AC is listed in CDFW’s NSO database as site number SIS0319 (CNDDB Spotted Owl Database 2012, 2016). Based on survey results (detailed below and in Table 32), the ST-215 AC has not been occupied by a reproductive NSO pair since 1990, when the last nesting attempt failed.

At this time there are no barred owls known to occur in the action area. The pair that had been occupying portions of the project area, and stands to the north on ORM lands since 2012, was removed in October 2014 (Feamster, Hanna 2014). Neither barred owls nor NSOs were detected during the 2015 survey efforts on NFS lands or private lands in the action area (USDA-FS 1989-2015; Wizner 2015). While the presence of the barred owls prior to their removal may have suppressed or reduced NSO responses during surveys, 6-visit surveys and stand searches occurred from 2012 through 2014, in accordance with the 2012 survey protocol (see Map 5 in Appendix B). Stand searches and spot checks, as agreed to with the FWS in 2015, occurred during the 2015 season with no verified detections of NSO. The closest, known barred owl on the SMMU is approximately six miles southwest of the project area (ST-203 barred male/NSO female pair) as this individual has not been removed to date.

Fire and Disease Threats

Nearly all NSO habitat lost due to high severity wildfire on the Forest over the past 20 years has occurred on the west side and more recently, on a combination of the Shasta-Lake and McCloud Ranger Districts during the 2012 Bagley Fire and the 2009 Chalk Goose Fire. The primary natural threats to NSO habitat on NFS lands on the McCloud Ranger District are tree mortality resulting from high stocking densities, black stain root disease in pine and white fir, *Heterobasidion* (annosus) root disease in white fir, white fir-mistletoe infection and subsequent bark beetle attacks occurring above endemic levels. These conditions, combined with fire suppression, result in stands that are more susceptible to high severity fire effects and potential NSO habitat loss. While most lightning or human-caused fire starts on the District are quickly contained due to fast response times and roads that permit easy access, fire behavior and rates of spread remain erratic and high in some areas due to fuel loading, wind and dry site conditions (McRae 2015).

The topography and dry site conditions that influence forest vegetation are the primary factors that limit suitable habitat for NSO in the action area and project area. The epidemic mortality from overstocking, disease, and insect attacks in ponderosa pine; past management in the LSR; and past and ongoing timber harvest on private lands also influence the current quality and spatial distribution of NSO habitat in the action area and project area. While the pine-dominated stands may not support NSO habitat, their existing and declining condition poses a direct threat to the long-term sustainability and development of NSO habitat in the remainder of the NSO habitat stands in and outside of the project area.

**Gray Wolf**

The biology, recovery planning and other information specific to the gray wolf is included in the project record. Information most relevant to the project’s analysis is included here. The Shasta-Trinity National Forest is located in the portion of the United States where the gray wolf remains federally listed as endangered. It is not currently designated as a sensitive species. While there is no official Region 5 guidance for gray wolves, effects generally...
Elk LSR Enhancement Project – Wildlife Biological Assessment – Shasta-Trinity National Forest – Appendix D

considered include disturbance to dens and rendezvous sites, loss of security habitat that can lead to greater human conflicts and potential mortality, and impacts to prey species availability and distribution. The Biological Opinion for the NWFP’s preferred alternative addressed the gray wolf, in respect to Washington and Oregon, noting that “Wolves can live in essentially any habitat that supports adequate numbers of ungulates and provides safety from excessive human exploitation….They utilize a broad spectrum of habitats provided there is an abundance of natural prey and minimal conflict with human interests/uses. The key components of wolf habitat are: 1) a sufficient, year-round prey base of ungulates and alternate prey; 2) suitable and somewhat secluded denning and rendezvous sites; and 3) sufficient space with minimal exposure to humans” (USDI-FWS 1994 in USDA-FS and USDI-BLM 1994 Appendix G p. 32). The Biological Opinion also recommended reducing existing road mileage and noted that Federal agencies would need to minimize effects to the wolf and prey by avoiding new road construction and implementing stringent closures for roads (p. 33).

On August 20, 2015 the CDFW issued a news release announcing the confirmed presence of seven gray wolves, designated as the Shasta Pack (CDFW 2015). The Shasta Pack consisted of five pups (estimated from photographs to be several months old) and two adults. Scat was also collected and processed for genetic analysis and it was determined that the Pack’s alpha female is descended from the Imnaha Pack in northeast Oregon (CDFW 2015).

Confirmed gray wolf presence in California since the last sighting in 1924 near Lassen County has been limited to OR7 and the Shasta Pack (Jurek 1994; CDFW 2011, 2015). Though historic records do not report wolves, because of their wide-ranging habits and being a generalist predator, wolves likely historically inhabited the Shasta-Trinity National Forest. Also while there may have been/may be other individual wolves in the state that are not known or radio-collared and able to be tracked, all other “wolf” sightings reported in California prior to OR7 and the Shasta Pack were determined to be coyotes, domestic dogs or wolf-dog hybrids. There was no scientific or verifiable evidence that wolves occurred in the state, Forest, or project area for over 100 years. Wolves utilize and disperse across a wide range of habitats (forests, deserts, woodlands, alpine areas, grasslands) and dispersal behavior by young wolves demonstrates they can travel up to, if not farther than 600 miles. Actual packs usually hunt within a specific territory ranging from 25 square miles, up to 1,500 square miles in areas where prey is scarce, and they can generally travel 20-30 miles a day for hunting forays (USDI-FWS 2011).

As described in the current Federal Coordination Management Plan for the Gray Wolf (CDFW et al. 2012), the CDFW is coordinating with the FWS, and the FWS offices will continue to disseminate appropriate information to the federal land management agencies, including the Forest Service, as that information becomes available.

The Shasta Pack is the first verified documentation of multiple wolves and wolf reproduction in California since the 1920s and relatively little information is currently available about the spatial and temporal patterns of habitat use by the Pack. Per CDFWs communications with and detection maps provided to FWS, the Pack was observed within about two miles of the project area and within the gray wolf action area established for the Project (Kanim 2015). This distance is well within the hunting foray distance for adults and if the Pack remains close to the CDFW detection area, it is possible that members may travel past, or through, the project area when it transitions to nomadic hunting behavior in late fall or winter. Based on past and ongoing surveys and fieldwork for the Project, there are currently no den or rendezvous sites in or near the project area (USDA-FS 2014, 2015). CDFW has not shared any additional information on the Shasta Pack with the FWS or Forest Service since August (Kanim 2015).

The CDFW contacted the Forest in February 2016 to inquire about ongoing monitoring and if any positive detections of the Shasta Pack or other verified sightings of wolves have occurred (Figura 2016). The Forest
responded that the last verified occurrences were in October 2015 and were not located on the Forest. Aside from OR7’s dispersal behavior in the northeastern portion of the state from 2011-2013 and early 2014 and the recent observations of the Shasta Pack, there are no other known or verified wolves or packs in the vicinity of the Forest. Given their wide ranging habits and dispersal behaviors, information on other confirmed wolves moving in to or through California is expected to change rapidly and this analysis is based on the best available information at the time it was completed.

The principles of suitable wolf habitat are similar across all of their known range; they persist where ungulate populations are adequate to support them and where conflict with humans and livestock is low (Carroll et al. 2006; Oakleaf et al. 2006). The most important habitat attributes for wolf-pack persistence are forest cover, large undeveloped tracts of public land, high ungulate density and low livestock density. Their security habitat is often measured by road density, and source habitat measured by prey availability. Habitat quality is based largely on availability of their preferred prey species - elk and deer (Paquet and Carbyn 2003). However, as they continue to expand their range, wolves are establishing territories more proximal to substantial human development (ODFW 2010; Wiles et al. 2011). They are very resilient and can likely survive in such areas as long as prey supply, a function of both prey density and vulnerability; habitat; and regulation of human-caused mortality are adequate (Fuller et al. 2003; Haight et al. 1988; Creel and Rotella 2010). Unsuitable habitat is typically characterized by low forest cover, high human density and use, and year-round livestock presence (Oakleaf et al. 2006). Areas considered unsuitable are primarily due to human and livestock presence and the associated lack of tolerance of wolves due primarily to livestock depredation.

There is no current, reliable or tested data on the types of habitat that wolves “prefer” to occupy in California. Where wolves are collared in Oregon, they primarily use forest habitat and will also use open areas depending on distribution and seasonal shifts of prey (e.g. elk and deer shifting to lower elevation wintering areas). Location data from collared wolves in Oregon from 2006 to 2014 showed land use by wolves to be higher on public (62%) than private lands (38%). In Washington, the majority (77-93%) of habitat use has been on federal and state public lands, primarily Forest Service (Wiles et al. 2011). The research and tracking data for wolves in the Northern Rocky Mountain states demonstrates those wolves’ greater tolerance of human presence and disturbance and larger use of private lands (Wiles et al. 2011).

General habitat requirements, territory use and behaviors are fully described in the project record summary for gray wolf life history, along with mortality and population growth factors. Actual rates of population change depend on whether the wolf population is pioneering vacant habitat, or whether it is well established. The degrees and types of legal protection, agency control actions and regulated harvest can also influence population trends. Once established, populations can generally withstand high mortality rates, provided reproductive rates are also high and immigration continues (Fuller et al. 2003). Landowner acceptance of wolf presence and use of private lands is also going to be highly variable. Given wolves’ high mobility (outside their denning period) and the juxtaposition of public and private lands in the action area (and in the state), it will not be unusual for wolves to traverse these multiple ownerships in a single day (evidenced by the movements of OR7 in California, and other tracking in states with wolf populations). While land uses may predispose a pack to conflicts with humans or livestock, the presence of livestock does not present a foregone conclusion that a dispersing wolf or pack will routinely depredate (Bangs and Shivik 2001; Sime et al. 2007, 2011).
The Shasta Pack, while not conclusive evidence, likely demonstrates an expanding wolf population and range from Oregon into California and CDFW is the only entity known to be conducting specific wolf monitoring efforts in California at this time. CDFW plans to cooperate with the ODFW and the FWS on various monitoring efforts for the Pack (Kovacs 2015). GPS collaring or use of microchips can assist CDFW with tracking wolf movements, and help to avoid sensitive areas (den, rendezvous sites). None of the Shasta Pack individuals are collared at this time, and this effort (should it be undertaken) will take planning and likely permitting with the ODFW and FWS (Kovacs 2015). When and how any data might be shared has not been determined.

The topography, wide elevation range, variable habitat conditions and land management practices all influence forest vegetation and prey distribution in the wolf action area. The high road density and lack of security habitat are likely the primary limiting factors in the action area and project area. There is one grazing allotment administered by the NFS, the Bartle Allotment, and this also overlaps the project area.

The known fire and timber harvest activities in the action area are summarized in the Past Influences on Existing Conditions section below.

Surveys

Based on the Forest Service’s survey history and stand search data, the ST-215 activity center (AC) has not been occupied by an NSO pair since 1990, when the last nesting attempt failed. Table 32 outlines the survey history for ST-215 from 1990 through 2015. Protocol surveys were either completed using the 1992 (USDI-FWS 1992) or 2012 versions (USDI-FWS 2012). Annual AC stand searches have varied from 2-5 per season since 2007 (landowner depending) with the Forest Service completing three each season from 2013-2015. Three-visit protocol surveys of the action area were completed from 2003-2005 and 2007-2011. In 2003, a single subadult female NSO was detected during nighttime calling and was confirmed as a subadult during the follow-up. This individual remained in the core for the duration of the 2003 season (Thomas 2015). No aural or verified visual detections of this individual, or other NSOs, have occurred. In 2011, a probable NSO feather was found in the core during a stand search (Farber 2013), with no aural or visual detections of NSO during the follow-up surveys or nighttime calling efforts that year.

Starting in 2012, and continuing through 2014, six nighttime calling visits were completed; with a modified 3-visit spot check completed in 2015, in accordance with the January 2012 NSO Survey Protocol and its guidance for annual survey coordination with the FWS and landowners (USDI-FWS 2012 pp. 4-6). No NSOs have been detected during any of these survey efforts on NFS and private lands in the action area (USDA-FS 1989-2015, Wizner 2015). The reason a lack of NSO activity can vary depending on habitat conditions, distance to other reproducing territories, predation and other factors. For the ST-215 core, 25 years of non-occupancy by reproducing NSOs, and 12 years since the last verified single NSO is likely the result of the low amount of N/R and high quality habitat in the core and home range, the predominance of ponderosa pine in the home range, the higher open road density and the surrounding private lands management.

An adult male barred owl was detected in the project area in 2004, and a pair was detected intermittently during the 2012-2014 nighttime calling surveys. Barred owls were not detected during the daytime stand searches and neither the Forest Service nor private land surveys located the nest or nesting area. In fall 2014, the barred owl pair was

45 Per annual survey coordination meetings with landowners and the FWS, and agreements to share data
removed (Feamster, Hanna 2014). During the 2015 surveys and stand searches, there were no barred owl detections (Wizner 2015).

While barred owls are not currently known to occur in the action area, this does not mean they (or NSOs) could not reoccupy portions of the action area or project area in the future. Surveys, activity center searches or spot checks will be continued prior to and throughout project implementation, as discussed and agreed to annually with the local Level 1 team and as described in Table 6 (WL-33, WL-34) above.

Table 32. Survey status and results of the NSO activity centers in the action area

<table>
<thead>
<tr>
<th>STNF Activity Center ID (State ID)</th>
<th>Overall Status (most recent confirmation of pair or resident single status)</th>
<th>1989-2015 Survey Results and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-215 (SIS0319)</td>
<td>Occupied Nest/Failed (1990) Resident Single Subadult Female (2003)</td>
<td>Surveys were conducted to 1992 or 2012 protocol, unless indicated*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2015 – No NSO or Barred owl detections during the three stand searches or modified Spot Check surveys (3-visit nighttime calling)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2014 – No NSO detections during the three stand searches or 6V nighttime calling; Barred owl pair detected during nighttime calling-pair removed fall 2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013 – No NSO detections during the three stand searches or 6V nighttime calling; Barred owl pair detected during nighttime calling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2012 – No NSO detections during stand searches or 6V nighttime calling; Barred owl pair detected during nighttime calling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2011 – No Detections (1992 3V-protocol); Probable NSO feather observed during stand search (Farber 2013) – no confirmed visual/aural observations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2010 – No Detections (1992 3V-protocol)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2009 – No Detections (1992 3V-protocol)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2008 – No Detections (1992 3V-protocol)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2007 – No Detections (1992 3V-protocol)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2006 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2005 – No Detections (1992 3V-protocol)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2004 – Barred owl adult male detected during nighttime calling (1992 3V-protocol); no NSO detections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2003 – NSO subadult female detected during nighttime calling and follow-up – present throughout season (1992 3V-protocol)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2002 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2001 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2000 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1999 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1998 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1997 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1996 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1995 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1994 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1993 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1992 – Not Surveyed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1991 – No Detections* (stand search, nighttime spot calling)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1990 – NSO nest, nest failed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1989 and Prior – No Available Data</td>
</tr>
</tbody>
</table>

During the SMMU’s winter 2014 and 2015 carnivore surveys that used baited camera stations and hair snare techniques (primarily to survey for fisher and Pacific marten), no gray wolves were detected in or near the project area, or other areas surveyed on the Unit (USDA-FS 2014, 2015). Past camera-trapping surveys for forest carnivores in 2002 and 2003 for the Pilgrim Creek snowmobile park (in the project area) and winter 2010 camera-
trapping in the upper Sacramento River watershed, approximately 25 miles west of the project area, also did not detect any wolves (North State Resources, Inc. 2003, 2010).

There have been four to six camera stations deployed in the action area since January 2014 (stations typically rotate on a biweekly basis across the Unit) and several stations will continue to be monitored in the action area throughout future years. Howling or other tracking surveys have not been conducted in the action area. No wolves or wolf sign such as tracks (typically 4 to 4.5 / 5 to 5.5 inches long and noticeably larger than those of coyotes (which are 2 to 2.5 inches long) and domestic dogs (Harris and Ream 1983)), or other sign were detected during the extensive wildlife field work and surveys done for the project. There were no reports of confirmed wolves or probable wolf sign during the 2007 common stand exams, botanical surveys or other resource-related field work for the project, which has been ongoing, though intermittent, since 2009.

At this time, and based on the best available data, there are currently no confirmed individuals, packs, dens or rendezvous sites in the project area. Conservation measures that include limiting project noise- and smoke-generating activities within one mile of den and rendezvous sites have been developed and are incorporated in the project’s design (Table 6, WL-44). It is recognized there are several challenges to applying these measures to specific locations, as identifying den locations and rendezvous sites primarily depends on evaluating location data of collared wolves during the pup rearing period or conducting intensive pre-breeding season surveys. Monitoring efforts are also described in Table 6, including continued close coordination with the FWS and CDFW (and potentially private landowners).

**Existing Environment and Habitat Status**

The distribution and quality of suitable and dispersal habitat for the NSO, and security and source habitat for gray wolf, in their respective action areas is strongly influenced by the local physiographic and climatic conditions, the history of forest management on both NFS lands, private lands managed for timber production, rural residential lands and roads.

**NSO Habitat**

Located near the edge of the NSO's geographic range, the McCloud Flats historically supported open East-side pine forests described by Mayer and Laudenslayer (1988) on lower-elevation gentle slopes and flat terrain. These ponderosa pine-dominated stands typically lack multi-layered/multi-species components of other mixed-conifer or hardwood species, as well as structural characteristics associated with suitable NRF habitat selected by NSOs (Irwin et al. 2007; USDI-FWS 2011). While reduced in extent from historic conditions, given historic logging, more recent Forest management activities on private and federal lands and the departure from the natural fire regime due to 100 years of fire suppression, ponderosa pine forest currently occupies a sizeable proportion of the McCloud Flats management area, constituting a habitat type considered naturally unsuitable or of low quality for NSO. Conifer and hardwood species diversity and habitat quality, due to a corresponding increase in elevation, surface water availability and general topography changes of more drainage features and slopes, increases on the Mt. Shasta management area portion of the action area.

---

46 While not specific to this project’s proposed actions, as they relate to ongoing seasonal actions in the action area and cumulative effects to the gray wolf, conservation measures for the Bartle Grazing Allotment have also been discussed with the allotment permittee (Wenham 2015)
Forest structural features typically used to describe suitable NSO habitat include canopy cover, tree size and basal area; other attributes such as tree species composition, canopy layering, presence of edges and small openings and landscape position are also influential (Zabel et al. 1995; Ward et al. 1998; Irwin 2007, 2012). Suitable habitat in the action area and project area is variable and quality and function are wholly dependent on the unique, local stand attributes, prey habitat, and abiotic factors. This includes species composition of the predominant and dominant trees, mid and understory density and species, snag and down wood levels, condition and size, juxtaposition of shrubs or early seral habitats and hardwoods. Abiotic features such as topographic relief and elevation, slope position, and proximity to water also contribute to habitat quality and use (Solis and Gutiérrez 1990; Blakesley et al. 1992; LaHaye and Gutiérrez 1999). Studies from northern California (and observations on the SMMU) indicate NSOs typically nest and roost on the lower two-thirds of slopes in a drainage (Forsman et al. 1984; Blakesley et al. 1992; Hershey et al. 1998; Derby and Thomas 2013, 2015). Upper ridgelines are also generally considered natural barriers that can separate home ranges (Forsman et al. 1984).

As described in the detailed consultation section of this document in Appendix C, six categories of habitat types were assessed for NSO in the project area: Nesting/Roosting, High Quality Foraging, Foraging, Dispersal, Capable and Non-Habitat. This approach was taken due to the variability of stand conditions, Recovery Action 32 recommendations, and the capability of the older plantations to transition toward dispersal and suitable habitat with treatment within a 20- to 30-year timespan.

**Nesting/Roosting Habitat and High Quality Foraging Habitat**

Nesting/roosting habitat (N/R) is generally typified by a multi-layered, multi-species (including hardwoods) canopy dominated by large overstory trees; moderate to high canopy closure (70-90%); a high incidence of trees with large cavities and other types of deformities; numerous large snags; an abundance of large down logs; and open space within and below the upper canopy that allows for maneuvering (Thomas et al. 1990; USDI-FWS 2011, 2012). Nesting platforms (brooms, broken top trees with leaders or snags) must be present. Based on field review, N/R habitat is primarily limited to areas of higher elevation and steeper slopes in the action area that consist of multi-layered, multi-species stands of Douglas fir, white fir, sugar pine and incense cedar with minor amounts of ponderosa pine, or on lower elevation slopes, closer to surface water with similar species composition. In N/R habitat, basal areas exceed 260 sqft/ac, canopy closure ranges from 75-100% and there are large amounts of coarse woody debris >20” in diameter with large embedded logs and stand decadence.

In the project area, N/R habitat is primarily located in the northern extent within one large block (unit 150, and extends into some adjacent units), and then pockets along Ash Creek to the southeast. These areas have a higher density of 40-72” DBH (or larger) Douglas fir, sugar pine and incense cedar trees, high levels of stand decadence (cavities, brooms, large branching that support nesting) more evenly distributed across the stand, multiple canopy gaps, and multiple canopy layers that contribute to thermal refugia and roosting sites. There is a higher proportion of embedded 20-30” and larger diameter logs and snags average 3-5 per acre in the 26” or larger diameter class across all species types.

There is limited Douglas fir in the project area outside of the N/R and higher quality foraging habitat, and black oak is being encroached. The importance of Douglas fir is largely attributed to the interaction between it and dwarf mistletoe (*Arceuthobium douglasii*) infection, and resulting “brooms” that provide nesting structure. Numerous sugar pine mistletoe brooms were also documented in N/R and high quality foraging habitat areas and the
predominant, remnant Douglas fir, sugar pine and larger diameter, broken topped white fir are considered the most important components of nesting habitat in the project area.

Where there is a mix of smaller size class incense cedar, sugar and ponderosa pine, Douglas fir, black oak, and white fir ranging from 180-200+ basal area, with most dominant and codominant trees averaging 26” DBH, some small canopy gaps, initial formation of stand layering, and canopy closure averaging 70 percent, stands were typed as high quality foraging (areas transitioning to N/R). The differentiation between habitat qualities was made based on more open mid and understory canopy conditions due to reduced layering, less decadence across the stand, lower levels of large snags (average 2-3 per acre in the ~22” diameter size class with a higher proportion of ponderosa pine and white fir) and lower levels of large down wood (~18-20” diameter logs scattered across the area). N/R, high quality foraging and foraging habitat tend to also occur along and within the Ash Creek Riparian Reserve where stand composition is more mixed conifer (i.e. at the very southeastern portion of the project area in the Reserve, the stands are open or ponderosa pine-dominated and do not provide for N/R, foraging or dispersal).

Foraging Habitat

Based on radio telemetry locations, Zabel et al. (1992) considered stands with at least 40 percent canopy cover to be suitable foraging habitat. Though Zabel et al. (2003) found that 18-40 percent of foraging locations occurred in stands with 20-39 percent canopy cover, other studies have not found significant relationships with canopy cover (Irwin et al. 2007). Average tree diameters at foraging locations vary, with selection for medium to large trees (>20 inches) and considerable use (41-87% of locations) of smaller size classes (Zabel et al. 1992; USDI-FWS 2009). Regardless, the presence of trees ≥20-24” DBH is considered an important attribute of foraging habitat (USDI-FWS 2009; Irwin et al. 2007, 2012, 2015). While most studies suggest some degree of selection for higher basal areas (160-220 ft²/ac) for foraging, a substantial amount of foraging (44%) occurred within stands with basal areas ranging from 80-160 ft²/ac (USDI-FWS 2009; Irwin et al. 2007, 2012). Irwin and others (2015) also found that retaining 25-35 m²/ha (110-150 ft²/ac) in the midstory also resulted in a higher likelihood of post-harvest foraging by NSOs. NSOs also require sufficient space below and through the canopy to maneuver while hunting (Thomas et al. 1990).

Foraging habitat in the action area consists of true fir (white fir-dominated stands with small amounts of red fir as elevation increases), and mixed-conifer pine and white fir-pine composed of white fir, sugar pine, incense cedar and ponderosa pine. These latter stand types typify the foraging habitat in the western, northern and central portions of the project area and quality ranges from moderate to low, based on species composition and mid/understory density. In general, basal areas range from 80-220 with an overstory that includes mid- to large-sized trees (13-26” DBH), a mixed conifer under and midstory with layering that provides thermal refugia sites and perching structure, and canopy cover averaging at least 50 percent. Snag and down log average diameters are less than 18 inches.

The determinations of foraging habitat typing and quality in the project area considered the size of the stand, its proximity to other habitat types that NSOs can utilize, such as dispersal habitat or early/mid seral habitat occupied by woodrats or other prey, and the distance to water, slope position, elevation and horizontal heterogeneity that influence NSO use and habitat quality (Irwin et al. 2012). Another key factor influencing the use of foraging habitat, and subsequent evaluation of effects of treating such habitat, is its proximity and connectivity to N/R habitat. It is well documented that during the breeding season, foraging decreases with increasing distance from the
nest stand, and therefore stands greater than one mile from suitable nesting/roosting habitat have a low probability of use by foraging NSOs (Bart 1995; Bingham and Noon 1997; USDI-FWS 2009, 2011).

As stands are more dominated by ponderosa pine and white fir, their quality as foraging habitat is reduced, and if there are dense homogenous patches of even-aged, even-sized white fir (12-16” DBH), these patches are also considered lower quality. More moderate quality foraging habitat is represented by white fir, incense cedar, pine and a minor under or mid story component of Douglas fir, though these trees tend to be ≤16” DBH. Where it occurs in the project area, foraging habitat is interspersed with early and mid-seral plantations (10-40+ years old), numerous small (<1/10 to 0.25-acre) openings, younger patches of fir and pine regeneration, brushy openings and edges between stands.

Dispersal Habitat

About 77% of the action area, and 64% of the project area, is not considered suitable NSO habitat due to the prevalence of homogeneous ponderosa pine stands, plantations, meadow at Elk Flat and clearcut areas on adjacent private lands. While individual ponderosa pine trees may contribute to stand structure and species diversity in habitats used by NSO, it generally avoids forest stands dominated by ponderosa (or lodgepole or knobcone) pine and the relative probability of stand use by NSOs declines with an increasing basal area of ponderosa pine (Irwin et al. 2007, 2012; USDI-FWS 2011). These stands lack the multi-layered/multispecies composition of other mixed conifer or mixed conifer-hardwood stands, as well as structural characteristics associated with the suitable NRF habitats described above.

In pine types, diversity of tree age, size and species classes that provide vertical structure are generally lacking and stands generally tend to contain more open canopy and understories of widely spaced trees and shrubs. These areas may provide for limited dispersal function, depending on the proximity to other suitable habitats. Dispersal habitat for NSO contributes to maintaining stable populations by filling territorial vacancies when resident NSOs die or leave their territories, and also provides for adequate gene flow across the range of the species (USDI-FWS 2012). At a minimum, dispersal habitat consists of stands with adequate tree size and canopy cover to provide protection from avian predators and minimal foraging opportunities. It may include younger and less diverse forest stands than foraging habitat, but should contain some roosting structures for temporary resting and foraging habitat for dispersing juveniles (USDI-FWS 2012; Sovern et al. 2015) and be well-distributed across the landscape. Thomas and others (1990) suggested that management practices, such as visual and riparian corridors, streamside management zones, geologic reserves and other special management zones can provide habitat attributes conducive to dispersal between habitat areas.

For this analysis, dispersal habitat is quantified by the ponderosa pine/white fir stands that have at least 40% canopy cover and trees averaging 11 inches DBH, but also includes the consideration of proximity to suitable habitat, presence of and capability to support roost sites, and understory composition that contributes to prey base and foraging opportunities. As the current conditions of the ponderosa-pine dominated stands in the project area do not contain the structural characteristics to provide for roosting, and the majority of these stands do not contain minimum cover requirements for protection from predators, these stands are excluded from consideration as dispersal.

Dispersal habitat is generally considered adequate if about 50% of the assessed landscape meets the 40% canopy/11-inch DBH tree conditions described above (Forsman et al. 2002; Thomas et al. 1990; USDI-FWS 2012).
This is a very narrow definition in that it does not recognize that in order for NSOs to successfully move across a landscape, and eventually occupy a territory, dispersal habitat must also be in proximity to suitable foraging and roosting habitat. Population growth can only occur if there is adequate habitat in an appropriate configuration to allow for NSO dispersal across the landscape. While habitat allowing for dispersal may currently be marginal or unsuitable for nesting, roosting, or foraging; it provides an important linkage function among blocks of nesting habitat, both locally and over the NSOs range, that is essential to its conservation (USDI-FWS 2011; 2012).

Dispersal success is highest when dispersers can move through forests that have the characteristics of nesting-roosting and foraging habitats and successful juvenile dispersal is likely dependent on locating unoccupied suitable habitats in close proximity to other occupied sites (LaHaye et al. 2001). Fledglings of both sexes generally disperse from nest cores from September to November (Forsman et al. 2002; Gutiérrez 1985). Juveniles use temporary dispersal locations before acquiring a home range territory and the median natal dispersal distance from fledging to a permanent settlement is about 10 miles for males and 15.5 miles for females (Forsman et al. 2002). While large, non-forested areas (e.g. the Willamette Valley) are apparent barriers to dispersal, NSOs can and will disperse across a wide range of forest conditions and levels of habitat fragmentation. Where there are corridors of forest through fragmented landscapes, these areas serve primarily to support relatively rapid movements rather than colonization (USDI-FWS 2011). The private lands to the west, east and north that are managed primarily for timber production limit the development and connectivity of suitable and dispersal habitats both within and outside of the action area. There are small corridors on a combination of private and NFS lands that could be used by dispersing juveniles, subadults or non-territorial adult NSOs to move between the project area and the Fons MLSA/Mt. Shasta LSR to the north (~3-5 miles), or between the project area to the Algoma LSR to the east/southeast (~5 miles). It is assumed, based on ongoing and past land management activities that the private lands will continue to provide limited NSO habitat over the short and long term.

**Capable Habitat**

The older (40+), dense, monotypic ponderosa pine plantations are considered capable of transitioning to dispersal or lower quality suitable foraging habitat over the short and long term (with treatment) given their age and that they contain some level of remnant mixed conifer stand or patches. These areas would either be designated as unthinned patches, or would be retained as roost site elements. These capable stands also contain small openings of bush chinquapin and whitethorn that can support NSO prey. These capable stands are primarily located in the ST-215 core and home range on NFS lands.

**Non-Habitat**

Areas classified as non-habitat are not suitable for NSO nesting, roosting or foraging. They do not contain the minimum dispersal habitat elements and are not considered capable due to species composition, stand age or tree size or general soil conditions that prohibit development into dispersal or suitable habitat. In the action area and project area, this includes all ponderosa pine-dominated stands, as these are forest types rarely used by NSO (Thomas et al. 1990; USDI-FWS 2011, 2012; Irwin et al. 2007, 2012; Zabel et al. 1992; USDI-FWS 2009). It also includes the open meadows at Elk and Coonrod Flat, the early- and mid-seral/pole size stands of small diameter trees and canopy cover <35%, including the 10-30 year old plantations with ~7” DBH size trees, and non-forested lands such as brushfields, grasslands and barrens.
NSO Prey

NSOs primarily select arboreal or semi-arboreal prey and primary species vary by geographic location and available source habitat. Small mammals such as flying squirrels, dusky-footed woodrats and red tree voles are considered primary, with other mammals (deer mice), reptiles and insects being secondary (Courtney et al. 2004; Forsman et al. 1984; Gutiérrez 1985). Flying squirrel abundance is positively correlated with the presence of mature and late-seral forests with a significant Douglas fir component and large trees; though they have been observed at lower densities in ponderosa pine-dominated forest types (Lehmkuhl et al. 2006). They require large trees, snags, large down wood, water and arboreal lichen. They are nocturnal rodents that nest in trees in a variety of forest communities (Williams et al. 1992). Den sites include cavities in live and dead old-growth trees; cavities, stick nests, and moss-lichen nest in second growth trees; cavities in branches of fallen trees; nests in decayed stumps; and witches brooms formed by mistletoe infections (Carey et al. 1997; Carey 2000). Flying squirrel densities have been shown to decrease after thinning and underburning and are more likely to be negatively affected by thinning treatments that dramatically reduce understory and overstory density (Wilson 2010; Manning et al. 2012). Retaining overstory trees in the larger crown classes, and large snags and down wood has been shown to offset these impacts and maintain their habitat (Lehmkuhl et al. 2006).

Dusky-footed woodrats are associated with drier, early-seral mixed-conifer forest or open, late-seral forests (Courtney et al. 2004; Thomas et al. 1990; Ward et al. 1998) and occupy diverse habitats including shrubby openings and burned areas (Forsman et al. 2004; Wilson 2010; Manning et al. 2012). They are arboreal herbivores generally found below 5,000 feet elevation (Williams et al. 1992). Nests are built of sticks or other woody debris and are typically located on the ground but may also be found in shrubs, trees, or rock crevices (Ibid.).

In areas where woodrats are the primary prey, NSOs are also more likely to use a variety of habitats, including younger stands, brushy openings in older stands, and edges between forest types in response to the higher prey density in these locations (Sakai and Noon 1993, 1997; Carey et al. 1999; Franklin et al. 2000). Their densities appear to follow stages influenced by habitat quality with highest densities in 15-40 year-old sapling/brushy pole timber, and in older forests that have openings with an abundant brushy understory (Hamm 1995; Raphael 1988; Sakai and Noon 1993, 1997; Carey et al. 1999; Hamm and Diller 2009).

In the majority of the project area, woodrats likely constitute the majority of NSO prey, with other minor species such as deer mice and voles. In some stands (nesting/roosting, high quality foraging, RA32 areas), flying squirrels may be present, but at lower densities. There may also be some flying squirrel/woodrat overlap at the higher elevation ranges of the action area and within the denser, contiguous mixed conifer/fir stands in the northwestern portion of the project area. Prey assessments or surveys have not been completed for the project, but during fieldwork and NSO habitat typing, abundant woodrat nests were observed (see the Analysis Assumptions section of this document).

Wolf Habitat

Wolf Prey

Prey availability is one of the most important factors affecting wolf distribution and abundance. Wolves mainly hunt and eat elk and deer but depending on location, they also eat moose, beaver, caribou, bison, bighorn and Dall sheep, snowshoe hare, other small mammals such as mice and voles, fish, insects, nuts, and berries and they may
scavenge carrion and forage on vegetation (Haight et al. 1998; Fuller et al. 2003; Boyd et al. 1994; Paquet and Carbyn 2003). Conflicts with human uses can also occur during predation (livestock, pets). Smaller animals become more important in the diet of wolves during the snow-free months, but ungulates remain their main food source. While prey selection varies, their primary prey species is elk wherever the two species co-occur (Smith et al. 2004; Oakleaf et al. 2006). Wolves typically hunt in their territory (20, up to 1,500 square miles in areas where prey is scarce) and may cover 20-30+ miles a day during hunting forays (USDI-FWS 2011). They generally prefer the easiest available travel routes (Paquet and Carbyn 2003) and often use semi-regular routes through their territory (Young and Goldman 1944). Given the new information on the Shasta Pack, the average size of wolf territories in California is not yet known or understood, though will likely be directly correlated to prey availability.

In the gray wolf action area, the primary ungulate prey is mule deer, though elk may occur in reduced numbers. The action area is defined as year-long range for mule deer (CDFG 2006), but due to (generally) deep winter snows, it is primarily considered summer, spring and fall range. The deer typically migrate out of the action area and project area from September through November to winter range areas located north and northwest of Mt. Shasta, and south toward the McCloud River. Due to their generalist nature, mule deer also use a variety of habitats. Bitterbrush is an important element for deer forage, fawning and cover habitat. It occurs in low numbers in the project area, intermixed with manzanita and whitethorn. It is more prevalent in the remainder of the action area. It does occur as a minor component in shrub-dominated habitats, and in the open pine and earlier seral stands. Perennial surface water is more available in the upper elevations of the action area from headwater streams and springs associated with Ash Creek, Cold Creek, Swamp Creek and Dry Creek. These areas likely contribute to supporting a higher prey base, though the mule deer do migrate to the lower and less-snow covered slopes north of Mt. Shasta and south near the McCloud River in mid to late fall. Wet meadows and better quality riparian vegetation areas (preferred fawning habitat) are also more available at the higher elevations, though private lands management also influences conditions.

Security Habitat

In addition to prey, availability of security habitat is an important consideration for wolves and road density and access by humans is directly related to habitat quality. Security habitat provides seclusion from human disturbance and motorized roads and trails are a predictor for human-wolf interaction. The primary effect of high road density and associated traffic volume (depending on seasonality, as an area could be heavily roaded but inaccessible by vehicles during winter due to snowpack) is providing access for humans who deliberately or accidentally kill wolves (Mech et al. 1988). Security habitat also reduces impacts of road-associated factors that can negatively affect prey (elk and deer and their vulnerability to disturbance). For purposes of most analyses, security habitat is generally defined as areas with open road and motorized trail densities at less than one mile per square mile, as when road densities exceed this density, wolves avoided or were displaced from areas (Mech et al. 1988; Thiel 1985). Road density alone, however, is not an accurate variable in determining suitable wolf habitat and is actually less significant than traffic volume (e.g. roads themselves will not prevent wolves from inhabiting an area; Merrill 2000). Other studies show wolves may inhabit areas with higher road densities if the habitat is adjacent relatively unroaded areas (Mech 1989; Mladenoff et al. 2009). Roads and trails can alter wolf movements and use of the landscape (Whittington et al. 2005) and while wolves may use low-use roads and trails as travel pathways, they tend to avoid contact with humans near high-use roads and trails.
The NFS roads in the action area receive regular traffic volume and moderate to high use, including FA13 (Pilgrim Creek road), the FA19 (Sugar Pine Butte road that connects to the Military Pass Road), and the 41N12 (Cramer Springs road). These roads provide public access to the Mt. Shasta wilderness and the Klamath National Forest, and for other recreational activities including hunting, mushroom collection, dispersed camping and roaded recreation in spring, summer and fall and access to the Pilgrim Creek Snowmobile Park and the Tri-Forest Oversnow Vehicle (OSV) trail systems in winter. They also provide access to private industrial timberlands and are used on an almost constant basis for hauling wood products, with the exception of winter months depending on snow pack. Winter logging on private and NFS lands is common on the McCloud Flats however, and has the potential to occur if safe conditions permit, plowing occurs or other resource protections are not in place.

Denning and Rendezvous Sites

Alpha females and males typically breed as 2-year-olds and may produce young annually until 10 years or older. Litters are born from early April into May and can range from 1-11 pups, but generally include 5-6 pups (Mech 1970; Fuller et al. 2003; USDI-FWS 2003; USDI-FWS et al. 2009). On average, a pack has a single litter annually. Pups usually remain with parents for 10-54 months before dispersing, or may stay with the natal pack indefinitely. Pups are cared for by the entire pack (USDI-FWS 2009a). From about mid-April through early May, until September or mid-October, pack activity is centered at or near the den and then moves to various rendezvous sites.

Dens need to be sheltered (e.g. an excavated underground burrow, rock crevice, hollow log/basal tree cavity, overturned stump, shallow rock cave) and are typically located near the central core of the territory on a hillside or in another dry, elevated area with loose soil. They tend to be more common in saddle areas. Fresh water and a larger proportion of vegetative cover are important (Trapp et al. 2008; Person and Russell 2009; Unger et al. 2009). Den sites are fairly obvious given the tracks, howling that can occur, prey carcasses and bones, and scat. Wolves will tolerate some limited human disturbance near dens, including when pups are younger than six weeks, and will regularly continue using disturbed den sites in subsequent years. They can also respond to human disturbance at active dens by abandoning the location and moving pups to another site (Thiel et al. 1998; Frame et al. 2007; Person and Russell 2009). If moved from their natal den, pups are vulnerable during transition to inclement weather and predators (Claar et al. 1999).

Pups generally emerge from dens at 3-4 weeks (Paquet and Carbyn 2003) and at about 8 weeks (~typical weaning), they are moved to a rendezvous site(s). These are specific resting and gathering areas used by the pack after pups emerge from the den. Several sites (averaging 4-6) can be used by a pack and they can be in wet or dry meadows, small grassy or forest openings near or within about one mile (sometimes further) of the den (Ausband et al. 2010). One adult or few pack members typically stay with pups while others hunt. The same dens and rendezvous sites can be used year-to-year by a given pack (Paquet and Carbyn 2003), or they may have several in a territory.

When pups are 7-8 months old and almost fully grown, they begin traveling with adults on their hunting circuits (nomadic hunting behavior during fall and winter). The pack generally hunts throughout its territory until the following spring, with climatic, elevation and prey availability all factoring in to territory size. After a year or two, yearling or young wolves may disperse and try to find a mate and form a new pack.

Suitable areas for denning and potential rendezvous sites are located in the higher elevation areas near mixed-conifer forested buttes and slopes with larger size classes of down wood, average lower open road density (given the checkerboard ownership in the northern third of the action area and higher likelihood of locked private roads
that prohibit general access). These higher elevation areas also provide increased availability of perennial surface water. While the project area and immediate-surrounding private and NFS lands contain Ash Creek and Cold Creek (Pilgrim Creek is ephemeral), large meadows (Elk Flat) and small grassy openings, and abundant down wood, the high road density and year-long moderate to high levels of human activity in and directly surrounding the project area reduce the likelihood of prolonged wolf presence and reproduction in this area. The high road density, human influence and low level of security habitat in the remainder of the action area to the south, southeast and southwest greatly reduce the potential for wolf denning and associated pup rearing activity in these areas.

Habitat Quantification in the Action Area

NSO Habitat in the Action Area

The habitat typing in the action area for NSO was completed using a combination of field review, the Forest’s existing vegetation layer from the Remote Sensing Lab (USDA-FS 2007), the draft NSO Habitat EVEG model for the SMMU (information on this model is in the project record), and 2012 and 2014 NAIP aerial photo interpretation. For the NSO, habitat typing in the home range portion of the action area was supplemented by habitat data provided by private landowners and ground-truthing all portions of private lands in the home range.

NSO habitat quality and suitability in the project area and treatment units was evaluated closely, particularly in the 60-120 year-old natural stands and areas proposed for underburning-only. Initial field review was completed in August-September 2009 (Baxter and Paul 2009) with a detailed review from fall 2011 through May 2013. The latter ground-truthing and habitat validation used a combination of tools to determine habitat type and quality, including peer-reviewed literature, personal communications with other Forest Service and FWS biologists and knowledge about NSO habitat use on the SMMU. Refer to Appendix C for a detailed account of habitat typing and field work in the project and action area.

Species composition, basal area and quadratic mean diameter, number of large trees (>26” DBH) per acre, CWD sizes and levels, snags, decadence, understory composition and canopy cover/closure was assessed. Abiotic factors including elevation, slope position, aspect and distance to water were considered. Each treatment unit was reviewed (with exception of younger plantations) and based on the stand and abiotic characteristics, was assigned a habitat type. Some treatment units contain more than one habitat type and stand conditions, prescription and marking guides in those areas dictate the treatment to be implemented (e.g. some stands are a mix of foraging and high quality foraging; in the high quality foraging habitat there will be no mechanical treatment, only prescribed fire would be used and these areas would be delineated during unit layout and marking. Conversely, some stands are a mix of dispersal and foraging. In dispersal, lower basal areas or group selections in white fir may be prescribed).

The field validation and 2012/2014 NAIP imagery were utilized to hand-edit the 2007 existing vegetation layer for the NSO action area. This allowed for capturing changes in vegetation as stands ‘age and develop’ and a consideration of ongoing mortality, or completed timber harvests on private or NFS lands since the 2007 data was developed. The layer was also hand-edited to address errors in the initial 2007 vegetation classification (i.e. some regional dominance types are inaccurate in portions of the action area).

Based on the resultant habitat layer for the NSO action area, habitat acres were queried at the action area, project area, home range, core, treatment area, Elk Flat LSR and NSO critical habitat spatial scales for the analysis of project effects (Map 4 in Appendix B displays the final NSO habitat in the action area).
**NSO Action Area**: The 15,960-acre NSO action area consists of NFS lands and private lands managed for timber production west and north of the project area. Approximately 23% is suitable (2% N/R; 21% F); 24% provides dispersal; 2% is capable (all in the project area) and 51% is classified as non-habitat. Table 33 displays the suitable, dispersal and non-habitat in the action area by landowner. About 47% of the action area currently provides dispersal habitat (inclusive of NRF and dispersal that provide for dispersal). This is below the 50% level typically used to evaluate the dispersal capability of a landscape (Forsman *et al.* 2002; Thomas *et al.* 1990; USDI-FWS 2012) and is primarily due to the natural stands and plantations of ponderosa pine and open meadow conditions in the eastern and southeastern portions of the action area (and project area) that preclude development of suitable or dispersal habitat. There is a higher level of suitable NSO habitat on private lands in the action area compared to the NFS lands due to the increases in elevation and surface water and corresponding increases in diverse species composition that support suitable habitat.

Table 33. Habitat types in the NSO action area by landowner

<table>
<thead>
<tr>
<th>Action Area</th>
<th>NFS Lands (8,303 acres - 52%)</th>
<th>Private Lands (7,657 acres - 48%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/R</td>
<td>F</td>
</tr>
<tr>
<td>15,960 acres</td>
<td>120</td>
<td>1389</td>
</tr>
<tr>
<td>Percent by Landowner</td>
<td>1%</td>
<td>9%</td>
</tr>
</tbody>
</table>

**Project Area**: Approximately 36% of the project area is considered suitable; 9% is dispersal (exclusive of NRF); 9% is capable; and 45% is considered to provide overall dispersal function (inclusive of NRFD).

Table 34. NSO habitat types in the project area

<table>
<thead>
<tr>
<th>Project Area</th>
<th>N/R</th>
<th>Foraging</th>
<th>Dispersal</th>
<th>Dispersal (inclusive of NRFD)</th>
<th>Capable</th>
<th>Non-Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,519 acres</td>
<td>120</td>
<td>1142</td>
<td>317</td>
<td>1579</td>
<td>331</td>
<td>1609</td>
</tr>
<tr>
<td>Percent by Habitat Type</td>
<td>3%</td>
<td>32%</td>
<td>9%</td>
<td>45%</td>
<td>9%</td>
<td>46%</td>
</tr>
</tbody>
</table>

**NSO Core and Home Range**: See Table 35 for suitable habitat in the core and home range. The ST-215 core is centered in the 120 acres of N/R habitat in the project area in the core – there is no N/R in the outer ring of the home range, but there is high quality foraging habitat (~58 acres) in the outer ring that is trending toward N/R conditions. The remainder of the core consists mostly of a mix of high quality foraging (24 ac), foraging (196 ac) and capable (96 ac) stands. The majority of suitable habitat in the core is on NFS lands, with 29 acres of suitable (combination of N/R and F) on private lands to the north. No other activity centers or home ranges overlap the action area.

The entire ST-215 home range is in the action area, with 41% in the project area. There are 450 acres of suitable habitat on private lands and 806 acres on NFS lands. Based on a summary of data from various studies that showed a positive association between NSO fitness and habitat or a mosaic of habitat types at the scale of a NSO core (Franklin *et al.* 2000; Dugger *et al.* 2005; Olson *et al.* 2004) and past consultations, the FWS concluded that NSO productivity and survivorship may be reduced when the combined amount of suitable NRF habitat in the core falls below 400 acres (general desired levels are 250 acres of N/R and 150 acres of foraging; USDI-FWS 2009). Survival can also decrease dramatically when the amount of non-habitat (non-forested areas, sapling stands) exceeds about
50 percent of a home range (Dugger et al. 2005; USDI-FWS 2011). Conversely, if a provincial home range is at 40 percent or less suitable habitat condition, they are considered in combination with other criteria (including NSO occupancy history and the ability to affect structural change in ≤30 years) as strong, potential candidates for treatment prioritization under Recovery Action 10 (USDI-FWS 2011 pp. III-44 to III-45). There is currently 69% suitable habitat in the core (of which, 92% is on NFS lands), and 37% suitable habitat in the home range (of which 64% is on NFS lands).

Table 35. Acres of suitable NSO habitat in the ST-215 core and home range

<table>
<thead>
<tr>
<th>Activity Center ID</th>
<th>Acres of Habitat: 0.5 mi Core</th>
<th>Acres of Habitat: 1.3 mi Home Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/R</td>
<td>HQF</td>
</tr>
<tr>
<td>ST-215</td>
<td>125</td>
<td>24</td>
</tr>
</tbody>
</table>

With respect to the levels of suitable habitat that better support survivorship and productivity, the ST-215 home range is below the recommended levels of habitat at both spatial scales (37% suitable in the total home range; 69% in the core but with N/R habitat at half the recommended amount in the core). The larger proportion of suitable habitat on NFS lands at both core and home range scales, and the management direction for the Elk Flat LSR (contrasted with the past and ongoing private lands management) affords an opportunity to affect structural and compositional changes in habitat to increase its resilience and long term suitability.

The home range includes about 334 acres of capable habitat (99% on NFS lands). The remainder of the home range consists of 958 acres of dispersal and 850 acres of non-habitat (primarily on private lands). This habitat configuration results from the combination of older and younger plantations on NFS lands in the core and home range, and the habitat conditions and past treatments on private lands to the west and north.

Table 36. Acres of NSO capable, dispersal and non-habitat in the ST-215 core and home range

<table>
<thead>
<tr>
<th>Activity Center ID</th>
<th>Acres of Habitat: 0.5 mi Core</th>
<th>Acres of Habitat: 1.3 mi Home Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dispersal</td>
<td>Capable</td>
</tr>
<tr>
<td>ST-215</td>
<td>9</td>
<td>96</td>
</tr>
</tbody>
</table>

Generally, private lands in the western and northern portion of the home range contain a higher level of ponderosa pine and mixed-pine dispersal habitat, average tree sizes of 10-15” DBH, 15-40 year-old plantations, and have had a greater amount of past timber harvest. There are interspersed mixed-conifer/pine and mixed-conifer/fir stands that support foraging in pockets but most lower-elevation stands are open-canopied, functioning better as dispersal habitat and corridors to connect the core with suitable habitats west, north and northeast (see Map 4 in Appendix B). About 65% of the home range provides for dispersal, inclusive of NRFD. The early seral and capable stands on NFS lands and early seral stands on private lands provide pole and brush habitat for dusky-footed woodrats.

The ST-215 core and home range has not been occupied by a reproductive or territorial NSO pair since 1990, or a resident single NSO since 2003 (Table 32). While the home range is below the 40% level recommended for suitable habitat, based on occupancy history and ability to affect meaningful structural change in habitat suitability in ≤30 years, treatments are proposed in portions of foraging, dispersal and capable stands in the core and home range (USDI-FWS 2011 pp. III-44to III-45, Recovery Action 10 prioritization). With about 59% of the current home range configuration in private timber production, it is possible and probable that should NSO re-occupy the core, the
home range ‘use area’ would likely be more concentrated on NFS lands in the western and central portions of the project area, and not the private lands in the ‘1.3-mile’ assessed circle. Without actual occupancy/monitoring of use however, this conclusion is not yet supportable.

**Treatment Area:** Table 37 displays NSO habitat in the 3,483 acres of NFS lands proposed for treatment.

<table>
<thead>
<tr>
<th>Nesting/Roosting</th>
<th>HQ Foraging</th>
<th>Foraging</th>
<th>Dispersal</th>
<th>Capable</th>
<th>Non-Habitat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>120^</td>
<td>89^</td>
<td>1044</td>
<td>301</td>
<td>329</td>
<td>1600</td>
<td>3483</td>
</tr>
</tbody>
</table>

^ Low-intensity prescribed fire treatment only

**Elk Flat Late-Successional Reserve:** In the 3,074-acre Elk Flat LSR, there is 120 acres (4%) of N/R and 1,139 acres (37%) of foraging habitat. There is 299 acres of dispersal (10%); 331 acres of capable (11%); and 1,185 acres are non-habitat (39% of the LSR). The large proportion of non-habitat is due to the ponderosa pine, western extent of Elk Flat meadow, ongoing and past mortality, and past management that created early seral plantations that are considered non-habitat at the time of this analysis.

**Critical Habitat:** In the action area, there are 794 acres of critical habitat in the ECS-3 (East Cascades South) subunit. 720 acres are in the project area and ST-215 home range. The PCEs in the project area include capable stands (PCE1), Nesting/Roosting (PCE2), High Quality Foraging and Foraging (PCE3) and Dispersal (PCE4). The remainder is non-habitat and is not considered PCE1, 2, 3 or 4 per definitions in the 2012 Final Critical Habitat Rule (USDI-FWS 2012 pp. 71904-71908 including those for the East Cascades).

<table>
<thead>
<tr>
<th>Scale</th>
<th>PCE1</th>
<th>PCE2</th>
<th>PCE3</th>
<th>PCE4</th>
<th>Non</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Area</td>
<td>165</td>
<td>120</td>
<td>330</td>
<td>76</td>
<td>106</td>
<td>797</td>
</tr>
<tr>
<td>ST-215 Home Range</td>
<td>165</td>
<td>120</td>
<td>330</td>
<td>15</td>
<td>90</td>
<td>720^</td>
</tr>
<tr>
<td>0.5-mile ST-215 Core</td>
<td>91</td>
<td>120</td>
<td>167</td>
<td>0</td>
<td>46</td>
<td>424</td>
</tr>
<tr>
<td>Treatment Area (not necessarily treated mechanically)</td>
<td>164</td>
<td>120</td>
<td>330</td>
<td>15</td>
<td>89</td>
<td>718^</td>
</tr>
</tbody>
</table>

^ The 2-acre difference is accounted for in slivers and areas that overlap roads that are not considered critical habitat

Table 39 summarizes NSO suitable, capable, dispersal and non-habitat for all analysis scales.
Table 39. Summary of suitable, dispersal, capable, non-habitat and NSO critical habitat for all spatial scales

<table>
<thead>
<tr>
<th>Habitat</th>
<th>ST-215 0.5-mile core^</th>
<th>ST-215 1.3-mile home range^</th>
<th>Treatment Unit^</th>
<th>Project Area^</th>
<th>Elk Flat LSR^</th>
<th>NSO Action Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nesting/Roosting (N/R)</td>
<td>125</td>
<td>126</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>265</td>
</tr>
<tr>
<td>High Quality Foraging (HQF)</td>
<td>24</td>
<td>82</td>
<td>89</td>
<td>89</td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>Foraging (F)</td>
<td>196</td>
<td>1048</td>
<td>1044</td>
<td>1053</td>
<td>1048</td>
<td>3329</td>
</tr>
<tr>
<td>Dispersal (Di)</td>
<td>9</td>
<td>958</td>
<td>301</td>
<td>317</td>
<td>301</td>
<td>3801</td>
</tr>
<tr>
<td>Capable (Cap)</td>
<td>96</td>
<td>334</td>
<td>329</td>
<td>331</td>
<td>331</td>
<td>335</td>
</tr>
<tr>
<td>Non-Habitat (Non)</td>
<td>50</td>
<td>850</td>
<td>1600</td>
<td>1609</td>
<td>1185</td>
<td>8141</td>
</tr>
<tr>
<td><strong>NSO HABITAT</strong></td>
<td><strong>500</strong></td>
<td><strong>3,398</strong></td>
<td><strong>3,483</strong></td>
<td><strong>3,519</strong></td>
<td><strong>3,074</strong></td>
<td><strong>15,960</strong></td>
</tr>
<tr>
<td>PCE1 (Cap)</td>
<td>91</td>
<td>165</td>
<td>164</td>
<td>165</td>
<td>165</td>
<td>165</td>
</tr>
<tr>
<td>PCE2 (N/R)</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>PCE3 (HQF)</td>
<td>13</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>PCE3 (F)</td>
<td>154</td>
<td>308</td>
<td>308</td>
<td>308</td>
<td>308</td>
<td>308</td>
</tr>
<tr>
<td>PCE4 (Di)</td>
<td>0</td>
<td>76</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>76</td>
</tr>
<tr>
<td>Non-Habitat in CH</td>
<td>46</td>
<td>106</td>
<td>89</td>
<td>90</td>
<td>90</td>
<td>106</td>
</tr>
<tr>
<td><strong>ECS-3 CH DESIGNATION</strong></td>
<td><strong>424</strong></td>
<td><strong>797</strong></td>
<td><strong>629</strong></td>
<td><strong>720</strong></td>
<td><strong>720</strong></td>
<td><strong>797</strong></td>
</tr>
</tbody>
</table>

^ Portions of the ST-215 core, home range and action area are located on private lands. Acres are reported at varying scales and are not meant to be summed (i.e. core habitat acres may overlap with critical habitat designation, treatment and project area and the Elk LSR scales). The treatment unit habitat is the existing condition, not the amount proposed for mechanical treatment, though all treatment areas are subject to prescribed fire in accordance with the Project Design Features and measures listed in Tables 6, 7, 8 and 9.

Gray Wolf Habitat in the Action Area

Habitat suitability in the 86,759-acre gray wolf action area was based on supplemental field review in fall 2015 (limited to the project area and one mile distance surrounding it, as access permitted), the Forest’s 2007 existing vegetation layer and 2012/2014 NAIP review, and road density information from the Forest GIS roads layer (Navarre 2015). In the action area, 44,798 acres (52%) are in private ownership, with 41,961 acres (48%) on NFS lands managed by the Shasta-Trinity National Forest (see Map 2 in Appendix B). As noted above, the Bartle Grazing Allotment is within the action area and project area.

Based on the available information for road density on private lands and road inventories on NFS lands, security habitat currently comprises about 10,240 acres or 12% of the action area (Navarre 2015). Average road density across the action area is an estimated 3.6 mi/mi² (Navarre 2015). The majority of the areas with less than 1 mi/mi²
road are disjointed across the action area, and the northern third is where the highest level of security (as well as available denning) habitat is located. Road densities are highest (averaging 5.5 mi/mi²) in the eastern and western portions of the action area. No portion of the project area is considered security habitat. The project area contains approximately 18.6 miles of NFS roads, and 6.5 miles of unauthorized routes with a total estimated road density of 3.39 mi/mi² (there are 15 miles of open roads, and open road density of 2.72 mi/mi²; Bonivert 2015). Road density within one mile of the project area averages 3.4 mi/mi².

Vegetation types in the gray wolf action area consist of white fir-dominated stands (~10%); some knobcone pine (~5%); mixed conifer-pine (~15%); mixed conifer-fir (~20%); and ponderosa pine in the lower elevations (~25%). Red fir is found at higher elevations (~10%). There are barrens, meadows and shrubfields (~15%). Approximately 20% of the action area is in plantation (USDA-FS 2007). Evidence of heavy browse (by deer or elk) has not been observed in the project area (reviews of aspen, shrubs); indicating numbers are either low or that higher quality habitat is not available. Adult mule deer have been observed on occasion, but not large herds and no elk have been observed. The reduced amount of surface water in the project area reduces habitat quality for both deer (CDFG 2006) and elk. There are no wet meadows or quality riparian vegetation areas (preferred fawning habitat; USDA-FS 1995 Appendix G). Water availability is intermittent in the project area with Ash Creek, and to some extent Swamp Creek, generally flowing in late fall, winter and early spring in response to precipitation events or snowmelt, but flows are reduced or non-existent by mid-spring, summer/late summer. Ash Creek also has limited areas of riparian vegetation where small canopy openings occur with a minor willow component, but most of the Riparian Reserve is forested. Swamp Creek in the project area contains no riparian vegetation and is greatly modified from its natural channel form and configuration due to upstream private lands management (George 2015).

As described in the Species Status section above for the gray wolf, denning habitat and potential rendezvous sites are more ‘available’ in the higher elevation areas and mixed-conifer forested buttes and slopes with larger size classes of down wood, average lower open road density, and increased availability of perennial surface water. While the project area and immediate-surrounding private and NFS lands contain Ash Creek and Cold Creek (Pilgrim Creek is ephemeral), large open meadow areas (Elk Flat and Coonrod Flat), small grassy openings and abundant down wood, the high road density and year-long moderate to high levels of human activity in and directly surrounding the project area reduce the likelihood of prolonged wolf presence and potential reproduction in this area.

Based simply on the general detection areas for the Shasta Pack, reported by CDFW to FWS (Kanim 2015), individuals from the Pack used the action area, and may travel through or near the project area during: foraging forays in spring and summer (adults), the nomadic hunting period (pack) in fall and winter, or during dispersal (generally lone individuals). They are not expected to den or establish rendezvous sites in or near the project area, but resource protection measures are in place in case of any new discoveries (Table 6, WL-44). Future monitoring by CDFW is expected to determine if the Pack remains near the area where it was detected in summer 2015, or if it moves and occupies a more suitable territory or moves to a different part of the state, or even out of the state.

Status of Predators and Competitors in the Action Area

Great horned owls, northern goshawks and red-tailed hawks are common on the SMMU and may depredate or harass NSO. Predation is the most frequent source of mortality among young owls. Avian predation includes that from goshawks and great horned owls and potentially barred owls (Forsman et al. 1984, 2002; Leskiw and
Gutiérrez 1998; Pearson and Livezey 2003). Other sources include mammalian predation, starvation and accidents (Forsman et al. 2002, 1984). There are two northern goshawk territories in the action area assessed for NSO (ST-205-Elk Flat and ST-259-Cramer; USDA-FS 1989-2015 NGO survey data). The ST-205 territory is in the project area and the last nesting was in 2015 (two juveniles fledged). 1996 was last nesting in the ST-259 territory, located northeast of the project area.

As described in the Barred Owls section above, due to similar dietary and habitat preferences, the barred owl is a serious competitor with the NSO and potential predator. Again, while details on habitat interactions are not well known or understood to date, barred owls have a broader diet, can reduce NSO detectability, can occupy former NSO activity centers and are known to interbreed with NSO (Diller et al. 2016; Wiens et al. 2014; Wiens 2012; USDI-FWS 2011; Irwin et al. 2010; USDA-FS 1989-2015 SMMU NSO Survey Records). Competition with barred owls may also be the primary cause of NSO population decline across their range (Dugger et al. 2015 p. 98).

Recovery objectives for dry forests include maintaining sufficient NSO habitat in the short-term to allow NSOs to persist in the face of threats from barred owl expansion and habitat loss from fire and other disturbances (USDI-FWS 2011) and Appendix B of the Recovery Plan contains numerous references regarding known barred owl competitive interactions with NSO. Also as described in the Management Unit NSO/Barred Owl Status section above, the first verified observation of barred owls on the SMMU was in 1997, with an adult male detected in the project area in 2004, and an adult pair detected during the 2012-2014 surveys (see Table 32). This pair was removed in October 2014 (Feamster, Hanna 2014).

It is recognized that when barred owls and NSOs co-occur, a reduction in habitat availability and quality may exacerbate interactions between the two subspecies. Dugger and others (2011, 2015; Forsman et al. 2012, 2011; USDI-FWS 2011) suggest that in environments where the two subspecies compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help NSOs to persist in the short term. At this time, direct and indirect effects to NSO from competitive interactions with barred owls are not expected to occur as a result of the project (see the Direct Effects to NSO section of this document). Contributing to this determination is the fact that the ST-215 activity center has not been occupied by a verified reproductive NSO pair since 1990, or a verified resident single NSO since the 2003 summer season. However, a potential always exists for the activity center or project area to be used by dispersing NSOs, or be occupied by territorial NSOs in the future (or be re-occupied by barred owls) regardless of implementation. Since the removal of the barred owl pair in fall 2014, survey results in the action area on NFS lands and private lands have not detected any other barred owl(s) or NSOs (USDA-FS 1989-2015; Feamster 2014, 2015; Wizner 2015). It is also possible that NSOs may be present, but non-responsive during survey efforts (dispersing juveniles, subadults or non-territorial individuals).

More critically, the project is designed in accordance with recommendations from the Recovery Plan for Recovery Action 32. There are no mechanical treatments proposed in nesting/roosting habitat, or high quality foraging habitats and reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function, but benefit it over time. As described in Table 6 for the project design features and monitoring, NSO surveys, spot checks and stand searches will be continued in accordance with the 2012 protocol, or modification of the protocol as agreed to by the Level 1 team prior to and throughout project implementation.

47 Confirmed predation of spotted owls by barred owls is known from one direct observation and predation is not considered a significant issue. Note that competition is considered a significant threat per the Revised Recovery Plan for the Northern Spotted Owl.
(WL-33, WL-34). The pre, during and post-implementation surveys will be used to evaluate for any NSO individual or pair occupancy or barred owl presence. Also, if barred owls (or NSO) are detected during these survey efforts, technical advice or reinitiation with the FWS will be required (WL-36).

Wolves are apex predators, those at the top of their food chain that have few to no wildlife predators of their own. A discussion of how wolf return to California may influence smaller meso-predators and result in interference competition (competing predator species kill each other) or exploitative competition (predators consume similar prey) is included in the state’s Draft Conservation Plan (CDFW 2015). Based on monitoring and direct observations in the project area, other large carnivores and meso-predators include black bear, coyote, fisher, Pacific marten and gray fox. Mountain lion, bobcat and badger may be present but have not been observed (USDA-FS 2014, 2015; North State Resources 2003). The strongest interference competition for wolves in North America is documented with coyotes and mountain lions (Ballard et al. 2003), presumably due to their relative sizes. The potential effect on wolves, coyotes and mountain lions from the colonization of wolves in California is unknown at this time, and will likely vary from location to location (CDFW 2015). At the project scale, none of the activities are expected to result in any measurable exploitive or interference competition as the project does not meaningfully increase or decrease habitat suitability or availability of wolf prey and does not significantly reduce or increase open road density that reduces or permits additional access.

**Past Influences on Existing Conditions**

Existing forest stand conditions and NSO habitat suitability and quality in the NSO action area and project area are discussed in previous sections, and all effects of past actions in the action area are included in the baseline habitat conditions described for NSO above. This includes the ongoing insect and disease mortality. The following is a summary of past actions that have resulted in current NSO habitat and forest stand conditions in the action area.

NFS lands (8,303 acres) managed for LSR protection and enhancement, and matrix lands managed for commercial wood products under the Forest Plan (and recreation), and private lands managed primarily for timber production (7,657 acres) comprise the NSO action area. Timber harvest on the current NFS and private lands has been ongoing since the mid to late 1800s as evidenced by the numerous railroad logging grades from the McCloud River Lumber Company. As described in the Mount Shasta and Edson Watershed Analyses, from the 1950s-1970s roads were improved to provide better access and accommodation for commercial timber management on private lands, management of NFS lands and recreation traffic (USDA-FS 2012, 2011).

Over the past 20 years, portions of the following vegetation management projects have occurred in the action area on NFS lands and influenced NSO habitat (primarily dispersal, but some effect to foraging in terms of habitat being degraded based on a review of Biological Assessments): Elk Flat Salvage (completed 2005; no suitable habitat affected but MANLAA due to NSO occupancy in 2003 at ST-215), Elk Thinning (completed 2001; degraded foraging and modified dispersal habitat), Pilgrim Vegetation Management Project (completed in 2013; removed and modified dispersal habitat). Treatments under these projects were designed to improve stand health and growth through commercial thinning, improvement cuts and group selection harvests and reduce heavy fuel concentrations in ponderosa pine and white fir from ongoing mortality. No treatments downgraded or removed suitable NSO habitat, per the Biological Assessments. Many treatments were also designed to reduce the risk of high-severity fire and fuel loading, including the salvage and thinning projects in the Elk Flat LSR. Roadside hazard tree felling and
other small projects that removed dying and dead ponderosa pine have also occurred (Dry, Coonrod Visual Enhancement).

Both Sections 919.9 and 939.9 of the California Forest Practice Rules (FPRs), which govern timber harvest on private lands in the state, provide that no Timber Harvesting Plan (THP) can be approved if it is likely to result in take of federally-listed species, unless authorized by a federal Habitat Conservation Plan (HCP). Private THPs are reviewed under section 9 of the ESA for the possibilities of prohibited take. In 1990, concurrent with the Federal listing of the NSO, the FPRs were amended to establish protections that would ensure that take of NSOs is unlikely. Measures include requirements for NSO surveys in suitable habitat, and retention of specified amounts of habitat near activity centers and within the 0.7-mile and 1.3-mile radii around activity centers. Timber harvest activities on private lands are ongoing and data for other forest management treatments on private lands is not available. While some areas have had more than one treatment, about 6,890 acres, or 90 percent, of private lands in the action area have had some level of treatment over the past 10-20 years (Navarre 2015; Calfire THP database). As conifer stands are typically intensely managed for even-aged timber production on private lands there are several scattered clearcuts and openings and mature forest that supports NSO nesting/roosting habitat comprises two percent of the private lands, with dispersal accounting for 34 percent. There are higher levels of foraging habitat on private lands in the action area (26%), given the gradual elevation increase and higher proportion of mixed conifer stands compared to the predominant ponderosa pine stands and flats on the lower elevation NFS lands that do not function as NSO habitat.

Potential barriers to NSO dispersal include areas that do not currently support late- or mid-successional forest, or forest vegetation types that NSOs do not use. Portions of the private land-landscape in the action area are fragmented from ongoing and past timber management. There is an estimated 8,141 acres of non-habitat area composed of plantations, clearcuts, small and large meadows and dry openings, and early seral habitat in the entire action area (51%). These areas of non-habitat are evenly distributed to the west, north and east and may provide some limitation to NSO dispersal opportunities, but the primary limitation is movement to and from the southern aspects where soil type, dry conditions and the exiting vegetation (ponderosa pine) greatly preclude dispersal.

Fire suppression over the last century has changed the fire regime from a frequent low-intensity return interval; further increasing stand susceptibility to disease and insects, increasing dead and live fuel and development of ladder fuels, and creating a more dense forest with a closed canopy that can sustain a crown fire. These conditions also create the potential for a large-scale loss of habitat from fire which can also preclude dispersal. There have been no large wildfires in the action area in over 100 years, and since 1924, the LSR has had a very low occurrence of fire. Fire scars are present on some of the predominant trees and historic records dating back to 1910 report 24 fire starts, of which 92% were from lightning (McRae 2015, USDA-FS 1999 p. 126). There have been no recent (past 20 years) starts in the project area. The ease of access on flat ground, road system and active suppression policies generally result in fires being managed quickly, though fire behavior and rates of spread remain erratic and high in some areas due to fuel loading, wind and dry site conditions (McRae 2015).

Past road management on private and NFS lands in the gray wolf action area has increased the overall road density (open and closed) to its current condition of 3.6 mi/mi², which has increased the potential for human-caused disturbance to wolves and reduced available security habitat.

48 Smaller fire starts, particularly those earlier in this time period, were not likely fully recorded.
Other past (and ongoing) influences that can affect vegetation and NSO habitat, create potential noise or smoke disturbance, or increase the potential for human-caused disturbance to wolves include fuelwood collection, routine road and recreational site and facilities maintenance, implementation of Motorized Travel Management decisions or road management decisions from other projects (road closures, decommissioning), timber stand improvement work (young plantation maintenance), pile burning or prescribed fire, noxious weed monitoring, recreation activities and grazing. The project area is frequently utilized by the public for fuelwood gathering, primarily ponderosa pine that is dying or dead and on the ground. Cutting of dead and down trees, and standing dead conifers ≤15 inches diameter at 4.5 feet from the ground, is allowed under fuelwood collection permits and cutting is limited to within 100 feet of roads in LSR. Road and recreation site maintenance (Pilgrim Creek Snowmobile Park maintenance shed and facilities) do not typically affect NSO habitat or have a meaningful or measureable influence on ungulate or other prey or their source habitat. Road work is generally conducted in the road prism, but can include short-term noise (a few hours, to a day), felling of hazard trees and removal of small trees/saplings along the travel way. Recreation uses in the broader action area include dispersed camping, hunting, mushroom collection and oversnow vehicle use. Use of oversnow vehicles also does not affect NSO or gray wolf source habitat, but may result in periodic short-term increases in noise associated with snowmobiles, grooming or plowing equipment, or short-term disruptions to prey species. The Bartle Grazing Allotment is permitted for 240 cattle (185 permitted on USFS, and 55 permitted on/off private) from June 1 to October 30. Other activities that alter habitat or generate noise or smoke typically occur outside of Limited Operating Periods on both NFS and private lands unless surveys ‘clear’ an area. The cumulative effects of the future activities on State and private lands in the respective action areas are discussed in the Cumulative Effects section at the end of this document.
Appendix E – FVS Modeling Data

FVS modeling data and tables that display the average pre and post-thinning conditions for foraging and dispersal stands – modeling results are for thinned stands and represent averages and trends, not actual numbers.

Table 40. Pre- and Post-Treatment Stand Condition Averages for FVS-Modeled Thinning Treatments

<table>
<thead>
<tr>
<th>Unit</th>
<th>Habitat^</th>
<th>Basal Area Averages</th>
<th>Canopy Closure Averages</th>
<th>Snags 20” Diameter/Ac</th>
<th>TPA 24” Diameter/Ac</th>
<th>QMD Stand Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>DI</td>
<td>CA</td>
<td>Pre</td>
<td>Post</td>
<td>20 Yrs Post</td>
</tr>
<tr>
<td>151</td>
<td>48</td>
<td>0</td>
<td>1</td>
<td>261</td>
<td>156</td>
<td>196</td>
</tr>
<tr>
<td>152-1</td>
<td>68</td>
<td>30</td>
<td>2</td>
<td>295</td>
<td>154</td>
<td>182</td>
</tr>
<tr>
<td>153</td>
<td>100</td>
<td>2</td>
<td>2</td>
<td>187</td>
<td>156</td>
<td>195</td>
</tr>
<tr>
<td>154</td>
<td>71</td>
<td>0</td>
<td>5</td>
<td>252</td>
<td>156</td>
<td>195</td>
</tr>
<tr>
<td>155</td>
<td>98</td>
<td>0</td>
<td>3</td>
<td>292</td>
<td>156</td>
<td>198</td>
</tr>
<tr>
<td>157</td>
<td>145</td>
<td>8</td>
<td>0</td>
<td>271</td>
<td>155</td>
<td>186</td>
</tr>
<tr>
<td>158</td>
<td>12</td>
<td>42</td>
<td>0</td>
<td>200</td>
<td>118</td>
<td>157</td>
</tr>
<tr>
<td>159</td>
<td>2</td>
<td>35</td>
<td>0</td>
<td>163</td>
<td>117</td>
<td>146</td>
</tr>
<tr>
<td>160</td>
<td>30</td>
<td>7</td>
<td>0</td>
<td>255</td>
<td>142</td>
<td>168</td>
</tr>
<tr>
<td>161</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>295</td>
<td>155</td>
<td>185</td>
</tr>
<tr>
<td>162</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>146</td>
<td>116</td>
<td>134</td>
</tr>
</tbody>
</table>

^ NR and High Quality Foraging habitats are excluded as those areas would not be thinned and were not modeled for tree and stand growth over time. Stand conditions in these 11 stands are similar to other non-inventoried stands with foraging, dispersal and non-habitats. Data was only collected in these 11 stands, and two additional stands that are not proposed for thinning.

The pre-thinned condition and subsequent modeling is based on the 2007 Common Stand Exams. Within the habitat acres listed, unthinned patches and roost/rest site habitat clumps would be retained, as described in the Project Design Features section of this document. The FVS modeling demonstrates expected trends in thinned portions of stands, and does not represent the actual post-treatment condition (i.e. canopy cover, snags and trees per acre >24” DBH across stands would average slightly higher than the modeled outputs, due to retaining unthinned patches, habitat clumps, and riparian reserve exclusion zones in units 152-1, 154, 157, 163 that contain these stand elements (snags, larger trees, etc.). In pine-dominated stands (units 158, 159, 162), stands would be more open than what is modeled given the ongoing mortality in the pine component since stand data was collected in 2007.
Table 41. Pre- and Post-Treatment Stand Condition Data for Modeled Thinning Treatments

<table>
<thead>
<tr>
<th>Unit</th>
<th>Thin to BA (sqft/ac)</th>
<th>Treatment Status</th>
<th>BA</th>
<th>Snags 20&quot; Diameter/Ac</th>
<th>TPA 24&quot; Diameter/Ac</th>
<th>Canopy Closure</th>
<th>QMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>151</td>
<td>~150</td>
<td>2007 Existing Condition</td>
<td>261</td>
<td>6</td>
<td>22</td>
<td>60</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>131</td>
<td>4</td>
<td>12</td>
<td>34</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>170</td>
<td>6</td>
<td>17</td>
<td>44</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>156</td>
<td>4</td>
<td>17</td>
<td>38</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>196</td>
<td>6</td>
<td>22</td>
<td>47</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>Post-Thinning</td>
<td>181</td>
<td>4</td>
<td>23</td>
<td>42</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>222</td>
<td>6</td>
<td>28</td>
<td>50</td>
<td>22</td>
</tr>
<tr>
<td>152-1</td>
<td>125-175</td>
<td>2007 Existing Condition</td>
<td>295</td>
<td>12</td>
<td>27</td>
<td>67</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>129</td>
<td>4</td>
<td>18</td>
<td>34</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>154</td>
<td>7</td>
<td>21</td>
<td>41</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>155</td>
<td>4</td>
<td>18</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>183</td>
<td>7</td>
<td>22</td>
<td>47</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>Post-Thinning</td>
<td>180</td>
<td>6</td>
<td>21</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>208</td>
<td>9</td>
<td>24</td>
<td>51</td>
<td>19</td>
</tr>
<tr>
<td>153</td>
<td>125-175</td>
<td>2007 Existing Condition</td>
<td>187</td>
<td>3</td>
<td>20</td>
<td>48</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>130</td>
<td>2</td>
<td>18</td>
<td>34</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>165</td>
<td>4</td>
<td>19</td>
<td>42</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>155</td>
<td>2</td>
<td>21</td>
<td>38</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>194</td>
<td>4</td>
<td>27</td>
<td>46</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>Post-Thinning</td>
<td>181</td>
<td>2</td>
<td>21</td>
<td>43</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>226</td>
<td>4</td>
<td>28</td>
<td>51</td>
<td>20</td>
</tr>
<tr>
<td>154</td>
<td>125-175</td>
<td>2007 Existing Condition</td>
<td>252</td>
<td>8</td>
<td>26</td>
<td>59</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>130</td>
<td>3</td>
<td>16</td>
<td>35</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>168</td>
<td>5</td>
<td>24</td>
<td>44</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>156</td>
<td>3</td>
<td>16</td>
<td>40</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>199</td>
<td>5</td>
<td>24</td>
<td>49</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>Post-Thinning</td>
<td>182</td>
<td>5</td>
<td>18</td>
<td>47</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>218</td>
<td>7</td>
<td>24</td>
<td>53</td>
<td>18</td>
</tr>
<tr>
<td>155</td>
<td>125-175</td>
<td>2007 Existing Condition</td>
<td>292</td>
<td>5</td>
<td>29</td>
<td>64</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>131</td>
<td>2</td>
<td>10</td>
<td>37</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>172</td>
<td>3</td>
<td>16</td>
<td>46</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>156</td>
<td>3</td>
<td>14</td>
<td>40</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>197</td>
<td>7</td>
<td>20</td>
<td>49</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>Post-Thinning</td>
<td>181</td>
<td>3</td>
<td>19</td>
<td>44</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td></td>
<td>227</td>
<td>6</td>
<td>24</td>
<td>52</td>
<td>18</td>
</tr>
<tr>
<td>Unit</td>
<td>Thin to BA (sqft/ac)</td>
<td>Treatment Status</td>
<td>BA</td>
<td>Snags 20” Diameter/Ac</td>
<td>TPA 24” Diameter/Ac</td>
<td>Canopy Closure</td>
<td>QMD</td>
</tr>
<tr>
<td>------</td>
<td>----------------------</td>
<td>------------------</td>
<td>----</td>
<td>----------------------</td>
<td>---------------------</td>
<td>----------------</td>
<td>-----</td>
</tr>
<tr>
<td>157</td>
<td>125-175</td>
<td>2007 Existing Condition</td>
<td>125</td>
<td>5</td>
<td>25</td>
<td>64</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>129</td>
<td>3</td>
<td>18</td>
<td>34</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>157</td>
<td>6</td>
<td>19</td>
<td>41</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>155</td>
<td>3</td>
<td>25</td>
<td>38</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>Post-Thinning</td>
<td>180</td>
<td>3</td>
<td>26</td>
<td>42</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>216</td>
<td>6</td>
<td>33</td>
<td>49</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>158</td>
<td>80-140</td>
<td>2007 Existing Condition</td>
<td>100</td>
<td>4</td>
<td>17</td>
<td>53</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Post-Thinning</td>
<td>106</td>
<td>2</td>
<td>10</td>
<td>35</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>145</td>
<td>3</td>
<td>14</td>
<td>44</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>131</td>
<td>2</td>
<td>15</td>
<td>38</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>170</td>
<td>5</td>
<td>18</td>
<td>47</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>80-140</td>
<td>2007 Existing Condition</td>
<td>163</td>
<td>4</td>
<td>14</td>
<td>48</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Post-Thinning</td>
<td>104</td>
<td>2</td>
<td>12</td>
<td>33</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>130</td>
<td>4</td>
<td>13</td>
<td>40</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>130</td>
<td>2</td>
<td>14</td>
<td>37</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>163</td>
<td>4</td>
<td>19</td>
<td>45</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>125-150</td>
<td>2007 Existing Condition</td>
<td>125</td>
<td>5</td>
<td>30</td>
<td>60</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Post-Thinning</td>
<td>129</td>
<td>2</td>
<td>21</td>
<td>34</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>155</td>
<td>5</td>
<td>23</td>
<td>41</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>154</td>
<td>2</td>
<td>26</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>182</td>
<td>5</td>
<td>28</td>
<td>45</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>161</td>
<td>125-175</td>
<td>2007 Existing Condition</td>
<td>125</td>
<td>4</td>
<td>13</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Post-Thinning</td>
<td>129</td>
<td>4</td>
<td>13</td>
<td>40</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>156</td>
<td>5</td>
<td>14</td>
<td>47</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>Post-Thinning</td>
<td>155</td>
<td>4</td>
<td>20</td>
<td>44</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>185</td>
<td>5</td>
<td>21</td>
<td>50</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>175</td>
<td>Post-Thinning</td>
<td>180</td>
<td>4</td>
<td>24</td>
<td>48</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>214</td>
<td>5</td>
<td>29</td>
<td>54</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>162</td>
<td>80-140</td>
<td>2007 Existing Condition</td>
<td>100</td>
<td>7</td>
<td>17</td>
<td>46</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Post-Thinning</td>
<td>103</td>
<td>3</td>
<td>13</td>
<td>34</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>120</td>
<td>4</td>
<td>13</td>
<td>40</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>Post-Thinning</td>
<td>129</td>
<td>4</td>
<td>17</td>
<td>38</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>20 Years Post-Thinning</td>
<td>147</td>
<td>5</td>
<td>18</td>
<td>43</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>
Appendix F - Past, Present and Reasonably Foreseeable Management Activities

This appendix describes the overall approach to the Elk project cumulative effects analysis and summarizes a list of potentially relevant ongoing and reasonably foreseeable futures actions.

Past, present, and reasonably foreseeable future management activities were considered for this project, in order to assess accumulated impacts. According to the Council on Environmental Quality NEPA regulations, a “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7). Spatial and temporal boundaries are the two critical elements to consider when deciding which actions to include in a cumulative effects analysis. Spatial and temporal boundaries set the limits for selecting those actions that are most likely to contribute to a cumulative effect. The effects of those actions must overlap in space and time for there to be potential cumulative effects (FSH 1909.15 (15.2)). Spatial and temporal boundaries are the two critical elements to consider when deciding which actions to include in a cumulative effects analysis. Spatial and temporal boundaries set the limits for selecting those actions that are most likely to contribute to a cumulative effect. The effects of those actions must overlap in space and time for there to be potential cumulative effects (FSH 1909.15 (15.2)). Therefore, relevant boundaries and projects assessed for cumulative effects vary by resource. Each resource’s cumulative effect area can be different and possibly larger or smaller.

With respect to already completed (past) actions, this cumulative effects review does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalogue and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not always be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions may be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions.

The cumulative effects analysis for each environmental component or resource area is guided by and consistent with the Council on Environmental Quality letter “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis” of June 24, 2005 (Connaughton, 2005). The current environmental conditions on the landscape reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and can be used as a proxy for the impacts of past actions.

For each resource area, direct and indirect effects of the proposed action were reviewed, in accordance with the Forest Service Handbook 1909.15 (15.2), and relevant spatial and temporal boundaries for cumulative effects analysis were determined. For the Elk project, the longest relevant temporal boundary in this review was 30 years. The largest relevant spatial boundary in this review encompasses the 5th field watershed that intersects the project area, Ash Creek, modified to expand the boundary...
where any other resource cumulative effects boundary extends past it. All other spatial and temporal boundaries either fell within the expanded 5th field HUC boundary, or were unneeded.\textsuperscript{127} \textsuperscript{128} The Elk project area boundary was the most common cumulative effects spatial boundary used. Additionally, most specialists considered existing conditions as the aggregate of past actions in lieu of designating a specific temporal boundary.

Once this “general review area” was identified (Elk Project general cumulative effects review area), activities were reviewed for data contained within or intersecting this largest boundary within the last 30 years to generate a list of potentially relevant actions. The interdisciplinary team reviewed for past, present, ongoing and future activities that are contained within or intersect with the Elk Project general cumulative effects review area from the following sources: Forest Activities Tracking (FACTS) database for the Shasta-Trinity and Klamath National Forests, CALFIRE’s timber harvesting plan (THP) status table (for THPs submitted to CALFIRE) and CALFIRE’s Forest Practice Geographical Information System timber harvest data in ERSI formats (for THPs approved, completed, etc.), the Schedule of Proposed Actions (SOPA) for the Shasta-Trinity and Klamath National Forests (January 1-March 31, 2015 Quarterly SOPA, and the Current SOPA January 1, 2015).\textsuperscript{129} The information is characterized in the Cumulative Effects Worksheet for each resource as applicable (in the project record).

Potentially relevant present and reasonably foreseeable future actions is summarized in Table Appendix F-1. A column is included in the table indicating the estimated acreage or mileage within the project area boundary because it is the most common cumulative effects boundary used by specialists. Refer to the cumulative effects worksheet summary of past actions assessed. Relevant cumulative effects are documented for the resource in the project specialist reports and are summarized in Chapter 3.

Following the tables, two figures are shown displaying this information. Figure Appendix F-1 displays the locations of past actions in 10-year increments. Figure Appendix F-2 displays the ongoing and future projects.

### Table Appendix F-1. Present and Reasonably Foreseeable Future Activities in the Elk Vegetation Management Project’s General Cumulative Effects Boundary and the Project Boundary

<table>
<thead>
<tr>
<th>Activities within the General Cumulative Effects Boundary (Expanded Ash Creek 5th Field HUC)</th>
<th>Estimated Acres/miles Within CE Boundary</th>
<th>Estimated Acres/miles Within Project Area Boundary</th>
<th>Past-Ongoing or Future Foreseeable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Service Activities</td>
<td>59,184 NFS, 116,461 Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{127} A few resources such as socio-economic had larger spatial boundaries but because of the nature of the resource and/or effects, a cataloguing of actions was not necessary to the analysis.

\textsuperscript{128} Rationale for selection of boundaries as well as analysis can be found in individual specialist reports and are summarized in chapter 3.

\textsuperscript{129} There may be a slight overestimate of the amount of activity conducted because activities intersecting the boundary were used in addition to those contained completely within the boundary.
<table>
<thead>
<tr>
<th>Activities within the General Cumulative Effects Boundary (Expanded Ash Creek 5th Field HUC)</th>
<th>Estimated Acres/miles Within CE Boundary</th>
<th>Estimated Acres/miles Within Project Area Boundary</th>
<th>Past-Ongoing or Future Foreseeable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firewood cutting</td>
<td>59,184 acres NFS</td>
<td>490 acres of Matrix and downed wood within 100 feet of open system roads in LSR.</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Mushroom picking, 59,184 NFS acres (116,461 total acres) in the 5th field CE boundary</td>
<td>59,184 acres NFS</td>
<td>3,520 acres</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Dispersed recreation, (including: driving for pleasure, snowmobiling, camping and hunting)</td>
<td>59,184 acres NFS</td>
<td>3,520 acres</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Cattle Camp Campground &amp; Picnic Area – operation, maintenance, use</td>
<td>~ 5 acres</td>
<td>0</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Trout Creek Meadow dispersed area camping - use</td>
<td>~ 5 acres</td>
<td>0</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Brewer Creek Trailhead, maintenance and use</td>
<td>~ 1 acre</td>
<td>0</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Pilgrim Creek Snowmobile Park, operation (snow grooming), maintenance and use</td>
<td>~ 2 acres</td>
<td>0</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Fire suppression</td>
<td>Variable, unknown within 116,461 acres</td>
<td>Variable, unknown within 3, 520 Acres</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Noxious weed control (monitoring of noxious weeds, prevention and control measures [hand methods, no herbicides])</td>
<td>Unknown (variable, localized)</td>
<td>Unknown</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Snowmobile Trail</td>
<td>60 miles of groomed and .15 miles of ungroomed trail in the CE boundary</td>
<td>3.8 miles in project boundary (groomed)</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Road maintenance</td>
<td>Unknown (variable, localized)</td>
<td>Unknown (variable, localized)</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Special use permit - tribal ceremonies</td>
<td>~ 5 acres</td>
<td>1 event approximately 2.5 acres</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Special use permit - Caltrans easement (Highway 89 right of way)</td>
<td>~ 1 mile</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Special use permit - PacifiCorp powerline along Highway 89. Includes vegetation management maintenance (e.g. hazard tree felling).</td>
<td>~ 1 mile</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Activities within the General Cumulative Effects Boundary (Expanded Ash Creek 5th Field HUC)</td>
<td>Estimated Acres/miles Within CE Boundary</td>
<td>Estimated Acres/miles Within Project Area Boundary</td>
<td>Past-Ongoing or Future Foreseeable</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Special use permit - McCloud Railway Company permit for 14.92 miles (156.41 acres) to maintain/operate a common carrier railroad; however, the rails have been removed. The majority of the railroad is under a purchase agreement with Shasta Land Trust and will be converted into a trail system.</td>
<td>~ 2 miles (0.7 miles under special use permit)</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Special use permit - two road permits for permit holder’s access to their private land.</td>
<td>Unknown</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Recreation special use permits-four permits for guided mountaineering and skiing on Mt. Shasta</td>
<td>N/A</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Recreation special use permit - permit for guided hiking, snowshoeing, backcountry skiing, scenic vehicle tours, step-on bus tours many of which include meditation and on-site counseling.</td>
<td>N/A</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Recreation special use permit - permit for guided snowmobile tours (administered by the Klamath National Forest). Authorized for use on the Tri-Forest Snowmobile Trails.</td>
<td>Variable</td>
<td>If used, there are 3.8 miles in project boundary (groomed)</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Recreation special use permit - permit for conducting crevasse and glacier travel training classes</td>
<td>N/A</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Recreation special use permit - permit for an annual recreation event, a rendezvous, at Trout Creek Campground but sometimes held at Elk Flat if Trout Creek Campground is closed due to snow.</td>
<td>~ 5 acres</td>
<td>Elk Flat</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Recreation special use permit - permit for annual recreation event, “Biktoberfest” along the Pilgrim Creek Road to the Harris Spring Road.</td>
<td>~ 13 miles</td>
<td>~ 2 miles</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Hazard tree abatement (roads, campgrounds, administrative sites) - variable</td>
<td>Unknown variable</td>
<td>Unknown variable</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td>Bartle Grazing- 240 cattle (185 USFS permit, 55 permitted on/off private permit), 6/1-10/30.</td>
<td>~ 30,404 acres</td>
<td>3,520</td>
<td>Past-Ongoing-Future Foreseeable</td>
</tr>
</tbody>
</table>
### Activities within the General Cumulative Effects Boundary

**Activities within the General Cumulative Effects Boundary**  
(Expanded Ash Creek 5th Field HUC)  

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Estimated Acres/miles Within CE Boundary</th>
<th>Estimated Acres/miles Within Project Area Boundary</th>
<th>Past-Ongoing or Future Foreseeable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timber Stand Improvement-</strong> The work planned may include one or more of the following; release and weeding, precommercial thinning of conifers, hazardous fuels reduction and understory vegetation control, pruning, chipping, and/or pullback of contractor-generated fuels along roads and around leave trees. The work may be accomplished by manual or mechanical means.</td>
<td>~ 2,414 acres (0-300 acres per year depending on funding and other factors)</td>
<td>~ 641 acres in 22 plantations approved in NEPA decisions – however these are now incorporated into the Elk Proposed Action</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Underburning – Trout Creek and Pilgrim</strong></td>
<td>229 acres</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Machine piling and burning</strong></td>
<td>134 acres</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Precommercial thinning</strong></td>
<td>18 acres</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Motorized Travel Management- Planning, MVUM</strong></td>
<td>N/A</td>
<td>N/A</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Special Forest Products-Bough, Cone Collection - variable</strong></td>
<td>Unknown, variable</td>
<td>Unknown</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Permitted rock collection-obsidian, pumice - variable</strong></td>
<td>Unknown, variable</td>
<td>Unknown</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Road closures authorized under previously approved NEPA</strong></td>
<td>~22 miles (ML1) ~6 miles decommissioning</td>
<td>2.6 ML1</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Gravel, cinder pits</strong></td>
<td>Unknown</td>
<td>None</td>
<td>Past-Ongoing</td>
</tr>
<tr>
<td><strong>Highway 89 Safety Enhancement and Vegetation Management Project - Vegetation and Fuels Management</strong></td>
<td>480 acres</td>
<td>None</td>
<td>Future Foreseeable</td>
</tr>
<tr>
<td><strong>Trout Creek Stream Restoration- meadow and stream restoration.</strong></td>
<td>90 acres</td>
<td>None</td>
<td>Past-Ongoing-Future foreseeable</td>
</tr>
<tr>
<td><strong>Algoma Vegetation Management Project-South-A portion of thinned units would be underburned.</strong></td>
<td>~ 290 acres thinning with some underburning</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable*</td>
</tr>
<tr>
<td>Activities within the General Cumulative Effects Boundary</td>
<td>Estimated Acres/miles Within CE Boundary</td>
<td>Estimated Acres/miles Within Project Area Boundary</td>
<td>Past-Ongoing or Future Foreseeable</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>---------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Elk LSR Enhancement Project</td>
<td>59,184 NFS, 116,461 Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Algoma Vegetation Management Project-East-Thinning - A portion of thinned units would be underburned and/or machine piled/burned. | ~615 acres of thinning with some burning | None | Past-Ongoing/Future Foreseeable |

| Algoma Vegetation Management Project-West, thinning and pile burning. A portion of thinned units would be underburned. | ~1,712 acres of thinning, ~175 acres of pile burning | None | Past-Ongoing/Future Foreseeable* |

| Pilgrim Project: ~ Completion of thinning in unit 401 | ~147 acres completion of thinning | ~147 acres completion of thinning (unit 401) | Past-future foreseeable |

### Timber Harvest Plans on Private Land

<table>
<thead>
<tr>
<th>2-05-144-SIS (Approved)</th>
<th>Alternative Prescription (68 ac) Shelterwood Removal Cut (6 ac)</th>
<th>None</th>
<th>Past-Ongoing/Future Foreseeable**</th>
</tr>
</thead>
</table>

| 2-09-073-SIS (Approved) | Clear Cut (9 ac) Shelterwood Removal Cut (19 ac) | None | Past-Ongoing/Future Foreseeable** |

| 2-10-063-SIS (Approved) | Alternative Prescription (355 ac) Clear Cut (413 ac) Commercial Thin (37 ac) No Harvest Area (19 ac) Rehabilitation (19 ac) Sanitation Salvage (286 ac) Shelterwood Removal Cut (355 ac) Shelterwood Seed Cut (40 ac) Selection (106 ac) | None | Past-Ongoing/Future Foreseeable** |

| 2-11-001-SIS (Approved) | Alternative Prescription (636 ac) Commercial Thin (394 ac) Group Selection (1902 ac) Sanitation Salvage (135 ac) Shelterwood Removal Cut (77 ac) Seed Tree Seed Cut (14 ac) | None | Past-Ongoing/Future Foreseeable** |

| 2-12-049-SIS (Approved) | Alternative Prescription (2881 ac) No Harvest Area (53 ac) Seed Tree Seed Cut (20 ac) | None | Past-Ongoing/Future Foreseeable** |

| 2-12-065-SIS (Approved) | Alternative Prescription (528 ac) Commercial Thin (318 ac) Group Selection (628 ac) Seed Tree Seed Cut (12 ac) | None | Past-Ongoing/Future Foreseeable** |

<p>| 2-13-003-SIS (Approved) | Alternative Prescription (155 ac) | None | Past-Ongoing/Future Foreseeable** |</p>
<table>
<thead>
<tr>
<th>Activities within the General Cumulative Effects Boundary (Expanded Ash Creek 5th Field HUC)</th>
<th>Estimated Acres/miles Within CE Boundary</th>
<th>Estimated Acres/miles Within Project Area Boundary</th>
<th>Past-Ongoing or Future Foreseeable</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-98-329-SIS (Approved)</td>
<td>Clearcut (15 ac) Commercial Thin (20 ac)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-15-065 (Approved)</td>
<td>Alternative Prescription (194 ac) Shelterwood Removal Cut (20 ac)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-15-059-SIS (Approved)</td>
<td>Alternative Prescription (196 ac) Fuelbreak (109 ac) No Harvest Area (63 ac.) Road (2 ac.) Shelterwood Removal Cut (72 ac.) Shelterwood Seed Cut (263 ac.) Selection (71 ac.)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-15-044-SIS (Approved)</td>
<td>Alternative Prescription (376 ac.) Commercial Thin (248 ac.) Road (1 ac.) Shelterwood Prep Cut (26 ac.) Shelterwood Removal Cut (43 ac.) Shelterwood Seed Cut (17 ac.)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-15-042-SHA (Approved)</td>
<td>Alternative Prescription (8 ac) Shelterwood Removal Cut (14 ac) Seed Tree Cut (21 ac)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-14-096-SIS (Approved)</td>
<td>Alternative Prescription (266 ac.) Commercial Thin (75 ac.) Shelterwood Removal Cut (85 ac.)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-14-071-SIS (Approved)</td>
<td>Alternative Prescription (177 ac.) Commercial Thin (381 ac.) No Harvest Area (25 ac.) Shelterwood Removal Cut (70 ac.) Selection (125 ac.) Seed Tree Removal Cut (167 ac.)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-14-039-SIS (Approved)</td>
<td>Alternative Prescription (677 ac.) Group Selection (15 ac.) No Harvest Area (46 ac.) Shelterwood Removal Cut (218 ac.) Seed Tree Removal Cut (28 ac.)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>Activities within the General Cumulative Effects Boundary (Expanded Ash Creek 5th Field HUC)</td>
<td>Estimated Acres/miles Within CE Boundary</td>
<td>Estimated Acres/miles Within Project Area Boundary</td>
<td>Past-Ongoing or Future Foreseeable</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2-13-090-SIS (Approved)</td>
<td>Alternative Prescription (291 ac.) No Harvest Area (133 ac.) Sanitation Salvage (37 ac.)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
<tr>
<td>2-13-067-SIS (Approved)</td>
<td>Alternative Prescription (805 ac) No Harvest Area (10 ac) Shelterwood Removal Cut (44 ac) Selection (6 ac)</td>
<td>None</td>
<td>Past-Ongoing/Future Foreseeable**</td>
</tr>
</tbody>
</table>

*a portion of units have been treated in Algoma West. They are not shown as completed yet in FACTS so acreage may be overestimated.

**Approved or unlogged THPs that are not indicated to be completed on CalFire THP website. Because a THPs status is not marked completed until all actions are accomplished, the THP actions on a unit-by-unit basis are in various states of completion.
Figure Appendix F-1. Cumulative Effects Boundary Map with Past Actions

(Grouped in 10-Year Increments)
Figure Appendix F-2. Ongoing and Future Projects in General Cumulative Effects Boundary
Appendix G - Changes in the Proposed Action and Changes Between Draft and Final

Changes in the Proposed Action

The Proposed Action for the Elk Flat Late Successional Reserve Enhancement Project (Alternative 1, the Modified Proposed Action) was incrementally modified since the project was originally scoped and noticed in 2013 (USDA-FS, 2013; USDA-FS, 2013b).130

The original Proposed Action described the Purpose and Need for Action in terms of the primary purpose to reduce the current and future risk of large-scale disturbance events within early, mid and late-successional habitat within the Elk Flat LSR and nearby stands per LSRA Objectives III and I. Additional benefits of the project were to increase resilience and promote continued development and connectivity of late-successional forest habitat in the Elk Flat LSR (LSRA Objectives II and IV); restore and maintain meadow habitat in Elk Flat, increase hardwood diversity across the project area, and improve streamflow and vegetation conditions within Riparian Reserves associated with Ash and Swamp Creeks and their tributaries. To clarify that they were part of the Purpose and Need for Action, the “additional benefits” are now identified as secondary purposes under Alternative 1. The original Proposed Action noted road decommissioning in support of the meadow habitat and streamflow aspects. It did not explicitly include management of the transportation system as a purpose, whereas Alternative 1 lists it as a secondary purpose for clarity.

In summary, the most substantial modifications to the original proposed treatments in Alternative 1 are:

- **Radial Thinning** – Radial thinning trees per acre were modified from 5 trees per acre on average to 2 trees per acre, except for unit 157, which is a maximum of 4 trees per acre (see pp. A-19). The higher level of radial thinning as originally proposed would remove the canopy more than is desired for late-successional wildlife habitat retention.

- **Reforestation** – The original proposed action did not refine the interplanting and group selection planting needs by acres and specific units and did not include specific site preparation techniques and acres, or the potential for release treatments. The modification discloses the action more specifically and incorporates the potential for release as needed in order to assure growth to accelerate development per the Purpose and Need for Action. Alternative 1 provides this more detailed information on pages A-27, 52, and 63.

- **Underburning** – The original Proposed Action did not specify that repeated entries for underburning would be 2 to 3 prescribed fire entries on a 5 to 10 year interval within the project area boundary may occur to fully restore the natural fire regime as described for Alternative 1 (see p. A-29, 54, and 64). Some areas between treatment units and existing barriers were originally left untreated. The original proposed action did not include underburning units 1-U, 156-U, 157-U, 159-U, 346-U. Alternative 1 increases underburning to take advantage of existing barriers to minimize fireline construction and to fully restore the project area to the natural fire regime consistent with the Purpose and Need for Action.

- **Mortality Levels During Underburning** – Mortality in the residual stands from underburning are refined for site-specific conditions in Alternative 1 (see RPMs 25-27). The original Proposed Action

---

130 The responsible official may modify the proposed action and alternative(s) under consideration prior to issuing a draft EIS. In such cases, the responsible official may consider the incremental changes as alternatives considered. The documentation of these incremental changes to a proposed action or alternatives shall be included or incorporated by reference in accord with 40 CFR 1502.21. (36 CFR 220.5(e))
included mortality from underburning between 5% and 10%. The refinements inform the effects analysis and were discussed and developed through consultation with the FWS (BA Appendix C).

- Oak and Aspen Release Treatment and Aspen Adaptive Management – Alternative 1 modified the original Proposed Action to more thoroughly describe the oak and aspen release treatments and sets a diameter or canopy class limit within the release areas and adds Aspen Restoration Adaptive Management to provide a strategy to adjust future treatments based on release success (see pp. A-21 and A-28).

- Hazard Reduction Treatment – Alternative 1 provides a description of hazard reduction as a connected action to the thinning and fuels treatments (see pp. 59, and 66) to accommodate the concern of ongoing mortality on safety in specific areas.

- Extensive Mortality Area Treatment – Alternative 1 adds the Extensive Mortality Area treatment (see pp. A-32, 55, and 63) due to ongoing and contiguous mortality that presents a risk to surrounding stands in the LSR, and a concern for public safety in and near the area.

- Salvage Adaptive Management – Alternative 1 adds a salvage adaptive management of salvage of dying trees, primarily pine, in units 6, 14, 16, 113, 123, 124, 125, 158, 159, 160, 161, 162, 163, 164, 175, 176, 204, 206 and 235 in the event conditions deteriorate further post-decision and post marking (see pp. A-28, 53, and 63). Salvaging the trees would reduce the safety and hazard concern post-project from continued mortality.

- Follow-up Mechanical Fuels Treatment - The original Proposed Action described that the entire suite of fuels treatments could be utilized and the decision on appropriate method would be made based on post-thinning activity and surface fuels levels. Alternative 1 clearly defines where machine piling and pile burning may take place (see p. Table Appendix A-3 and p. 64) to inform the effects analysis.

- Road Actions –Road Actions in the original proposed action are shown in Table 4 of the Scoping document (USDA-FS, 2013b). Table 10 on page 65 summarizes the road actions in Alternative 1 and the specific road action list is on page A-36. Changes occurred as analysis of the existing condition and connected actions refined the proposed action since scoping. For the most part mileages of all road actions decreased; for example, the proposed reconstruction of 4 miles in the original Proposed Action down to 0.3 miles in Alternative 1. Additionally, the original Proposed Action did not include addition of 0.10 miles of unauthorized route to the FTS to provide legal access to an existing dispersed recreation site near Elk Flat meadow.

- Adaptive Management for Biomass Thinning – Alternative 1 added adaptive management for biomass thinning (see pp. 53 and 60) to address potential market fluctuations and provide an alternative method of thinning material 4 to 6.9 inches DBH.

- Meadow Enhancement dropped in Unit 401 - The original Proposed Action included unit 401 as a meadow enhancement unit. Review of the stand history revealed the prescription for treatment under the Pilgrim Vegetation Management Project was for a transition zone between meadow and forest with widely spaced overstory (80 square feet of basal area per acre) and all understory removed to resemble a pine savannah. That treatment has been partially completed under Pilgrim. Alternative 1 drops the meadow enhancement prescription in favor of fully implementing the Pilgrim project’s treatment of the unit. Underburning unit 401 remains in Alternative 1. See footnote 29 on page 60 for more information.

- Unthinned Patches – The original Proposed Action included approximately 10% of units included as unthinned patches. Alternative 1 includes a minimum of 10% but most units having between 12% and 50% UTPs. The original Proposed Action included no burning in UTPs. Alternative 1 instead prescribes no direct ignition in some UTPs (RPM 30) and has other protections to prescribe mortality limits throughout the project area (starting p. 88). Alternative 1 adds snag retention areas as part of the unthinned patch prescriptions in areas of heavy mortality. This primarily affects units 158, 162, 175,176, 204 and 206. These were added due to ongoing mortality reducing the options for unthinned patches consisting of mostly live trees. See pages A-18, Table Appendix A-2). Table 7 (p. 61) for acres of unthinned patches.
• Borax Treatment – The connected action of Borate fungicide treatment to inhibit the spread of *Heterobasidion* root disease may include different formulations based on changing market availability. The solid Sporax® or liquid Cellu-Treat® or possibly other brands or formulations may be used. Additionally, it is clarified that borax may be applied to stumps meeting the requirement (over 14 inches in diameter) in all harvested areas, including equipment exclusion zones in Riparian Reserves where equipment may reach into thin trees without entering the exclusion zone.

• Acreages of Treatments – Alternative 1 provides refinements, corrections and display of acres by treatments and prescriptions elements. See Table Appendix A-2 for unit acres by treatment.

Changes in the EIS between Draft and Final

The following changes were made to the EIS between the January 2016 DEIS and the April 2016 FEIS

1. Correction of minor typographical errors, minor wording and incorrect cross references throughout the document
2. Summary updated to address clarifications on effects to PCE 3 of NSO Critical Habitat; and throughout document, updated that 629 acres of total critical habitat would be treated compared to the 624 acres erroneously reported in the DEIS.
3. Addition of footnote #1 page vii clarifying LSRA approval by Regional Ecosystem Office (FEIS p. vii)
4. Edit to Riparian Reserves clarify the actual Forest Plan prescription is Riparian Area Management (FEIS p. vii)
5. Edit to clarify 10% of the project are is in mixed conifer (FEIS p. viii)
6. Edit to #5 Actions in section to clarify the 211 acre of treatment in Riparian Reserves, 65 acres is to promote riparian vegetation, 65 acres for meadow enhancement, and 80 acres is underburning only and under Alternative 3 that “Thinning” 165 acres is an error and changed to “Treating” 165 acres: 55 acres of thinning, 65 acres of meadow enhancement and 45 acres of underburn only (FEIS starting on page ix).
7. Footnote 3 on page xvii was added to clarify the addition of 1/10th of a mile or UA route would not need new road construction.
8. Edit was made to qualify the stand ages being discussed apply to natural stands (FEIS p. 4).
9. Additional description for the land allocations is added to the Riparian Reserves discussion (FEIS p. 7)
10. Table 3 heading changed to clarify % of Project Area rather than % of Treatment Area (FEIS p. 4)
11. Footnote 8 added clarifying the watershed analyses. (FEIS p. 9)
12. Clarification to Coarse Woody Debris desired condition for Matrix and LSR (FEIS in section starting on p. 17)
13. Clarification for “Density” desired condition for Matrix and LSR (FEIS p. section starting on p. 17)
14. Table 5 has been reorganized for clarity and seral stage acres corrected; DEIS table seral stage 3 & 4 acres were in error (FEIS p. 19)
15. Fuel loading existing condition tons per acre corrected (FEIS section starting on p. 26)
16. Key Issue #1 on FEIS p. 45 was clarified that some dominant trees may be removed in meadow enhancement, and in radial thinning, groups selection, oak release and aspen release areas within the thinning units. The same clarification was made throughout the document where it is discussed which trees would be retained or removed.
17. Description of Group selections edited to correct that two natural stands also have group selections and to clarify diversity objective. The natural stands were always shown in Table A-2 and reflected in Table 7, but in the DEIS were not mentioned in this description. (FEIS, p. 51)
18. Salvage Adaptive Management clarified the treatment is removal to reduce risk posed by higher levels of standing and down fuels and that it applies to pine only. (FEIS, p. 53)
19. Extensive Mortality Area (EMA) description Adaptive Management deleted because the treatment is not necessary and had not been carried forward in the remainder of the document. Inclusion in the DEIS was inadvertent. Addition of risk to adjoining stands as an objective was also added to the treatment objective. (FEIS, 55, A-38)
20. Hydrologic descriptions had very minor wording edits for clarity with no changes in meaning. (FEIS, p. 56)

21. Hazard Reduction description corrected to note that the delineated hazard reduction treatment areas are areas with a high likelihood of snag felling due to their locations and high mortality, not that “all” snags would be felled there. (FEIS p. 59)

22. Table 7, Table 12, Table 21 have been corrected for the “thinning only” and the “with radial thin” because unit 171 is not prescribed radial thinning. The Total thinning acres remains the same. Biomass thinning acres were corrected because unit 178 was incorrectly included in biomass thinning. (Table 17 also had the following). The heading for Subtreatment was corrected to read “prescription elements or subtreanments”. A table note was added pertaining to units 206 and 402 harvest acres. Throughout the document references to radial thin acres have been corrected.

23. Table 11, Table 16, Table 21, Table 26 corrected to better describe Riparian Reserve Treatments.

24. Correction in Aspen Release treatment acres under Alternative 2 in Table 12.

25. Minor clarifying wording edits made to RPMs 6, 11, 13 (FEIS, pp. 86, 86)

26. Correction to Table 29 PART I, Purpose and Need #4, 4b. Acres of Aspen Release, Alternative 2 (FEIS p. 101)

27. Minor acreage updates were made in Table 29, Part II for Issue 3 to correct the preliminary analysis acres (e.g. GIS analysis errors in PCE1-adjusted by one acre; PCE 3-adjusted by five acres), FEIS p. 104.

28. Table 29, Part III for NSO dispersal habitat acres modified or removed were updated for rounding and were updated elsewhere in the document.

29. Suitable Northern goshawk habitat benefitted from prescribed fire only was updated throughout the document for each alternative by approximately 76 acres, including Table 29 PART III for Wildlife.

30. Northern goshawk habitat improved was corrected throughout the document from 1,921 to 1,997 acres for Alternative 1; 1,918 acres to 1,807 acres under Alternative 2; and 1,471 acres to 1,547 acres under Alternative 3, including Table 29 PART III for Wildlife.

31. The Determination for the fisher was updated in Table 29 PART III for Wildlife and in other portions of the document to reflect its current Forest Service sensitive species status vs. the determination made for the DEIS analysis when the West Coast Distinct Population of fisher was a proposed listed species. Other citations in the DEIS were updated or removed to reflect the FWS decision to not list the West Coast DPS of fisher under the ESA (April 14, 2016 News Release, Federal Register Notice planned for April 18, 2016).

32. Corrections were made to Table 29 PART IV for NSO critical habitat acres affected by landings – these numbers were correct in the Draft BA.

33. A block of text pertaining to Alternative 3 was deleted under the Alternative 5 heading. No changes in Alternative 5 were made. (FEIS p. 119)

34. The second bullet in Alternative 5 discussion was deleted. The large tree refugia and feathering treatments along the edge of the meadow would retain intact the trees the Boletus depend on, but the thinning of trees around them may not retain the overall Boletus habitat there.

35. Alternatives 10 and 11 were added in response to public comment (FEIS pp. 123-125)

36. Additional information was added to the cumulative effects on Boletus habitat in Elk Flat for Pilgrim unit 401, which also was a meadow enhancement treatment in Botany on FEIS p. 199

37. Additional description of Streamflow and Channel Condition bullets in Hydrology on FEIS p. 206

38. Additional discussion on the effects from prescribed burning and multiple entries was added to the Hydrology Environmental Consequences under Alternative 1, FEIS p. 212.

39. Clarification of landing placement outside EEZ and hand piling in Hydrology on FEIS p. 211

40. Added a bullet about restoration of infiltration from decommissioning in Hydrology on FEIS p. 212

41. Clarified difference between matrix and LSR down log standards in Soils Table 63, Table 66

42. Updated and corrected some correspondence dates in Tribal Coordination on pages 246

43. Updated Summary and Conclusions for SHPO Concurrence on FEIS p. 246 and 249
44. Added information of economic impacts of mushroom gathering in local community use of the forest on
FEIS p. 253, 255
45. Updated Consultation and Coordination section, FEIS p. 264
46. Added additional sources and definitions of Old Growth Forest to the Glossary, FEIS p. 267
47. Table Appendix A-1 updated and corrected for RR information
48. Table Appendix A-2 corrected to delete radial thinning from unit 171, biomass from 178, and delete unit
18 from salvage. (Elsewhere in the document, the number of salvage units was correct to 19. The acreages
in the DEIS of salvage adaptive management were correct at 811 for Alternative 1, 805 for Alternative 2,
and 766 for Alternative 3.)
49. Language clarified on page A-20 that equipment can enter the RR but not the equipment exclusion zones
(EEZ)
50. Additional units known to have oak added to list on page A-21 and the buffer for aspen release was
clarified to extend into adjoining units within 150 feet of aspen.
51. Site prep for reforestation was clarified on page A-27 that no site prep would occur in RRs
52. Units with thinning in RRs was added to the description for thinning in Riparian Reserves FEIS A-33 and
Table A-44 was expanded to clearly list all RR units receiving treatment
53. Road and landing actions on FEIS A-35 was edited to clarify no predominants or dominant trees with
late-successional structure would be removed during road operations unless a safety hazard.
54. BMP 8.2 added to Appendix C
55. Appendix D – Maps updated D-1 to D-6, Added D-9 and D-10 maps of NSO habitat maps from the BA
56. Appendix E – Full BA rather than just consultation record
57. Appendix F – Updated Table Appendix F-1 for consistency with the March 2016 updated cumulative
effects list. Updated Figure F-2.
58. Appendix G – Updated to list changes between the DEIS and FEIS
59. Climate change compliance was edited to delete the reference to a global scale and clarify the sustainable
forest management is the frame of reference for gauging carbon storage, FEIS Appendix H, p. H-5, 6.
60. The Irreversible and Irretrievable Commitments of Resources section was updated to reflect the errors
reported in the DEIS for landing acres within NSO critical habitat (acres were correct in the Draft BA).
61. The Late Successional Reserve consistency section was updated to reflect the information gained during
the Regional Ecosystem Office review process and to add their concurrence date and to edit for clarity,
FEIS Appendix H, starting p. H-17
62. Vegetation Diversity - Corrected reforestation acres in vegetation diversity that starts on FEIS p. H-28,
Caption updated for Table Appendix H-2 to reflect the table refers to the Ash Creek Watershed
63. Addition of Table Appendix I-1 – Response to Comments
64. Clarified the description of thinning within the Riparian Reserves to “Riparian Reserve thinning, machine
pile (outside of EEZs and UTP’s), handpiling and underburning may occur within these units) (see also
Table Appendix A-4 Part B)”
Appendix H – Compliance and Consistency

NEPA at 40 CFR 1502.25(a) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders.” Compliance with the legal and policy framework at the federal, state, and local level (applicable Forest Plan standards and guidelines, principle laws, regulations, executive orders and policies) that has not been previously discussed, are addressed here by resource topic or by the guiding authority. When there are multiple requirements from different authorities the discussion is introduced by resource topic. When the requirement is confined to a single authority, the discussion is introduced by that authority. Topics are listed here in alphabetical order except the National Forest Management Act (NFMA) is presented last to provide the Forest Plan consistency evaluations for those items not previously included.

Air Quality Requirements-Local, State and Federal

The project area is within the Northeaster Plateau Air Basin consisting of Siskiyou, Modoc, and Lassen Counties in a Class II airshed. Air Quality at the local level is regulated by the Siskiyou County Air Pollution Control District (APCD). The California Air Resources Board (CARB) has noted that Siskiyou County adequately represents the air basin as a whole (CARB, 2010 p. 15).

The major project activity relative to the decision with respect to air quality is smoke produced from prescribed burning. Other project actions that have the potential to affect air quality include dust from heavy equipment and trucks using native surface and gravel roads, and emissions from mobile equipment for implementation operations, hauling, and road actions. Projected vehicle emissions, including those from timber harvest activities, are already accounted for in the emissions inventory for Siskiyou County. Maximum vehicle emissions are regulated through state and federal mobile source emissions standards with which all vehicles and equipment must comply. Therefore, the compliance evaluation for air quality primarily concerns smoke and dust emissions.

Since air quality is transient; air quality impacts from activities prior to the project will have dissipated. Similarly, air impacts from the project would dissipate before future projects begin, so there is no potential for past or future projects, in conjunction with the proposed action, to cumulatively affect the air resource. For that reason, they are not catalogued specific to air quality.

---

131 The emissions inventories for various years by County or air basin are provided online at the California Air Resources Board website. See http://www.arb.ca.gov/app/emsinv/emssumcat.php

132 Vehicle emissions would vary in both timing and quantity produced based on the actual complement of equipment and strategy of implementation employed. It is assumed that given similar equipment and timing, more acres treated using heavy equipment, including thinning, machine piling, road maintenance and decommissioning, would produce correspondingly higher vehicle emissions to accomplish the treatments. Therefore Alternative 1 is likely to produce more vehicle emissions than Alternatives 2 and 3, with Alternative 3 producing the least.
Federal Clean Air Act and Federal Policy

General Conformity Rule
The conformity provisions of the Federal Clean Air Act (Section 176c) prohibit federal agencies from taking any action that causes or contributes to any new violation of the National Ambient Air Quality Standards, increases the frequency or severity of an existing violation or delays the timely attainment of a standard. The federal agency responsible for the action is required to determine if its actions conform to the applicable State Implementation Plan.

There are eight criteria pollutants for the federal standards (CARB, 2015). No criteria pollutants are in a federal nonattainment status for Siskiyou, Modoc or Lassen Counties, which comprise the Northeastern Plateau Air Basin (CARB, 2013). Because Siskiyou County and the air basin are in federal attainment, a conformity determination is not required for this project.

While fires managed for resource benefits generally are not subject to a preconstruction review and the issuance of a prevention of significant deterioration (PSD) permit, the emissions from such activities may affect the air quality in a PSD area. Under adverse conditions, the combined particulate matter (PM) emissions from increased fire activities and from other sources could possibly result in ambient concentrations that exceed the allowable PSD increments for PM. Historically, EPA has often regarded fires managed for resource benefits to be temporary activities (US-EPA, 1998 p. 32). The PM emissions resulting from fire activities differ from the PM emissions generated by most other sources because they are generally short-lived. That is, the burning generally is carried out infrequently at a specific location (once every 5-20 years) and the duration tends to be short (approximately 1-2 days).

Environmental Protection Agency Interim Air Quality Policy on Wildland and Prescribed Fires (US-EPA, 1998)
Under air quality regulations, prescribed burning is usually considered a temporary, intermittent source of air pollution and therefore is not subject to the same visibility requirements as a major “Prevention of Significant Deterioration” (PSD) source. The interim policy (US-EPA, 1998) integrates two public policy goals, (1) to allow fire to function, as nearly as possible, in its natural role in maintaining healthy wildland ecosystems, and (2) to protect public health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility. The document provides guidance on mitigating air pollution impacts caused by fires in the wildlands and the wildland/urban interface. It identifies the responsibilities of wildland owners/managers and State/tribal air quality managers to work together to coordinate fire activities, minimize air pollutant emissions, manage smoke from wildland and prescribed fires managed for resource benefits, and establish emergency action programs to mitigate the unavoidable impacts on the public. The indicators of effects under the policy are ambient air quality impacts above National Ambient Air Standards, visibility impairment and regional haze.

Air quality managers are urged to help evaluate the potential impacts of alternative resource treatments and assure that air quality concerns (also visibility and regional haze concerns, where appropriate) are adequately addressed in the public land use planning process. It allows flexibility in regulating fire managed for resource benefits when a smoke management plan is being implemented in that EPA will use its discretion not to re-designate an area as nonattainment when fires cause or significantly contribute to federal particulate matter standards violations. The policy also encourages collaboration and communication among land managers and integration of air quality into planning processes, describes analysis of air quality impacts in planning processes, and lays out basic requirements of smoke management plans.

The project complies with the policy through the smoke management plan process and burn permit process, the NEPA process, and compliance with the Regional Haze Rule.
Federal Clean Air Act Regional Haze Rule (US-EPA, 1999) [and California Regional Haze Plan (CARB, 2009)]

The nearest Class I airshed, Lava Beds National Monument, is within the Northeastern Plateau air basin. States prepare Regional Haze Plans to meet the Haze Rule. The latest California Regional Haze Plan Progress Report indicates Lava Beds visibility exceeds the 2018 goals (CARB, 2014 p. 12). Prescribed burning is a common practice in the air basin. The Elk project area is roughly 33 miles southeast of Lava Beds National Monument. At this distance, the class I airshed would likely be minimally impacted during burning because of the favorable atmospheric conditions present during permissible burn days. No significant deterioration of visibility would be expected with the action alternatives.

California Clean Air Act

In general, the California standards are stricter than the federal standards. The California Air Resources Board (CARB) directly regulates mobile sources of pollutants, while delegating regulation of nonmobile source to local air districts. None of the 11 State criteria pollutants (CARB, 2015) are in a nonattainment status in Siskiyou County (CARB, 2013). Burning activities on several projects could occur within the same season; however, burning over any period would be limited to assure air quality is maintained. Potentially cumulative simultaneous burning projects are not possible to catalogue at this time because the information for the exact years and days burning will occur is not available for this project or other projects. Under the Siskiyou County Air Pollution Control District Rules, the control officer may restrict burning to selected permittees on designated burn days if total tonnage to be ignited would discharge a volume of contaminants into the atmosphere sufficient to cause State ambient air quality standards to be exceeded (APCD, 2014 pp. 7.5-1.N). The project would not cause a State criteria pollutant to be reclassified into a nonattainment status.

Siskiyou County Air Pollution Control District Requirements

The Siskiyou County APCD handles the day-to-day field operation of agricultural burning: issuing burn permits and informing growers and land managers of when and how much burning can be undertaken. Burning would be done only on designated “burn days” as designated by the APCD when predicted weather conditions are favorable for good smoke dispersal.

Burn Permit and Smoke Management Plan

Consistent with SOPs (see p. C-1), a prescribed burn plan, including a Smoke Management Plan in compliance with the EPA Smoke Management Program, would be submitted to the Siskiyou County APCD per their rules. The Siskiyou County APCD requires burn permits for all burns over 50 acres or burn more than 3,000 tons material to be consumed, or are within 5 miles of a sensitive receptor (APCD, 2014 p. 7.6).

The Northeast Air Alliance (NEAA) has developed a standard Smoke Management Plan template (NEAA, 2012). As part of the Smoke Management Plan for the prescribed burn, the Forest must provide a detailed meteorological prescription to be met prior to ignition. The prescription must include acceptable wind direction. Other considerations include: wind speed, temperature profile, winds aloft, humidity, temperature,

---

133 Regardless of local requirements, the Forest Service Manual Chapter 5140 requires that all burning on National Forest System lands have an approved prescribed fire plan prior to any ignitions. Burning activities will be coordinated with affected landowners and control agencies.

134 While the APCD rules require approval for all burns over 50 acres or within 5 miles of a sensitive receptor, the Forest Service has agreed as a member of the Northeast Air Alliance to submit plans for approval when more than 10 acres are planned for prescribed fire.
actual and predicted inversions, burn day status and forecast, precipitation forecast, and any other meteorological conditions that may affect smoke dispersion and/or fire behavior. Projects exceeding 100 acres must include a map showing smoke sensitive areas (or Sensitive Receptors) likely to be impacted.

Prescribed burning takes place on permissive burn days and is managed in real time to avoid cumulatively significant effects through the issuance and administration of burn permits including smoke management plans. The NEAA provides an effective communication forum for land managers and regulators to discuss ongoing impacts throughout burning processes and make adjustments locally and regionally to avoid significant cumulative effects. Forest staff would coordinate burn ignitions to ensure smoke from any one project has dissipated prior to additional ignitions. The NEAA has proven to be an excellent forum to discuss ongoing burns, new burns planned, air quality issues, marginal burn days, fuel loads, etc. This process strengthens agencies’ commitments to cooperate and makes for a more efficient smoke management program. Local districts have the authority to suspend all or some burning operations should conditions change or monitoring indicates standard thresholds are being exceeded.

Sensitive Receptors
Smoke sensitive areas include but are not limited to Class I airsheds, populations centers, hospitals, schools, daycare centers, nursing homes, shopping centers, populated recreation areas, well attended public events, major roads, airports, campgrounds and trails (NEAA, 2012).

Sensitive receptors within relatively close proximity to the project area includes the Shasta Forest subdivision approximately 1.25 miles southwest and the Pilgrim Creek Snowmobile Park and dispersed use areas adjacent to the project area. Use at the snowmobile park is unlikely during burning operations. Prescribed fire would not occur during times of more concentrated use at the dispersed area in summer. Smoke may potentially impact dispersed use during the burning season and residents of the Shasta Forest subdivision. However, the Forest Service will follow Siskiyou County ACPD requirements in order to avoid creating a nuisance, visibility impairment or impacts to public health. Public education and information release are part of the prescribed burning procedures and will be followed. A severe smoke-created nuisance from prescribed fire is unlikely to occur due to the conditions under which burning is conducted (burn days).

Fugitive Dust
Rule 4.2 of the Siskiyou County APCD rules (APCD, 2014) regulates creation of dust that could pose a nuisance. Numerous native surface and gravel roads cross the project area. Fugitive dust can become airborne through ground disturbance and the spatial boundary for effects is actual treatment units and road actions, and sensitive receptors directly adjacent to ground disturbance areas. Low levels of fugitive dust are created by the public accessing the National Forest and administrative use. Fugitive dust from unpaved roads is included in the emissions inventories for the County under “Miscellaneous Processes.”

Vehicular travel on paved and unpaved roads and logging operations will produce some dust, primarily from tractor skidding of log bundles and hauling over earth surface (dirt) roads. When materials are being

---

135 Atmospheric conditions (smoke dispersal) and air quality determine the amount of burning that can take place on a given day without adverse impacts to air quality. CARB determines Permissive Burn Days and the number of acres allocated for agricultural and open burning based on meteorological and air quality factors. CARB Meteorologists utilize specific criteria such as mixing heights and wind speeds in conjunction with air quality data to determine the daily burn day status for the air basin. Weather forecasts will be reviewed and a spot forecast requested that specifies predicted transport winds and mixing heights. Burning on days when conditions are favorable for transport and dispersion will reduce the impacts of smoke. Ignition can be stopped where practical to hold the fire until conditions improve.

136 Siskiyou County APCD List of Current Rules (APCD, 2014)
transported from the sale area, all dirt roads are required to be watered by the timber sale purchaser to abate dust that would be created by the increased road usage. Dust generated and the resultant particulate matter is directly related to vehicle miles traveled on un-surfaced roads in the project area. It can also be attributed to tractor work on harvest units.

Standard Operating Procedures (see p. C-1) require dust abatement, which is most often water applied to the road surface at regular intervals. If agreed upon, a temporary road surface material especially made for dust reduction may be applied to the roads instead of water. A Forest Service Timber Sale Administrator oversees all such operations, ensuring they adhere to contract specified requirements. With the above constraints in place and enforced, fugitive dust from logging equipment will have little measurable impacts on the airshed. There might be periods of localized impacts from created dust by logging and recreational activities conducted on both public and private lands within the analysis area. Logging operations are generally done over several years and localized dust from skidding and hauling dissipates rapidly. The project will comply with the APCD rules for a dust nuisance.

**Naturally Occurring Asbestos (NOA)**

California Final Regulation Order 2002-07-29 regulates construction of roads associated with timber harvesting in areas that have naturally-occurring asbestos, serpentine, or ultramafic rock (CARB, 2002). Although NOA is documented in Siskiyou County, it is not known to occur in or near the Elk project area (Churchill, et al., 2000), therefore no protective measures are needed to comply with the NOA regulation.

**Forest Plan Compliance – Air Quality**

The Forest plan directs air quality to meet or exceed applicable standards and regulations (4.4), and directs coordination with affected landowners and control agencies, and smoke management controls be incorporated into smoke management and prescribed fire plans. The proposed action and action alternatives are consistent with the Forest Plan. The project meets applicable air quality standards and regulations. Burning will be coordinated with the local air district in conjunction with CARB meteorological forecasts for burn days. The Northeast Air Alliance facilitates coordination and communication between area land managers. Smoke management controls are incorporated into the NEPA design and SOPs and will be incorporated into burn plans, smoke management plans, and part of the burn permit.

**Climate Change**

**Forest Service Strategic Plan**

The USDA Forest Service Strategic Plan for FY 2015-2020, Strategic Objective “A” calls for fostering resilient, adaptive ecosystems to mitigate climate change. This is accomplished by improving the ability of forests to remain healthy and resilient, despite stresses and disturbances such as drought and wildfire, and using information from climate change vulnerability assessments to inform adaptive management strategies. The strategy is to develop and apply detection, prediction, prevention, mitigation, treatment, restoration, and climate adaptation methods, technologies, and strategies for addressing disturbances such as changing climatic conditions (USDA-FS, 2015a). The purpose of the Elk project is in part to increase forest stand resilience to large scale disturbances attributed to climate change (such as drought).

Although future climate change at the local level is uncertain, the Elk project action alternatives will improve the ability of the forest to withstand drier or seasonally drier conditions by maintaining stand densities that promote forest health, and by favoring drought resistant species in appropriate residual stands. By promoting healthier stands, the project treatments will reduce the susceptibility of trees to insect attack during prolonged drought periods. If the local climate shifts towards wetter conditions, these measures would not have a
detrimental effect, because treatments would still promote healthier stands for other reasons than climate change such as through less competition for sunlight and nutrients.

California Assembly Bill 32
In 2006, California enacted Assembly Bill 32, The Global Warming Solutions Act, which required a scoping plan for achieving reductions in greenhouse gas (GHG) emissions by 2020. The 2020 Scoping Plan target for California’s forest sector is to maintain the current 5 million metric tons of carbon dioxide (CO2) equivalent of sequestration through sustainable management practices.

The project is consistent with the sustainable management practice as the frame of reference. Carbon storage (both in the standing forest and as wood products resulting from project timber harvest), the use of energy from biofuel displacing energy from fossil fuel consumption, and the reduced risk of losing large volumes of carbon to the atmosphere due to catastrophic wildfire indicate that the project will likely not have an adverse net effect on carbon cycling. With the removal of trees via thinning, oak release, and aspen release under the action alternatives, there would be an immediate reduction in the capacity of the remaining standing forest to store carbon. The carbon storage capacity of thinned stands will increase as trees grow and forest stocking (density) increases. The action alternatives will reduce the risk of a mass release of a large volume of carbon to the atmosphere as a result of uncharacteristic stand-replacing wildfire in the project area by modifying vegetation and fuel conditions. There will be short-term releases of carbon to the atmosphere during prescribed burning. Emissions would most likely occur over a period of several years, as actual burning activities will be spread over the project implementation period. See also the discussion of emissions on page H-1 and the Smoke Management Plan on page H-3.

Endangered Species Act
A thorough analysis of potentially affected federally listed species has been completed. Refer to the Wildlife section (starting page 162) and the Botany section (starting page 194). These sections address endangered and threatened species and their designated critical habitat. Resource specialists determined that the project would have no effect to endangered, threatened, or proposed plant, fish or other aquatic species or their designated critical habitats due to the lack of suitable habitat or the project area being outside of a species known or expected range. The project would have no effect to federally listed wildlife species, with the exception of the northern spotted owl and its designated critical habitat and the gray wolf. There is no critical habitat designated for the gray wolf in California at this time.

The Yreka FWS field office and the Forest have been consulting on the project’s effects to listed wildlife species since December 2011 and the Draft Biological Assessment was transmitted to the Yreka FWS field office on January 18, 2016. The final Biological Assessment was transmitted on April 4th, 2016. Consultation on the effects to the northern spotted owl and its critical habitat, and effects to the gray wolf, is ongoing with the U.S. Fish and Wildlife Service (FWS) and is yet to be completed. Once completed, the consultation will fulfill Section 7 of the Endangered Species Act’s consultation requirements (19 U.S.C. 1536 (c)). Refer to the ESA Consultation and Coordination section for additional detail (p. 264).

The West Coast Distinct Population Segment (DPS) of fisher was proposed for federal listing in October 2014 (USDI-FWS, 2014) and was considered a proposed listed species when the analysis for the Draft EIS was prepared. The FWS issued a news release on April 14, 2016 that the West Coast DPS will not be listed (USDI-FWS, 2016), and the Federal Register notice for this decision is set to notice on April 18, 2016. The fisher is a Forest Service sensitive species and the project effects are evaluated in the project wildlife Biological Evaluation. Refer to the Wildlife section of this EIS and the wildlife Biological Evaluation (Jordan,
Final Environmental Impact Statement

2016c) in the project record for more detail. As the fisher is not a listed species, consideration of project effects under the ESA is not required.

**Environmental Justice – Executive Order 12898**

As stated in Executive Order 12898 (Office of the President, 1994) all Federal actions are required to consider the potential of disproportionate effects on minority and low-income populations in the local region. The principals of environmental justice require agencies to address the equity and fairness implications associated with Federal land management actions. The Council on Environmental Quality (CEQ) provides the following definitions in order to provide guidance with the compliance of Environmental Justice requirements:

- “Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis...”

- “Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.” (CEQ, 1997).

According to the American Community Survey and US Census data, it is suggested that the Native American population meets the Environmental Justice criterion as a minority population meaningfully greater than the general population of the state. Therefore, decision makers should pay careful attention to the potential impacts of management actions on Native Americans.

Table Appendix H-1 reports the number of individuals below the poverty level and poverty rates in 2000 and 2008. Both counties have higher poverty rates than the state. Shasta County experienced a 3% increase in poverty during the specified period, while Siskiyou County experienced a slight decline. These poverty rates suggest that a substantial proportion of the existing population should be considered as a low income group. Therefore, decisions regarding future management actions should carefully assess the effects on low income populations in the study area.

![Table Appendix H-1. Poverty Status by State and County, 2000 and 2005](source: www.census.gov)

In cases where the management decisions are expected to create jobs and income in the local economy, it is unlikely that there would be a disproportionate adverse effect on minority and low income populations. Individuals in that population may benefit from any increase in jobs and income in the area. There are expected to be no disproportionate adverse effects on low income or minority populations because of implementation of any of the Elk Project action alternatives.
Historically, Native Americans collected edible berries such as strawberries, currents and gooseberries. Manzanita flowers and berries were eaten and the leaves were used medicinally. Manzanita berries can also be used to make a sugar. Many of these plants are still collected today by Native Americans and others. Most of these plants are common throughout the project area. Edible fungi species may be the most important species being collected in the project area. Prince’s pine (Chimaphila umbellatum) and wintergreen (Pyrola picta) are plants that occur in the project area that are important culturally for the Pit River Tribe. Concerns have been voiced by the Pit River Tribe regarding the retention of Prince’s pine and wintergreen in the project area. These are important cultural plants for the tribe and they can be sensitive to ground disturbance and burning (Posey, 2015). There are specific areas within and near the Elk project area that are of importance to local Native American tribes, and some ceremonial activities that occur periodically in the vicinity. The Forest has worked with local tribes to protect or avoid special areas and coordinate the timing of implementation activities to avoid disrupting traditional and ceremonial activities. There are expected to be no disproportionate adverse effects on Native Americans because of implementation of any of the Elk Project action alternatives.

Invasive Species-Executive Order, Regulation, Policy

Executive Order 13112, of February 3, 1999

Executive Order 13112 addresses preventing the introducing invasive species and provides for their control and minimization of the economic, ecological, and human health impacts the invasive species causes. The order states that Federal Agencies should:

Identify actions that may affect the status of invasive species.

Use relevant programs and authorities to: (a) prevent the introduction of invasive species; (b) detect and respond rapidly to and control populations in a cost-effective and environmentally sound manner; (c) monitor; (d) restore; (e) research; and (f) promote public education on invasive species.

Not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species.

Coordinate these duties with the National Invasive Species Council that coordinates Federal strategies to address the problem of noxious weeds.

This project is compliant with the executive order because project actions that may affect the status of invasive species have been identified. Relevant programs and authorities will be used to prevent the introduction of invasive species, and measures to minimize risk and harm caused by invasive species (see RPM 15 (Chapter 2) and Invasive Species Standard Operating Procedures 9 to 13 (Appendix C) will be taken in conjunction with this project.

Departmental Regulation 9500-10: Noxious Weed Management

USDA Regulation 9500-10 directs the Agency to integrate noxious weed management into all programs and activities and to develop, demonstrate, and apply the essential science, technology, and stewardship to effectively manage and prevent the spread of these plants. As described under FSM 2900 and Executive Order 13112, the Elk project also complies with this regulation.

Forest Service Manual (FSM) 2900

Forest Service Manual Chapter 2900 – Invasive species Management sets forth National Forest System policy, responsibilities and direction for the prevention, detection and restoration of effects from aquatic and terrestrial invasive species (This new chapter replaces FSM Chapter 2080 – noxious weed management).
Section 2902 strategic objectives include prevention, early detection and rapid response, control and management, restoration, and collaborating with other organizations. Section 2903 established policy at the project level. The Shasta-Trinity National Forest has placed a high priority on management of invasive weed species. This includes reducing management-related introduction and spread of invasive weeds on the Forest.

Initial implementation of the Elk Project any of the action alternatives would involve increased ground disturbance and vehicle travel in the short-term, increasing the opportunity for invasive plant introduction, spread, and establishment. In the long-term, the action alternatives would result in a healthier more resilient forest environment and a smaller road system with lower erosion risk and requiring less maintenance, resulting in decreased opportunity for invasive plant introduction, spread, and establishment. Implementation of mitigation (resource protection measures (see RPM 15 in Chapter 2) and Invasive Species Standard Operating Procedures 9 to 13 (Appendix C) to prevent the introduction and spread of invasive plants during project implementation would minimize the risk involved with any of the action alternatives considered in detail.

There are no known populations of any weed species rated moderate or high by the Forest within the Elk project area. If any new populations are found before or during implementation, these populations will be incorporated into any contract maps implementing the project. They will be flagged on the ground as exclusion areas.

**Migratory Birds – Executive Order 13186 of January 10, 2001**

Executive Order 13186 (Office of the President, 2001) directs executive departments and agencies to take certain actions to further implement the Migratory Bird Treat Act of 2001. Each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within two years a Memorandum of Understanding (MOU) with the Fish and Wildlife Service that promotes the conservation of migratory birds. On December 2008, a Memorandum of Understanding (MOU) between the FS and the FWS to promote the conservation and reduce take of migratory birds was signed, and was reaffirmed in 2014 (USDA-FS & USDI-FWS, 2008; USDA-FS & USDI-FWS, 2014). The intent of the 2008/2014 MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts through enhanced collaboration and cooperation between the FS and the FWS as well as other federal, state, tribal and local governments. Additionally, the January 2000 Landbird Conservation Strategic Plan, the Partners in Flight specific habitat conservation plans for birds, and the January 2004 Partners in Flight North American Landbird Conservation Plan (Rich, et al., 2004), all reference goals and objectives for integrating bird conservation into forest management and planning.

On National Forest System lands, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities. A Migratory Bird Report was completed for the project and is incorporated by reference (Jordan, 2016f). Information relevant to the decision to be made is summarized here. Opportunities to promote conservation of migratory birds and their habitats in the 3,519-acre project area were considered during project development per the 2008/2014 MOU, specifically Section C: item 1, and Section D: items 3a-3d, and 6.

For the Shasta-Trinity National Forest, the bird species of management concern are those listed under the Endangered Species Act as threatened or endangered, those designated by the Regional Forester as sensitive, those associated with management indicator assemblages (MIAs) affected by the project, and those of conservation concern (USDA-FS & USDI-FWS, 2008).
Effects to the federally listed threatened or endangered or Forest Service sensitive species are discussed in Chapter 3, starting on page 162. Effects to MIAs and representative species are summarized above on page H-17 and described in detail in the project-level MIA report. Project effects to other bird species of conservation concern within the Great Basin Bird Conservation Region (BCR-9) are assessed in the project-level Migratory Bird report (Jordan, 2016f).

The need to maintain, enhance and restore habitat components important to migratory birds and reduce the potential for take and adverse effects in the project area was emphasized throughout project development, in accordance with MOU Section D, item 3b and items 3c1-3c4. The project’s design, specific treatment prescriptions and resource protection measures will help ensure that treated areas continue to provide necessary habitat to maintain a diversity of species at both the stand and landscape scale during and after the project is completed, and that the potential for adverse effects to individuals and project-level populations is reduced if not eliminated.

The project’s design and resource protection measures preclude mechanical treatments in certain high quality habitat areas, known breeding sites, and near riparian zones that provide habitat for listed, sensitive and species of management concern. Treatments will maintain large and small trees; trees with old-growth and late-successional characteristics such as large branching, cavities, flattened tops; variable canopy cover of trees and shrub species; large and small snags and down logs; and shrubs that provide breeding, roosting and foraging habitat. Treatments will increase oak, aspen and open meadow habitats, and limited operating periods are in place for thinning and burning actions during critical breeding periods.

The FS has also assessed the potential for environmental contaminants and other stressors relevant to migratory bird conservation in accordance with MOU Section D, item 3c5 through the Human Health and Risk Assessment for Borax (USDA-FS, 2006). While the potential exists for migratory birds to consume prey exposed to borax application, the risks to terrestrial species are low, with most acute and chronic risk quotients well below levels of concern (USDA-FS, 2006). Considering it is unlikely for birds to ingest borax from treated stumps, that none of the hazard quotients exceed the level of concern for contaminated water (even at application rates 10 times the rate proposed), and that the 2006 risk assessment indicates boric acid is practically non-toxic to avian species, borax application is not expected to have measurable effects on migratory birds or their prey.

Implementation of the project is expected to maintain as well as enhance the existing functional habitat used by migratory birds over the short- and long-term, contributing to long-term sustainability and resilience of foraging and reproductive habitat that may be used by migratory birds (Jordan, 2016f).

Watch List (WL) botanical species - Departmental Regulation 9500-4

USDA Regulation 9500-4 directs the Forest Service to manage habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species, and to avoid actions that may cause a species to become threatened or endangered. Forest Service objectives further state that viable populations of all species must be maintained in habitats distributed throughout their geographic range on National Forest System lands (Forest Service Manual [FSM] 2670.22). The Compliance Report for Botanical Species (Posey, 2015) provides information specific to Watch List species and information most relevant to the decision and compliance with 9500-4 is summarized here.

The California Native Plant Society’s Inventory of Rare and Endangered Plants of California describes a watch list (WL) species as species that do not meet all the criteria to be included on the Regional Forester’s Sensitive List, but are of sufficient concern that we need to consider them in the planning process. These include species that are locally rare (as opposed to declining throughout their range), are of public concern, occur as disjunct populations, are newly described taxa or lack sufficient information on population size,
threats or distribution. The creation of the sensitive species and watch lists are key steps in meeting the commitment to maintain biologically diverse and healthy ecosystems.” 137 The Shasta-Trinity National Forest does not maintain a Watch List (WL), but instead considers all CNPS Inventory taxa of lists 1-4 (CNPS, 2015) [that are not already managed as Regional Forester’s Sensitive Species or Forest Plan Endemics] to be eligible for mitigation at the project level if needed.

A WL perennial bunchgrass, *Muhlenbergia jonesii* (Jones’ muhly), occurs within the project area throughout parts of Elk and Coonrod Flats. All areas combined cover many acres. The populations are in more open areas with few trees. Generally, grasses of this type are more robust and more nutritious after burning. Burning in a mosaic pattern will reduce the loss of soil biota. Removal of conifers will create habitat for this species. Decommissioning unauthorized routes may improve habitat for Jones’ muhly by discouraging illegal vehicular use. The project will benefit the species through removal of dead thatch during burning. Equipment disturbance may crush, uproot and possibly cause mortality of individual plants; however, the sparse conifer cover near these populations will minimize disturbance from equipment. Burning may kill some individual plants. The population as a whole will benefit as disturbance, especially burning, is generally important for maintaining healthy grasslands.

Resource Protection Measures, SOPs, and BMPs in place for protecting soils, and improving and protecting hydrological function will provide protection for this species in compliance with DR-9500-4 and Forest Service Policy.

Should other watch list species be found before or during project implementation, protection measures will be put into place to protect the species and its habitat. Protection measures will depend on the species. However, many watch list species require disturbance especially fire to maintain their habitat. Many early seral species respond favorably to mechanical disturbance. In this case, it may not be necessary to protect the sight from either mechanical or fire disturbance. If the species is one that does not respond favorably or require disturbance, the site would be flagged and avoided.

**Water Quality – Basin Plan**

Designated beneficial uses, water quality objectives (standards), and a policy statement regarding maintaining high quality waters in California are within the Board’s Water Quality Control Plan (Basin Plan) (CVRWQCB, 2011). Under section 303(d) of the 2006 Clean Water Act where water quality is limited, state agencies develop plans to improve water quality to support the beneficial uses of water (US-EPA, 2002). This information was reviewed in context of the project area boundary and proposed treatment units. According to the Section 303(d) list of water quality limited segments for the State of California, there are no water quality limited waterbodies related to the project area (CVRWQCB, 2011).

There are no municipal watersheds within the 5th field watershed of the Project Area; A municipal watershed is a community water system “that serves at least 15 service connections used by year-round residents of the area served by the system; or regularly serves at least 25 year-round residents” (Safe Drinking Water Act, Section 1401, 42 U.S.C.A. 300f,(15)).

Through a memorandum of understanding with the State of California, and in compliance with the Clean Water Act for controlling non-point pollution sources, the U.S. Forest Service will implement Best Management Practices (BMPs) on ground disturbing activities that are approved by the U.S. Environmental Protection Agency (USDA-FS, 2000). All timber sales that may have the potential to impact water quality are

137 Watch List species are discussed under the heading of “Rare Plant Management on the National Forest and Grasslands in California on page 33 of the “California Native Plant Society’s Inventory of Rare and Endangered Plants of California” (CNPS, 2001).
evaluated, identified, monitored, and reported by the forest service and the state under a Conditional Waiver of Waste Discharge Requirements to assure BMPs are applied to prevent impacts to water quality (CVRWQCB, 2010).

**National Forest Management Act (NFMA) [Forest Plan Consistency]**

Under the National Forest Management Act (NFMA), the Forest Service (FS) is directed to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” (P.L. 94-588, Sec 6 (g) (3) (B)). NFMA requires specific findings and the development, maintenance, amendment, and revision of land and resource management plans [Forest Plan(s)] for each unit of the National Forest System. The Forest Plans help create a dynamic management system so that an interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences will be applied to all future actions on the unit [16 U.S.C. 1604(b), (f), (g) and (i)]. A Forest Plan consistency discussion follows the NFMA findings.

**NFMA Findings [16 U.S.C. 1604 (g)(3)(E)]**

1. **Soil, slope, or other watershed conditions will not be irreversibly damaged** - None of the alternatives would irreversibly damage soil, slope or other watershed conditions. See the soils section (p. 234) and hydrology section (starting on p. 209).

2. **There is assurance that such lands can be adequately restocked within five years after harvest** - Reforestation will occur within five years of final harvest. Any stand that receives any harvest activity will not be maintained as a permanent opening and will be fully stocked, or can be adequately restocked with natural regeneration within five years of final harvest. Live green trees retained on each unit will serve as seed sources where regeneration is inadequate. Minimum stocking levels are defined in the Forest Plan (p. 4.27). All areas proposed for artificial reforestation have been reviewed by a certified silviculturist and a soil scientist to ensure adequate soils for planting and growth of conifer seedlings.

3. **Protection is provided for streams, streambanks, shorelines, lakes, wetlands and other bodies of water from detrimental changes in water temperatures, blockages of water courses and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat** - Hydrologic function, water quality and fish habitat will not be adversely affected. See Resource Protection Measures Common to all Action Alternatives, Chapter 2 (starting p. 84) and the hydrology effects section (starting p. 209).

4. **The harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber** - Harvesting systems were selected based on a variety of factors. The systems used to accomplish the purpose and need were proposed to most efficiently achieve project objectives, minimize impacts to resources and took into account a variety of factors, including reduced impacts to soils and reduced activity fuels, topography, cost and efficiency.

Additionally, the Project is consistent with 36 CFR 219.27c1 since all stands proposed for harvest treatment under all alternatives are classified as suitable for timber harvest, and with 16USC 1604 (g)(3)(B) by providing for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives. The project also provides diversity of tree species similar to that existing in the region because species such as quaking aspen, black oak, ponderosa pine, incense cedar, white fir and sugar pine will be retained, and a variety of treatments are proposed. Also, see Executive Order 13186 on page H-9.
Forest Plan Consistency
In addition to the discussions of Forest Plan consistency previously presented in the individual resource effects discussions, the incorporated resource reports, and in the compliance topics listed above, the project meets the Forest Plan for the following presented in alphabetical order:

Aquatic Conservation Strategy Objectives
The Elk Flat LSR Vegetation Project meets the objectives under the Aquatic Conservation Strategy of the NWFP.\textsuperscript{138}

All action alternatives meet and do not prevent attainment of the ACS objectives. Differences to the degree that the action alternatives meet these objectives varies with how well a) overstocked stands and fuels are reduced over the project area; b) how well treatment within Riparian Reserves improves openings for sunlight for riparian vegetation and c) how well floodplain processes and functions are restored. Although Alternatives 2 and 3 do not optimize Riparian Reserve objectives as well as Alternative 1, they still meet and do not prevent attainment of ACSO objectives.

The nine Aquatic Conservation Strategy (ACS) objectives follow with a description of likely effects from each alternative.

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

   \textbf{Alternative 1}: The proposed treatment promotes stand health, open meadow and riparian plant species distribution, diversity and complexity adding to a positive contribution towards watershed and landscape-scale features.

   \textbf{Alternatives 2 and 3}: Less ground disturbance from these alternatives would result in less slight soil displacement to the ground surface. However, fewer stand and riparian health objectives will be met by reducing access as fewer acres will be treated that would meet the purpose and need of the project.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

   \textbf{Alternative 1}: All treatments proposed in and surrounding floodplains are designed to benefit spatial and temporal connectivity of streams. Some road closures and a ¼ mile of road decommissioning will reduce road and stream interaction. Routes in Elk Flat cross the Swamp Creek intermittent channel and will be decommissioned and floodplains restored.

Alternatives 2 and 3: Spatial and temporal connectivity may be slightly beneficial under Alternative 2 if no new temporary roads are constructed. However, the scale of new construction is so small that likely there would be no measurable results.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Alternative 1: The aquatic system will be maintained and restored to increase the physical integrity of instream structure and floodplain interaction. With the exception of restoration activity, there will be no direct entry or effect upon channel banks or beds from harvest activity. Improvements to aquatic system features are expected from restoring riparian plant vegetation and increasing bank strength.

Alternatives 2 and 3: These alternatives will provide the same benefits to the aquatic system as Alternative 1 for this objective.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Alternative 1: Negligible effects to water quality are expected from project implementation with BMP’s in place. Water quality should remain unaltered by harvest or fuel reduction activities, falling within the known range of natural variability, as all activities are guided by BMPs designed to avoid water quality impacts.

Alternatives 2 and 3: Some areas along Ash Creek would not benefit from the reduced surface runoff resulting from reduced temporary road length under Alternative 2, as skid trail length would increase. The No Action Alternative would show no improvements to water quality, as the current condition is not supporting riparian vegetation productivity.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Alternative 1: Aside from increase in fine sediments likely to occur from increased traffic, no other significant source of sediment from the proposed action alternatives is expected. The current regime will continue.

Alternatives 2 and 3: Some areas along channels would not be accessed by temporary roads, however, because of the small road area and proximity to creeks there would be relatively small benefits from reduced surface runoff potentially carrying sediment under Alternative 2 as compared to Alternative 1.

6. Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high and low flows must be protected.

Alternative 1: The project is designed to improve riparian and floodplain function, however, effects on flow regime will probably be neutral due to the larger watershed-scale influences being so much greater than project results. Project disturbances, particularly road actions, are expected to be insufficient to affect peak flow yield or timing.

Alternatives 2 and 3: Similar to Alternative 1, with slightly less ground disturbance, but due to the scale, any benefits to instream flow would not be measurable.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

**Alternative 1:** Flow timing and yield will not be measurably altered, as stated under ACSO 6. Floodplain processes and function should improve on a site-specific basis. A detectable change in floodplain inundation should result from this alternative, and should benefit water table elevation adjacent to the floodplain and channel.

**Alternatives 2 and 3:** Without temporary road construction, some slight benefit from treating a small portion of the stands adjacent to channels would not be realized under this alternative; however, no measurable difference in floodplain inundation or water table elevation would be detectable at this small difference in lack of treatment resulting in shade retention inhibiting riparian plant growth.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

**Alternative 1:** This alternative proposes to treat the Riparian Reserves to improve stand health, create openings to increase sunlight and restore floodplains. These efforts should result in many benefits to ACSO 8. Channel bank integrity should improve with an increase in riparian root strength. Plant diversity is expected to increase and eventually plant community should be improved in those riparian areas treated, because of increased sunlight reaching the forest floor.

**Alternatives 2 and 3:** Similar to Alternative 1 with negligible differences from no temporary road construction.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

**Alternative 1:** Restoration of meadow, floodplains and stand health should maintain and restore habitat as described under this ACSO objective. Most dense stands will be treated to improve understory conditions and increase habitat for native plant, invertebrate and vertebrate riparian-dependent species.

**Alternatives 2 and 3:** Similar to Alternative 1, there would be slightly more short-term benefit to leaving the existing ground without temporary road construction to treat stand-health, however, these are not the alternatives that would optimize the objectives that would meet the purpose and need of the project and therefore would not optimize maintaining or restoring habitat under ACSO 9.

**Ethnobotanical Resources/Special Forest Products**

A Forest Plan Goal (p. 4.4) is to integrate multiple resource management on a landscape level to provide and maintain diversity and quality of habitats that support viable populations of plants, fish and wildlife. The need to promote community stability is addressed through the integration of multiple resource standards and guidelines. Forest-wide Standards and Guidelines, Management Prescriptions and Management Area direction help provide for safe use and enjoyment of various resources and production of goods and services (Forest Plan p. 2.3). Ethnobotanical species/Special Forest Products and unique habitats are considered at the project level in relation to the Forest Plan and in the spirit of this agreement. The compliance Report (Posey, 2015) provides the analysis for Ethnobotanical Resources/Special Forest Products and Unique Habitats. Information relevant to this decision is summarized here.
Historically, Native Americans and settlers collected edible fruit such as strawberries, serviceberries, wild plums, currents, gooseberries and mushrooms. Manzanita flowers and berries are edible and a tincture made from the leaves used medicinally. Crushed, dried manzanita berries make a sweetener. Edible and medicinal plants collected by Native Americans and others are mostly common throughout the project area, and continue to be collected. Black oaks provide acorns, which are culturally important to Native Americans. Most of these plants, except for black oak, are common throughout the project area. Effects of the project on black oak are discussed in the Botany section starting on page 194.

Fungi are an important commercial special forest product. Spring collection permits are available late spring or early summer depending on the weather and continue until the summer heat arrives and mushrooms are no longer available. Fall collection permits are available in mid-October depending on the weather and continue until it freezes or snows. Spring mushrooms include boletes and morels. Analysis for Boletus mushrooms in Elk Flat begins on page 194. Morels (Morchella species) known to occur on the McCloud District include Morchella sextelata and M. septimelata (black, black burn, pink and green morels). Habitat is solitary to scattered, gregarious, or clustered, on burned soil in lightly to moderately burned montane coniferous forests; common, sometimes fruiting in abundance in spring following a forest fire the previous year, in smaller quantities in subsequent years, widely distributed (Desjardin, et al., 2015). Morels are saprophytic mushrooms meaning they decompose dead and dying material.

The design criteria to protect northern spotted owl (NSO) and goshawk habitat will also retain habitat for many fungi species by using a variable density thinning prescription designed to retain tree and shrub species, down woody debris, snags and overstory cover. The meadow prescription for Elk Flat will contain unthinned patches and retain predominant conifer species. Prescriptions designs for underburning will produce a mosaic pattern. This means that areas will burn in a way that produces a variety of burn intensities. These intensities will range from areas that do not burn at all to areas that burn very hot. Some habitat for ectomycorrhizal fungi will be degraded while other habitat may be improved. In either case, it will take time to reestablish the mycorrhizal associations destroyed or disrupted. Morels benefit from disturbance especially fire.

Special forest products collected, besides mushrooms, include firewood, fence posts, tepee poles, cedar boughs, collecting of plants for scientific study, wild-crafting of herbs, roots etc. for the health supplement industry, cones and other plant parts for craft and floral industries. Cones are also collected for seeds. Permits are required for the collection of special forest products. Collected species are mostly early seral, such as fruit producing shrubs and Indian tobacco, and benefit from disturbance. More shade-loving species such as Prince’s pine and wintergreen are more sensitive to the removal of overstory cover, ground disturbance and underburning. Recovery time could take up to 20 years or longer depending on the treatment.

Thinning and burning will improve habitat for most species. Historically, all plant species coexisted with fire. Most ethnobotanical plants have the ability to resprout after damaged, or have seeds in the soil that can germinate. Effects to plants would be short-lived (one to five years). The project design includes variable silvicultural and fuels prescriptions, which would help maintain diverse stand characteristics. Resource Protection Measures, SOPs and BMPs designed to provide protection for soils, maintain or improve hydrological functions and improve and maintain wildlife habitat address ethnobotanical and special forest products, consistent with the intent of the Forest Plan.

139 These are the most common mushrooms collected. There may be other species collected within the Elk project area.
Late Successional Reserve

Introduction

The Elk Flat LSR was identified as an area of important late-successional habitat during the mapping efforts undertaken for the Northwest Forest Plan. The LSR’s origins are as a habitat conservation area under the Interagency Scientific Committee’s northern spotted owl management strategy (LSRA, p. 124). At the time the LSR was established, it was occupied by one pair of northern spotted owls in the ST-215 activity center.¹⁴⁰

Thinning or other silvicultural activities must be reviewed by the Regional Ecosystem Office (REO), and the Regional Interagency Executive Committee (RIEC). (NWFP page 8 and pages C-12, 13, and 26). The NWFP describes that a management assessment should be prepared for each large LSR (or group of smaller LSRs) before habitat manipulation activities are designed and implemented. In 1999, the Forest prepared the Forestwide Late-Successional Reserve Assessment (LSRA), which met this requirement. The LSRA activity design criteria identify specific objectives and criteria to ensure consistency with LSR objectives. In their August 26, 1999 letter that documents review of the LSRA, the REO determined that the silvicultural activities described in the LSRA were consistent with the standards and guidelines of the NWFP and were exempted from further project-level REO review, which met the obligation of REO/RIEC review of thinning or other silvicultural activities. In 2009, REO corrected and clarified portions of the LSRA including Activity Design Criteria (ADC) #4 and #5 (Mohoric, 2009).¹⁴¹

The NWFP “Ecological Principles for Management of Late-Successional Forests” describes stand management in LSRs: “Stand management in Late-Successional Reserves should focus on stands that have been regenerated following timber harvest or stands that have been thinned. These include stands that will acquire late-successional characteristics more rapidly with treatment, or are prone to fire, insects, diseases, wind, or other disturbances that would jeopardize the reserve. Depending on stand conditions, treatments could include, but should not be limited to: (1) thinning or managing the overstory to produce large trees; release advanced regeneration of conifers, hardwoods, or other plants; or reduce risk from fire, insects, diseases, or other environmental variables; (2) underplanting and limiting understory vegetation control to begin development of multistory stands; (3) killing trees to make snags and coarse woody debris; (4) reforestation; and (5) use of prescribed fire. Thinning prescriptions should encourage development of diverse stands with large trees and a variety of species in the overstory and understory. Prescriptions should vary within and among stands.” The LSRA identifies criteria, objectives, stand attributes and/or treatment stands to meet these goals.

The NWFP states that silvicultural activities¹⁴² aimed at reducing risk shall focus on younger stands in LSR and younger stands are stands less than about 80 years old (NWFP pp. C-12, 13). While generally focused on young stands, risk-reduction activities in older stands may be appropriate if they meet the three criteria listed

---

¹⁴⁰ This activity center has not been occupied by a single territorial individual or pair, or a reproducing pair since 1990. See the Wildlife section for a summary, and the project wildlife Biological Assessment in the online project record for a detailed survey account.

¹⁴¹ The NWFP S&Gs (C-12-13) for risk reduction treatments do not limit the size of trees that can be removed when reduction of risk of large-scale disturbance is the primary objective of treatments within LSRs. However, by incorrectly referencing letters that exempt specific silvicultural activities from REO review, dated July 9, 1996 and updated on September 30, 1996, the LSRA limited trees to be removed to less than 20 inches dbh. Reference to these letters is removed by this correction. The LSR Work Group also concurred with a 150 year age limit on trees which could be cut to enhance development of late-successional habitat. It is logical to assume that trees this old would be larger than 20 inches dbh. This issue is clarified by the edits.” (Mohoric, 2009)

¹⁴² Stand and vegetation management of any kind, including prescribed burning, is considered a silvicultural treatment (NWFP S&G p. C-12).
and examined below. The LSRA (p. 174)\textsuperscript{143} quotes the NWFP ROD for the LSRS in the California Klamath and California Cascades Province:

"Levels of risk in those LSRs are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those LSRs even if a portion of the activities must take place in currently late-successional habitat. While risk reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if:

(1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat,

(2) the activities are clearly needed to reduce risks, and

(3) the activities will not prevent the LSR from playing an effective role in the objectives for which they were established. (USDA, USDI 1994b)"

Activities Are Clearly Needed To Reduce Risks and Clearly Result in Greater Assurance of Long-Term Maintenance of Habitat

The project will contribute to increased connectivity and resilience of late-successional habitat in the LSR. Treated stands will also have a greater capacity to respond to and withstand natural disturbances, allowing these stands to persist and develop into late successional habitat in the LSR.

The EIS discusses how the activities are clearly needed to reduce risk and how proposed activities will result in greater assurance of long-term maintenance of habitat, particularly in the Purpose and Need, Silviculture and Forest Health, Fire and Fuels and Wildlife sections; but also in the Hydrology and other areas. For example, the Elk LSR has already experienced loss of overstory ponderosa pine trees ranging from 80 to 120 years old in the extensive mortality area and other smaller mortality patches and units, which has continuously expanded since 2009. A fire start in the extensive mortality area and certain units in the southeastern portion of the LSR (units 162, 176) would be of high intensity. Without action, further stand and structural composition loss will result from the combination of continued overstocking and density-related mortality, root disease, insect attacks and the predicted lethal fire effects with a resulting loss or decline in habitat and failure to maintain or meet objectives for the LSR and surrounding stands. The same conditions affecting successional development are also reducing the value of these stands as connectivity between and within existing late-successional forest.

Based on the stand and fire effects modeling of no action vs. action, monitoring and results of similar treatments in dry forest ecosystems and available research, the proposed project activities clearly result in greater assurance of (short and) long-term protection and maintenance of late-successional habitat. Treatments are expected to produce variable short-term reductions in tree density, canopy cover and layering, shrub cover, snags down logs and coarse wood. However, the range of conditions that would provide utility for late successional-associated species would be retained and enhanced post-treatment.

Stand-level spatial pattern exerts an influence on key aspects of resilience and ecosystem function, such as disturbance behavior, regeneration, snow retention, and habitat quality in frequent-fire pine and mixed-conifer forests (Churchill, 2013). After treatment, the plantations and natural stands in the LSR would have a greater capacity to adapt and thrive in the face of natural disturbances and large-scale threats to sustainability (North, et al., 2012; Churchill, 2013). The specific kinds of treatment, and their placement, in these early and mid-successional stands are intended to help develop late successional habitat and mid-to-late successional stands persist and mature into late successional/old growth.

\textsuperscript{143} Also see (Johnson, 1991)
Actions proposed under the preferred alternative are expected to increase the probability that large-scale habitat loss will not continue in the LSR, but will also retain stand elements and conditions representative of endemic insect- and disease-related mortality and late-successional habitat development. The project’s design and variable density thinning treatments are aimed at protecting, maintaining and enhancing important habitat areas, attributes and functions. The variable density thinning prescriptions and sub-treatments of group selections, gaps, radial thinning around legacy pine and releasing hardwoods; underburning objectives; and design features that leave untreated areas across the LSR were all developed to promote and protect stand and habitat elements in the LSR. The treatments are expected to promote within- and between-stand heterogeneity and complexity, larger and more resilient trees over time, and conditions that allow for returning a frequent, low-intensity fire regime.

Under Alternative 1, thinning, underburning, key group selections and radial thinning would occur in the LSR, intermixed with areas that will not be mechanically treated (unthinned patches or high quality habitats set aside, with exception of underburning). Treated stands would emphasize retention and promotion of under-represented species such as Douglas fir, sugar pine, black oak and aspen. Douglas fir and black oak are known to provide high habitat utility for northern spotted owl (Irwin, et al., 2000) and are considered important for fisher denning, resting and prey base; “with their often broken tops or large cavities, oaks are used by small mammals, forest carnivores, and raptors for resting, denning and nesting” (North, et al., 2009).

Fisher, northern goshawk and spotted owls depend on a forest structure and setting usually dominated by large trees, snags, and down logs that provide suitable substrate for nesting, roosting, denning and rest sites. Snags and large tree-fall that create canopy gaps enable establishment of multiple tree layers and diverse species composition. Trees with physical imperfections such as cavities, broken tops and large deformed limbs are also desired for late-successional characteristics (NWFP p. B-5) and specific species reproductive and rearing needs (North, et al., 2009).

The thinning prescriptions in the Elk LSR project emphasize leaving all predominant and most dominant trees; healthy large overstory dominant trees of all species (with exceptions for radial thinning, group selections and hardwood release prescription elements); healthy pine of any size where pine is underrepresented; a component of healthy small understorey and midstory trees; a component of heavily damaged or diseased trees that provide habitat; and all hardwood trees as operationally feasible. Large snags and down logs and multiple canopy layers (where conditions allow) will be retained consistent with the project’s design and resource protection measures, which were specifically tailored to meet the desired future condition in the LSR, and based on LSRA guidance and best available science regarding species’ habitat requirements.

Variable density thinning will retain a range of densities by including skips, gaps, and thinning within a range of basal areas, promoting resilience and heterogeneity. As displayed in Table 36 (p. 136) and described in the Silvicultural and Forest Health and Wildlife sections of this EIS, thinning will accelerate individual tree growth and increase crown width and depth, as well as foliage density and needle length. This will contribute to desirable wildlife tree characteristics by providing conditions such as fuller crowns, larger boles and branches, and over time, larger trees with cavities or that contribute to larger snags and down wood. Combined, these components will provide important decadence and late-successional/old-growth habitat characteristics in the LSR.

144 "Width and Depth" - Increased light or space among trees enables the lower branches on the crown to remain alive and not be shaded out by adjacent trees. Thus, tree crowns expand in width as branches grow longer and thicker. Tree crown length increases as low branches remain alive and height growth continues. Growth in the stem and branches of trees is also accelerated by thinning because foliage density or leaf area within the crown increases and crown length is maintained or increased. This increase in leaf area enables trees to increase their photosynthesis; consequently, they have the resources to increase stem and branch diameter or volumes.
Within the LSR thinning units, the unthinned patches, larger high-quality foraging areas, and rest/roost clumps would retain thermal and visual cover, natural suppression and mortality, small trees, natural size differentiation, and undisturbed debris, as well as large trees, decadent trees, large snags, large downed logs, and dense and/or multilayered forest attributes. Other larger areas of no-mechanical thinning have been prioritized for retention, though would be underburned in accordance with the design criteria (e.g. units 150, 154, 156, 182 and others, and areas in the Ash Creek riparian reserve.). Retention of these areas will help retain diverse forest structure and functioning at the stand and landscape scale. This is one element of an overall spatial and temporal strategy to retain high quality habitat function on the LSR landscape and address forest change over time in other portions of the LSR in the advent of disturbance events.

For example, in most thinned foraging habitat for the northern spotted owl, when combined with the roost/rest clump retention and unthinned patches, basal areas of 125-200+ ft.²/acre, conifer and hardwood species diversity, large trees and snags, down wood, 40-60 percent or more canopy cover, mid and understory layering and vertical and horizontal heterogeneity will be well within the range of stand conditions frequently used by owls (Irwin, et al., 2012; Irwin, et al., 2007). In 27 acres of black oak release in foraging habitat, basal area would be lower with a short-term adverse effect to foraging habitat elements of critical habitat (PCE3), and a long-term benefit to species diversity and stand complexity. The project design and resource protection measures retain the largest oldest trees (predominants and dominants) that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops, safety permitting. In treated and untreated areas of stands, large decadent trees, snags, and down logs (including those that may be used for denning and/or resting furbears, nesting northern spotted owl or northern goshawk); large and small down wood that contributes to subnivean areas for fisher and Pacific marten in the winter to find prey and cover, plucking posts for northern goshawk and prey species habitat; and shrub and ground cover for prey species would be maintained and promoted.

Activities Will Not Prevent the LSR from Playing an Effective Role in Established Objectives

The project treatments will affect 100 percent of the suitable (nesting, roosting, foraging) and capable habitat in the home range and core of the ST-215 activity center. These effects are a combination of: habitat benefit in nesting/roosting from the reintroduction of low-intensity prescribed fire and transitioning capable stands toward more resilient dispersal and foraging habitat; maintaining foraging habitat function with a reduced quality over an approximate 10-20 year timespan; and downgrading foraging habitat to dispersal quality over a 10-30 year timespan in a minor percentage of the home range to increase hardwood diversity and retain predominant legacy pine.

Prioritization for treatment types and locations within the home range of this ‘historic unoccupied’ activity center closely followed the prioritization criteria recommended under Recovery Action 10 in the Revised Recovery Plan USDI-FWS pp. III-44 to III-47. The Forest also consulted with the FWS on more specific prioritization for this Project to meet the intent of Recovery Action 10, as well as Recovery Action 32 (in accordance with the Forest Plan standards and guidelines at p. 4.30). Similarly, prioritization of treatment types and location (or designating no-treatment areas) was done for the northern goshawk and the fisher, two species known to occur and reproduce in the Elk Flat LSR. Though not stated in the LSRA, the Elk Flat LSR is expected to only provide for one pair of northern spotted owls in the future, or more likely, to provide an important area for dispersing young northern spotted owls to reside in temporarily. This is largely driven by the fact that 60 percent of the home range is situated in private land ownership managed for timber production and the overall ponderosa-pine dominated stands in the LSR.

The ability to move across the landscape is important to the long-term persistence and viability of some wildlife species, and is particularly important to these late-successional habitat-associated species. As described in the NWFP, movement or dispersal across the landscape is provided by large blocks of late-successional habitat in the LSR/MLSA network, and through management objectives and various land allocations between them. Those management objectives and land allocations include riparian reserves,
administratively withdrawn areas, and management prescriptions for retention of old-growth fragments in Matrix allocation and 100-acre LSRs. Connectivity is a measure of the extent of which the landscape pattern of the late-successional and old-growth ecosystem provides for biological and ecological flows that sustain late-successional and old-growth associated animal and plant species. It does not necessarily mean that late-successional and old-growth areas have to be physically joined in space, because many late-successional associated species can move across areas that are not in late-successional ecosystem conditions.

Within the Elk Flat LSR, the treatments are expected to protect and enhance connectivity within and between stands. The surrounding private lands and large areas of pine-dominated forests (plantations and natural stands) on NFS lands do not provide highly suitable connective habitat for the northern spotted owl, though individual dispersing young from other LSRs or activity centers may be able to access the LSR (map 4 in the Biological Assessment displays habitat in the action area, including dispersal and connective habitat on private and NFS lands). Conversely, the northern goshawk and fisher are less dependent on species composition and cover requirements for dispersing (and foraging), and the areas within and outside the LSR; forest stands, shrub habitats, riparian reserves and streamside protection zones on private lands are expected to continue contributing to connectivity.

Late-successional habitat in the Elk Flat LSR in 1999 comprised a relative large proportion of the capable land base, 46 percent (LSRA p. 125). Again as described in Chapter 1, and the relevant resource sections of Chapter 3, delaying or taking no action in the project area leaves the LSR at continued risk of substantial habitat loss. The project’s thinning and fuels treatment designs, areas delineated for no mechanical treatment and measures to maintain and protect important habitat components will contribute to: 1) continued function for late-successional associated species use occurring now or in the future, 2) increased diversity and resilience of existing and developing early and mid-successional habitat, and 3) reduced risk of loss and increased connectivity within and between stands.

As such, the project activities will not prevent the Elk Flat LSR from playing an effective role for which it was established. The proposed actions in the LSR will help accelerate development of late-successional characteristics, will contribute to increased connectivity and resilience of late-successional habitat in the LSR, and will help reduce the risk of large scale habitat loss while maintaining important current habitat areas, attributes, and functions. This will be achieved by not thinning current high quality late-successional habitat stands and patches within stands that provide cover, layering and density; retaining important legacy components such as roosting and resting structures, large snags, large down wood, and large trees with cavities and decadence; retaining multiple canopy layers (where these conditions currently exist); and varying the thinning prescriptions within and between stands based on species composition to increase individual tree and stand resilience and to promote spatial heterogeneity through openings contrasted with dense forest areas. These treatments are expected to protect and enhance the current habitat function and quality for the northern spotted owl, fisher and northern goshawk in approximately 70 percent of the LSR, and 100 percent of the areas where habitat for these species currently exists. Actions taken under the preferred alternative will increase the probability that large-scale habitat loss will not continue, but also retain stand elements and conditions more representative of endemic insects, disease and mortality.

**LSR Consistency Review**

The Elk LSR Enhancement project is designed to move the landscape toward the desired condition for the Elk Flat LSR as guided by the visions, goals, strategies and design criteria embodied in the NWFP, the Forest Plan, and the LSRA as described earlier in the EIS. The Elk LSR Project proposes risk reduction treatments in stands ranging from about 60 to 120 years of age.

The project is consistent with general objectives from the LSRA, all of which fall under LSRA ADC #1 (Reforestation and revegetation), #4 and #5 (Thinning in early successional pole and mid-successional stands – hazard related and development of late-successional habitat as corrected by Mohoric 2009), #7 (Fuel
Reduction – primarily dead and down), #9 (Hazard Reduction – Prescribed Burning) and #10 (Hazard Reduction - Manual and Mechanical Fuels Reduction) or Miscellaneous Activity 7 (Maintaining Hardwood Stands, forest openings, meadows, and glades). Additionally, dangerous trees or snags may be removed consistent with Forest Service Policy and the applicable safety regulations and codes for operators.

The Forest reviewed the Elk silvicultural treatments with the REO in teleconference on February 25, 2016 (Mellen-McLean, 2016) and engaged in followup discussions between specialists. Based on the guidance received in the teleconference, formal REO consistency review was requested for two proposed treatments that are consistent with the Ecological Principles for Management of Late-Successional Forests under the NWFP, but vary from specific requirements in the LSRA: 1) Group (openings) selections greater than ¼-acre, and 2) the Extensive Mortality Area treatment.

The activities put forward for review take place on relatively few acres (154 acres [75 acres in gaps and 79 acres of EMA]) out of the 3,519-acre project area (or 4 %) and meet the overall intent of the ADCs and NWFP.

Openings Greater Than ¼ Acre within Thinned Stands

Group selection treatments are proposed with the Elk project that would create openings up to about two acres within several of the stands proposed for thinning, which is larger than the ¼-acre openings identified in the LSRA ADC 4 treatment standard “c”. Two types of stands are proposed for thinning with group selection treatments:

- 6, 40 to 50 year old ponderosa pine plantations that primarily function as capable habitat for the northern spotted owl. The plantations consist of dense homogeneous stands of medium- and small-sized ponderosa pine trees and in the natural stands, groups are proposed in dense homogeneous stands of white fir.145 The six plantation units have a minor amount of residual mixed-conifer that would either be placed in unthinned patches; and

- 2, 80 to 120 year old natural stands - Units 152-1 and 160 contain areas of dense, homogenous white fir infected with Heterobasidion root disease.

The Purpose and Need in Chapter 1 discusses why treatment activities are needed now to improve stand composition, structure, density (in particular to develop species and age/size diversity in stands that lack heterogeneity), and resilience with supporting analysis in the Chapter 3 Silviculture and Forest Health, Fire and Fuels and Wildlife sections. Permitting the no action alternative to continue clearly results in further risk to and loss of developing and existing late-successional stands in the Elk Flat LSR.

In line with the overall management direction contained in the LSRA and NWFP and recommendations from recent science, the Elk LSR Project proposes various ecological forestry-based treatments including variable density thinning (Carey, 2003; Franklin, et al., 2013; Franklin, et al., 2012; Franklin, et al., 2013; Carey, 2003; North, et al., 2009; North, et al., 2012; Franklin, et al., 2012). Variable density thinning does not include a singular density target, rather it retains a range of densities by including unthinned patches (“skips”), areas of heavy thinning or small openings or “gaps” (radial release of legacy trees, structures or minor species, or group selections), and thinning within a target basal area range elsewhere in the stand.

Silvicultural treatments are designed to increase stand resiliency, and structural and species complexity and function, as characterized by late-successional conditions. To achieve this desired complexity, density management activities incorporate areas of variable density thinning, gaps, and “no thin” areas (approximately 12% of the silviculture treatment areas). The group selections will allow the stands to

145 Purpose and Need #1, Density, Existing Condition; Stand Record Cards.
develop and contribute a diversity component of species and to increase vertical and horizontal complexity. Stand structure, tree size, layering and species composition, presence of edges and small openings, and landscape position are all influential in habitat selection for the northern spotted owl (Zabel, et al., 1995; Irwin, et al., 2012).

The gaps and heterogeneity created by the groups will also help the stands better sustain natural disturbances through higher resilience while increasing wildlife habitat heterogeneity and ecosystem function (North, et al., 2012; Churchill, 2013). It is documented that irregular tree patterns, large openings, and resulting variation in surface fuels can also reduce the potential for the spread of crown fire and help perpetuate variable post-fire patterns (Churchill, 2013). Heterogeneous stand structures typically impede the buildup of epidemic insect outbreaks (Churchill, 2013) and the variable density thinning treatments should also improve prey base and foraging habitat for northern spotted owl, fisher and northern goshawk associated with various forest conditions (North, et al., 2009). The group selections would also help break up the spread of *Heterobasidion* by reducing root-to-root contact and introducing other non-host species to the stand (application of borate compound is also expected to reduce the overland infection of *Heterobasidion*).

LSRA activity design criteria (ADC) #4 identifies objectives, stand attributes and treatment stands to meet the NWFP goals and principles. ADC #4 treatment standard “c” calls for treatment to increase diversity in relatively uniform stands by including areas of variable spacing including up to 15% of the area to be in heavily thinned patches, or in openings up to 1/4 acre in size. The Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS, 2011) and the Revised Critical Habitat Rule for the Northern Spotted Owl (USDI-FWS, 2012) both discuss utilizing ecological forestry techniques in the dry forest ecosystems to increase stand resilience to stressors and potential influences from a changing climate. These techniques include retaining and/or restoring spatial heterogeneity, species and structural diversity, and ecological processes (Recovery Plan p. III-14, Final Rule, p. 71910). Other recent scientific research and literature science describes the ecological forestry concept (Franklin, et al., 2007; Churchill, 2013; Franklin, et al., 2013; North, et al., 2012).

While proposed gap treatment sizes are larger than specified in treatment standard “c” the existing exemption criteria for commercial thinning, these treatments are consistent with the Forest Plan and the following objectives in the LSRA and are consistent with best available science for dry forest restoration. This treatment is consistent with the stand attributes (a through c). Treatment standards (a through i) are consistent, with the following concerns:

Standard e, bullet 3, states that “Up to 15 percent of the area would be in heavily thinned patches, or in openings up to 1/4 acre in size, to [promote] individual tree development, encourage some understory vegetation development and encourage the initiation of structural diversity.” The proposed group selections would be larger than ¼ acre, but are proposed to enhance the LSR and reduce the risk of further stand loss.
Elk LSR Enhancement Project

Extensive Mortality Area Treatment (EMA)

The EMA treatment is proposed under LSRA ACD #7 (Fuel Reduction). The treatment for this area is prescribed burning. Due to the safety concerns surrounding the heavy dead-standing and surface fuels the EMA will be ignited using aerial ignition, or by hand from the perimeter, and fire will be allowed to move through the snags and down material. There is no harvest proposed as part of the EMA treatment. While green trees would not be cut or thinned in this area, there will be some mortality to the live trees within the EMA during burning operations. It is anticipated that burning in the EMA would achieve a 70 to 80 percent reduction in hazard snags and trees with an expected 20 percent low intensity, 50 percent moderate intensity, and 30 percent high intensity burn.

Under ADC #7 b, c and h all live trees should be retained, including those injured but likely to survive. Following stand-replacing disturbance, management should focus on retaining snags that are likely to persist until late-successional conditions have developed and the new stand is again producing large snags. Logs present on the forest floor before a disturbance event provide habitat benefits that are likely to continue. It seldom will be appropriate to remove them. While green trees would not be cut, some losses over the 3 to 10 year period post-initial burn entry are expected. Unthinned patches of snags and large trees would be designated in the EMA in accordance with the project design features, and while direct ignition would not occur in the unthinned patches, it is not certain that fire would not creep into or reduce trees, snags or down logs in these areas.

No logs will be removed from the site. Much of the down wood will be consumed during the prescribed burning, reducing the surface fuel loading, returning nutrients to the soil and preparing a seed bed for natural and artificial regeneration.

Following the initial burn, the site will be evaluated. If the safety concerns have been mitigated by the burn, but surface fuels are still in excess of LSRA standards, machine piling and pile burning may occur. The area will then be evaluated for reforestation needs. Planting is proposed if needed to promote species and age diversity.

This activity is needed to reduce risks and result in greater assurance of long-term maintenance of existing and developing late-successional habitat in the LSR. A fire start in or moving through, the EMA during typical summer conditions would likely be high intensity. Without action, further stand and structural composition loss is likely to occur from lethal fire effects, with a resulting loss or decline in habitat and failure to maintain or meet objectives for the LSR.

Implementation of this prescription should provide the opportunity to develop late-successional characteristics in the future and reduce the risk of large-scale, undesirable wildfire effects. This treatment affords protection to surrounding stands through a reduced potential for high intensity fire and spread, and a reduction in potential Fuel Model 13 conditions, which is when a fire is generally carried by a continuous layer of slash. Fires spread quickly through fine fuels and intensity builds as the large fuels start burning under FM 13 conditions with active flaming sustained for long periods (NWCG, 2006). In the short and long term, reducing the existing fuel loading in the EMA would reduce the potential for high-intensity fire and torching that could potentially occur in, and spread from, the EMA due to: 1) a fire start on private lands adjacent the EMA and LSR, or 2) a fire start in or near the EMA in the LSR.

146 Although the EMA treatment does overlay thinning units. Thinning will occur on the periphery of the EMA area, outside of the heavy mortality zone.
Consistency Finding
The Forest Supervisor concluded the project as proposed is consistent with the LSRA and NWFP Standards and Guidelines (Myers, 2016a). Concurrence with the finding was received from the REO on March 24th, 2016 (Rubado, 2016).

Management Indicator Assemblage
The Forest Plan directs resource managers to monitor assemblage habitat trends at the National Forest scale (Forest Plan, p. 5.16). The Forest Plan identifies management indicator assemblages for monitoring; it does not identify management indicator species but does list examples of representative species for each assemblage. The Forest has selected specific species to represent the management indicator assemblages. These species were selected based on research concerning their habitat preferences (California Wildlife Habitat Relationship system and Birds of North America online), the range of the species, and the availability of good quality data on the Forest. These three factors had to be met for the Forest area in order for a species to be selected.

A project-level Management Indicator Assemblage (MIA) Report was completed and is incorporated by reference (Jordan, 2016e). Information relevant to the decision to be made is summarized here. The project-level analysis reviews the Forest Plan requirements for monitoring management indicators and analyzes project effects on management indicator assemblages for a representative species of each assemblage affected. The analysis addressed Alternative 1 in detail, which is the modified proposed action and preferred alternative, as it affects the most assemblage habitat.

The project-level report determined that Alternative 1 (and all action alternatives considered in detail) would affect five assemblage habitats: openings and early seral, late seral, snag and down log, hardwood, and riparian (defined in Table 1 of the MIA Report). The Nashville warbler was analyzed as a representative species of the openings and early seral assemblage because it is found in all of the openings and early seral assemblage CWHR types and is strongly associated with specific habitat components that define the assemblage. The brown creeper was analyzed as a representative species of the late seral assemblage because it is found in all of the late seral assemblage CWHR types and is strongly associated with specific habitat components that define the assemblage. The red-breasted nuthatch was analyzed as a representative species of the snag and down log assemblage because it is strongly associated with specific habitat components that define the assemblage. The white-breasted nuthatch was analyzed as a representative species of the hardwood assemblage because it is strongly associated with specific habitat components that define the assemblage. The yellow warbler was analyzed as a representative species of the riparian assemblage because it is strongly associated with specific habitat components that define the assemblage. All of these species occur in the project area147 and additional population data of high reliability are available for these species, which is tracked and compiled at the Forest level.148

The other three wildlife management indicator assemblages would not be affected by the project because it either does not occur within project units or the project contains measures to not treat elements of the assemblage (chaparral; cliffs, caves, talus, and rock outcrops) or there would be no effect to the proportion of assemblage habitats available (multi-habitat). There are no aquatic management indicator assemblages or

147 Point count surveys for migratory and resident bird species were conducted in the project area in 2013 and 2014. These surveys will be continued in 2016 and after implementation.

148 The Forest compiles Breeding Bird Survey data (BBS) for the representative species, and reports them at the regional (BBS strata), California, and range-wide scales. Four BBS strata occur on the Forest. BBS data have varying degrees of reliability based upon sample size. Representative species selected for Forest level tracking have data with the highest reliability in at least one of the four strata that occur on the Forest.
species (MIS) that would be affected by the project, as there is no suitable habitat and the project area is outside the Forest’s fish MIS range (Forest Plan, 1995 p. 3.11).

While treatments would result in changes to five management indicator assemblage habitats by reducing canopy closure and cover, tree densities and snag/down log density (notably in the Extensive Mortality Area and Hazard Reduction Zones on approximately 166 acres), treated areas would continue to provide the same quantity and distribution of each assemblage type after the project is completed. Hardwood quantity and quality (approximately 78 acres of California black oak and aspen) and riparian vegetation within the riparian assemblage component along Ash Creek (approximately 30 acres) are currently found intermixed within the late seral and openings and early seral assemblages. While the quality of these assemblages would be increased over the short-term, the quantity would not change. Even with the short-term reduction in snag and down log assemblage, and slight increase in hardwood and riparian quality, the project is not likely to result in any meaningful change to population trends or habitat availability for the red-breasted nuthatch or white-breasted nuthatch at the project or Forest scale.

As described in the existing condition section of Chapter 1, and the MIA report, the 3,519-acre project area contains abundant snag and down log assemblage habitat due to overstocking, ongoing root disease and insect outbreaks. Reducing the current snag and down log assemblage on 166 acres in the short-term is considered discountable when compared to the existing snag and down log assemblage habitat within the project area that would not be treated. The short-term reduction of this habitat in the specific areas of the project will also not limit the availability of the snag and down log assemblage in the project area for the red-breasted nuthatch. Over the short- and long-term, additional snags are expected to remain and develop in this area and will remain on the landscape until they fall, contributing to the down log assemblage. Over the short-term, habitat suitability is expected to increase for the white-breasted nuthatch and yellow warbler as the thinning, release and riparian vegetation planting treatments increase the quality and quantity of hardwood components of black oak and aspen, and riparian assemblage habitat along Ash Creek.

The affected assemblages will not be modified such that there is an immediate shift to another assemblage (e.g., late seral will not be treated such that it becomes openings and early seral post-treatment, snag and down log assemblage will not be wholly eliminated, and while hardwood and riparian assemblages will increase, they will not replace another assemblage). As there will be no conversion from one assemblage to another, there are no cumulative effects. Even if potential indirect effects are realized, they are not expected to meaningfully influence project-level habitat trends for the assemblages. Considering the best available population data and Forest-level habitat trends, as well as ongoing habitat influences from wildfire and private timber harvest, the project is not likely to result in any meaningful change to population trends or habitat availability for the Nashville warbler, brown creeper, red-breasted nuthatch, white-breasted nuthatch, or yellow warbler at the Forest-wide scale (Jordan 2015e).

**Survey and Manage (S&M)**

Guidance under the Northwest Forest Plan and Forest Plan requires the Forest Service to analyze projects for potential impacts to Survey and Manage species. Survey and Manage requirements were originally established to address little-known species believed to be associated with old-growth and late-successional forest microsite habitats, and for which species experts were unsure that the Late-Successional Reserve (LSR) network would be sufficient to provide for the conservation of the species.

All project activities are compliant with direction regarding the Survey and Manage standards and guidelines issued by Regional Foresters’ Connaughton and Moore (Connaughton, et al., 2014). This direction was issued pursuant the district court’s remedy order issued on February 18, 2014 (Conservation Northwest v. Bonnie, W.WA No. C08-1067-and other Mitigation Measure Standards and Guidelines (USDA-FS & USDI-BLM, 2001) [or 2001 ROD].
Certain project activities are exempt from the May 13, 2014 direction, as stipulated by Judge Pechman (Pechman, 2006). These include activities that: (a) thin stands younger than 80 years old; (b) replace culverts on roads that are in use and part of the road system, or remove culverts if the road is temporary or to be decommissioned; (c) riparian and stream improvements where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning, and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and (d) the portions of a project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph (a) above.

Survey and Manage Fauna

A Survey and Manage Report for terrestrial wildlife and aquatic species was completed for the project and is incorporated by reference (Jordan, 2016d). Information relevant to the decision to be made is summarized here. The project area falls outside the range, or contains no suitable habitat for, all Survey and Manage fauna species listed on the 2003 Annual Species Review list except for the Shasta hesperian, Chace sideband snail and great gray owl (Burke, et al., 1999; Duncan, 2005; Quintana-Coyer, et al., 2004).

Based on extensive protocol surveys for terrestrial and aquatic mollusks (Furnish, et al., 1997; Duncan, et al., 2003) conducted on 33,000 acres between 1999 and 2010 on the Management Unit, the Shasta hesperian was only found within riparian habitat and the chace sideband snail was only observed within the Shasta and Little Shasta River Drainages (Crumpton, et al., 2011). Surveys completed in the Elk Flat LSR Enhancement Project area for these two species between 2007 and 2010 did not detect either species and there are no known sites in the project area.

The project area lacks perennial streams and the preferred riparian vegetation for the Shasta hesperian, though the intermittent channel of Ash Creek may provide some level of potential suitable habitat. There will be treatments in Riparian Reserves under all action alternatives. The project includes design features and protection measures that limit disturbance to potential habitat and maintain microsite habitat conditions for this species (e.g., riparian canopy cover and large coarse wood will be maintained, water quality BMPs, limited disturbance to riparian areas/riparian vegetation during thinning and burning operations, and equipment exclusion within 20 or more feet of Ash Creek). This is consistent with the species management recommendations (Burke, et al., 1999).

The project area contains potential suitable habitat for the Chace sideband of dry conifer and mixed conifer with oak. There are limited talus piles and outcrops within Elk Flat that may provide refugia. The project includes protection measures that either prohibit equipment use on talus slopes or maintain microsite habitat conditions such as large coarse wood and uncompacted forest litter. This is consistent with the species management recommendations (Duncan, 2005).

Pre-disturbance surveys are not required for the great gray owl (GGO) in the California Cascades (Quintana-Coyer, et al., 2004) and no project-level surveys have been completed. There have been no aural or visual detections of this species in the project area during the 14 years of active survey efforts between 1990-2015 for the northern spotted owl or other fieldwork done for the project. There are no verifiable observations recorded in or near the project area ( (NRIS, 2014; CDFW, 2015). While transient GGOs may utilize the Elk Flat area for foraging or potential nesting, on average, deep snows likely limit use and access to prey. The project includes provisions for nest site protections in the event of a new discovery and this is consistent with management recommendations for this species.

Within the project area, there are no known sites of any Survey and Manage wildlife species on the 2003 Annual Species Review list. The project design and resource protection measures include management guidelines for the two terrestrial mollusks with suitable habitat, and the project contains measures for any new
discoveries of great gray owl. These measures are consistent with the May 13, 2014 direction and these species’ management recommendations.

**Survey and Manage Vascular Plants, Bryophytes, Lichens and Fungi**

A Supplemental Botany Report was completed for project (Posey, 2015) and is incorporated by reference.

Surveys were completed for S&M bryophytes including *Ptilidium californicum* (Pacific fuzzwort), a Category A bryophyte. There are seven known tree sites for Pacific fuzzwort in units 150, 157 and 159. Pacific fuzzwort sites will be buffered to protect them from underburning.

Predisturbance Surveys for Category B fungi are not required because old growth stands will not be affected by this project. Random grid S&M fungi surveys were done in the NW Forest Plan national forests, including the Shasta-Trinity, in 2001 and 2002. Fungi known site revisits were completed for permanent plots in the California NWFP area from 2005-2010. Additional purposive surveys for Category B S&M fungi were done in the California Cascades physiographic province, which includes the Shasta-McCloud Management Unit, from 2011-2013 (Hoover, et al., 2015). There is one known site for *Mycena overholtsii*, a Category B fungi in unit 150 and one site for *Cantharellus subalbidus* (white chanterelle), a Category D fungi, in unit 165. The site in unit 150 is protected from all activities including underburning and the site in unit 165 is within an unthinned patch and will have a cool, light underburn. Individual legacy old growth trees and large woody debris will be retained.

RPMs in place for maintaining and improving wildlife habitat, protecting soils and maintaining or improving hydrological function will also help to maintain and improve habitat for survey and manage fungi species. Should new S&M bryophyte, fungi, lichen or vascular plant species be found before or during project implementation, protection measures will be put into place to protect the species and its habitat. Generally, this will involve the “flag and avoid” approach. If monitoring after burning shows damage to a Pacific fuzzwort population, the buffer distance for other populations will increase depending on the type and extent of the damage.

**Vegetation Diversity**

The Forest Plan (p. 4.14) directs provision for and maintenance of at least five percent of each timber/type seral stage combination shown in the Forest Plan on Table 4.3. The Forest Plan also has special direction for Matrix Lands for fifth field watersheds in which federal forest lands are currently comprised of 15 percent or less of late-successional forest (p. 4.63). The Elk project area is located within the Ash Creek 5th-order watershed. The Silviculture Report (Payne, 2015b) provides a vegetation diversity analysis. Information relevant to this decision is summarized here.

**Seral Stage Diversity**

As Table Appendix H-2 illustrates, there is less than five percent vegetation in seral stage: 1 - grass/forb, 4a - Large tree, less than 40 percent canopy closure, and 4c – large tree, older, greater than 40 percent canopy closure. Silviculture treatments in the project will not appreciably change the current seral distribution in the Ash Creek watershed under any action alternatives. Thinning will shift some stands from seral stage 4b to 4a for approximately one to two decades until residual tree canopies reoccupy thinning space. Treatments will promote stand resiliency and accelerate development of larger overstory trees, promoting the development of 4c/older stands over time.

**Table Appendix H-2. Seral Stage Diversity in Ash Creek Watershed**

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>Watershed Acres</th>
<th>% of Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonforested (rock etc.)</td>
<td>3,136</td>
<td>4%</td>
</tr>
<tr>
<td>1 Grass &amp; forbes with or without shrubs and seedlings</td>
<td>2,297</td>
<td>3%</td>
</tr>
<tr>
<td>Seral Stage</td>
<td>Watershed Acres</td>
<td>% of Watershed</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>2</td>
<td>11,525</td>
<td>15%</td>
</tr>
<tr>
<td>3a</td>
<td>10,983</td>
<td>14%</td>
</tr>
<tr>
<td>3b, 3c</td>
<td>35,542</td>
<td>42%</td>
</tr>
<tr>
<td>4a</td>
<td>777</td>
<td>1%</td>
</tr>
<tr>
<td>4b, 4c</td>
<td>16,848</td>
<td>21%</td>
</tr>
<tr>
<td>4c - older</td>
<td>97</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>79,205</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Acreages and percentages reflect all Shasta-Trinity National Forest Land within the Ash Creek watershed. Other ownerships in the watershed (including 8,207 acres on the Klamath National Forest) are not reflected.

Thinning from below would not change the vegetation type in Alternatives 1 through 3. The majority of dominant and co-dominant trees would be retained and average tree diameter would increase with the removal of smaller diameter trees from the understory. Thinning treatments would reduce canopy cover sufficient to warrant a change in the density classification for some stands.

Radial thinning around large predominant pine would reduce canopy cover in small areas and create more variable density within treatment units, but would not change stand seral class.

Oak release treatment in Alternatives 1 through 3 would occur in seral stage 4b. Given the limited removal to overstory conifer and retention of predominant and some dominant conifers within the oak release radius, the successional or seral stage classification would not be changed.

Aspen release would occur on approximately 18 acres in seral stage 4a stand in Alternatives 1 through 3. Removal of most conifers within the aspen release would reduce canopy cover in the short term but not change the seral stage or vegetation type.

Recent pine mortality from insects and disease in the project area in all age classes is reverting areas up to several acres in size to a seral stage 1. Most mortality is occurring in seral stage 4b stands. Larger mortality pockets (generally 5 acres or larger) and group selections in Alternatives 1 through 3 would be reforested. Because they are few, scattered and small (2 acres or less), group selections do not cause a change in seral stage at the stand level. Reforestation would occur on approximately 313 acres in Alternatives 1, 309 in Alternative 2, and on 304 acres in Alternative 3.

Table Appendix H-3 summarizes the effects to seral stages as a result of treatments in Alternative 1 (the Alternative with the most amount of treatments) as identified in the seral stage analysis of existing conditions.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Change to Seral Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Stand Thinning -1526 acres (density reduction, stand resilience, accelerate development of late successional characteristics)</td>
<td>Approx. 47 acres of 3a/b change to 4a/b</td>
</tr>
<tr>
<td>Plantation Thinning – 664 acres (density reduction, stand resilience, accelerate development of late successional characteristics)</td>
<td>No change</td>
</tr>
<tr>
<td>Radial Thin (embedded in natural stand thinning and plantation thinning) – 197 acres</td>
<td>No change</td>
</tr>
<tr>
<td>Group Selection (embedded in natural stand thinning and plantation thinning) – 75 acres</td>
<td>A portion to seral stage 2, no change at the stand level</td>
</tr>
</tbody>
</table>
Treatment Change to Seral Stage

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Change to Seral Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oak and Aspen Release (embedded in natural stand thinning and plantation thinning) – 48 acres estimated</td>
<td>Localized canopy cover reduction, no change at the stand level</td>
</tr>
<tr>
<td>Meadow Enhancement (remove conifer encroachment) – 379 acres</td>
<td>No change</td>
</tr>
</tbody>
</table>

Watershed Level Late Successional Forest

This section provides an assessment of the current condition of late-successional forest on Shasta-Trinity National Forest land within the Ash Creek watersheds.

There are 5,555 acres (7%) of National Forest land within the watershed that have been identified as not capable of supporting late-successional forest (see table A4). These areas are mostly occupied by lava flows and rocky areas that support few to none scattered conifers. Meadows and sagebrush vegetation are included in this category.

There are 73,650 acres (93%) of Shasta-Trinity National Forest land within the watershed that have been identified as capable of supporting late-successional forest (see table A4). Of this acreage of capable land, a total of 41,959 acres (57%) are currently occupied by forest types that meet the criteria of late-successional forest.

For purposes of this assessment, the determination of late-successional forest follows definitions used in the FEMAT report. Late-successional forest status was assigned into two subsets by correlating CalVeg forest typing with the following descriptions and criteria:

- **Mature forest** – those forest stands generally greater than 80 years of age but not meeting the old-growth definition. For this assessment, all current 3N and 3G stands not planted after 1940 as well as 4N and 4G stands were classified as mature forest.

- **Old-growth forest** – Forest stands 5N and 5G (overstory tree class 40). Large overstory diameter and high canopy cover correlated to old-growth characteristics including: large trees, multi-layered canopies, decadence, large snags and down logs.

Table Appendix H-4 summarizes the categorization of the watershed into capable and non-capable lands in terms of ability to support late-successional forest. The table further separates late-successional forest into mature and old-growth forest subsets.

### Table Appendix H-4. Summary of the Capability of NFS Lands in the Ash Creek Watershed

<table>
<thead>
<tr>
<th>Land Capability for Supporting Late-Successional Forest</th>
<th>Acres</th>
<th>Percent of Watershed</th>
<th>Percent of Capable Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Shasta-Trinity National Forest land in Ash Creek Watershed</td>
<td>79,205</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Lands not capable of supporting late-successional forest (Barren lava, scattered trees on lava, powerline, dry meadows, etc.)</td>
<td>5,555</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Lands capable of supporting late-successional forest</td>
<td>73,650</td>
<td>93%</td>
<td>100%</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Land Capability for Supporting Late-Successional Forest</th>
<th>Acres</th>
<th>Percent of Watershed</th>
<th>Percent of Capable Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not currently occupied by late-successional forest includes grass, brush, size class 1 and 2, density class S and P, knobcone pine, lodgepole pine. Also includes all stands planted after 1940 (these are assumed to be less than 80 years old today).</td>
<td>31,691</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td>Currently occupied by mature late-successional forest. Includes all current 3N, 3G, and 4N, 4G stands. Generally 80 - 150 years old</td>
<td>41,862</td>
<td>53%</td>
<td>57%</td>
</tr>
<tr>
<td>Currently occupied by older late-successional forest. All 5N, 5G, 6N, and 6G stands. Generally, greater than 150 years old however, ages not field verified.</td>
<td>97</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Mature Forest

Mature late-successional forest occurs on 41,862 acres or 53 percent of Shasta-Trinity National Forest land within the watershed. This represents 57 percent of all lands capable of supporting late-successional forest.

Left unmanaged and in light of roughly 100 years of active fire suppression, mature late-successional forest conditions within the watershed tend to develop dense, overstocked forest conditions. Under these conditions, trees grow increasingly stressed for resources and high fuel loads develop making forests increasingly susceptible to catastrophic events such as wildfire and insect attack. Present day active timber management is used to reduce stand densities to healthy, more sustainable levels and to reduce fuel loads. As a result, most forest stands classified as mature late-successional forest have had some form of timber harvest in the past.

Old-Growth Forest

Old-growth forests are estimated to occur on 97 acres or less than 0.2 percent of Shasta-Trinity National Forest land within the watershed. Field surveys within the project area indicated that some mature stands contain isolated elements of older late-successional forest (for example, few scattered “remnant” trees over 150 years old) and it’s inferred there may be some older successional components in other mature stands in the watershed however these stands do not meet overall criteria as old-growth.

Most existing old-growth late-successional forest in the watershed occurs on rough or steep terrain that was difficult to access or harvest in the past. Due to the lack of past management activities, existing old-growth forest stands are typically overstocked with dense understory vegetation and heavy fuel loads. These stands are susceptible to catastrophic events such as wildfire, insect attack and disease.

Compliance

Thinning in dense mid and late successional natural stands would reduce canopy cover and increase average stand diameters at the project level. While there is a minor component of distinct older trees with old-growth characteristics within some treatment stands, overstory trees are generally between 60 – 120 years old with most trees being less than 100 years old. Canopy reduction from thinning would shift approximately 400 acres of stands currently typed as a density 4N to 4P for the near term. Many of these stands are near the division between density class 4N and 4P; thinning would drop the density to 4P in these stands for approximately 10 to 20 years until residual tree canopies expand.

Treatments would increase the percent of mature (and old growth) late-successional forest faster over the long term by promoting the growth of large diameter overstory trees within a mosaic of variable density and structural diversity. Additionally, treatments would increase stand resiliency to natural disturbances,
Elk LSR Enhancement Project

increasing the likelihood that residual overstory trees would persist and develop into late successional stands. Thinning treatments would retain all of the predominant trees as well as the majority of the dominant trees. While trees would be retained in all size classes to retain and promote structural diversity, removal would be focused on suppressed and intermediate trees as well as codominant trees adjacent and subsidiary to retained overstory trees. Thinning would increase average stand diameters but not change the age classes on the landscape.

Overall, for Alternatives 1 through 3 the percent of capable land occupied by forest types that meet the criteria of late-successional forest will remain at approximately 57 percent in the Ash Creek watershed.

Visual Quality Objectives

The Forest Plan provides standards and guidelines for the visual (scenery) resource utilizing the Visual Management System (VMS) to reduce impacts to visual resources (scenery) caused by management activities. Visual Quality Objectives (VQO’s) were established for areas seen from travel routes and management areas indicate allowable changes to scenery resulting from management activities.

A Scenery Analysis Report (Joyce, 2014) was prepared for the project and is incorporated by reference. The proposed silviculture treatments and fuel activities were analyzed as seen from Pilgrim Creek Road [Forest Road 13 (41N13)] and Forest Road 19 (41N19). The routes are not sensitive for scenery per the Forest Plan, but both routes may be socially sensitive since they are used by winter recreationists and visitors accessing some of the Mt. Shasta trailheads. The VQO indicator for Pilgrim Creek Road is “Modification” and the VQO indicator for Forest Road 19 is “Modification to Maximum Modification.” To reduce visual impacts of the proposed project in the foreground views of Pilgrim Creek Road due to the high number of people who use the route, a RPM will be implemented:

The following design features are prescribed within a 150-foot visual corridor adjacent to Pilgrim Creek Road. This visual corridor would apply to units 16-115, 106, 107, 123, 125, 157, 159, 180, 162, 176, 179, 347, and 401.

- Use existing landings and locate new landings out of view as seen from the roads where feasible.
- Stump height will be six inches or less (if a landscape feature obstructs the view between the road and the cut trees, stump height maybe higher).
- Cut and/or leave trees will be marked on the sides facing away from the roads. Prior to treatment, further measures such as flagging of individual leave trees may be implemented to assure operators can clearly identify leave trees.
- The goal within the visual corridor is to have a clean look by removing the majority of the slash and woody debris with the least amount of ground disturbance. This may be accomplished by: lopping and scattering if there are not large amounts of residual slash, as generally occurs with whole tree-yarding; hand piling and burning excess slash and scattering the burn pile residue that is not fully consumed and/or machine piling the slash outside of the visual corridor.

The proposed treatments for Alternatives 1, 2 and 3 are very similar from a scenery perspective; differences are comparatively negligible. All action alternatives would be consistent with the Forest Plan VQO map.
Appendix I – Comments on DEIS and Responses

Agencies have a responsibility under the National Environmental Policy Act (NEPA) to first “assess and consider comments both individually and collectively” and then to “respond… stating its response in the final statement (40 CFR 1503.4)” This document describes the comments received in response to the 36 CFR §218 comment period on the Draft Environmental Impact Statement. A notice of availability appeared in the Federal Register on January 15, 2016 and a legal notice for comment was published in the Redding Record Searchlight on January 19, 2016. The comment period lasted for 45 days, concluding on February 29. Table Appendix I-1 provides the commenters and affiliation if any, the date the comments were received, and the designation numbers assigned to the comment letters.

Table Appendix I-1. Commenter Number, Name, Organization and Date Received

<table>
<thead>
<tr>
<th>Letter #</th>
<th>Name and Title</th>
<th>Organization Represented</th>
<th>Date Received</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Keith Darrah, Jr.</td>
<td></td>
<td>1/20/16</td>
</tr>
<tr>
<td>2</td>
<td>Ryan Hadley</td>
<td>Sierra Pacific Industries, Burney Division (SPI)</td>
<td>1/19/16</td>
</tr>
<tr>
<td>3</td>
<td>Francis Mangels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>George Sexton, Kimberly Baker, Thomas Wheeler</td>
<td>Klamath Siskiyou Wildlands Center (KSWC), Klamath Forest Alliance, Environmental Protection Information Center (EPIC);</td>
<td>2/4/16</td>
</tr>
<tr>
<td>5</td>
<td>Jerry van Hees</td>
<td>American Forest Resource Council (AFRC)</td>
<td>2/5/16</td>
</tr>
<tr>
<td>6</td>
<td>John McPhee</td>
<td></td>
<td>2/24/16</td>
</tr>
<tr>
<td>7</td>
<td>Michael Mei</td>
<td></td>
<td>2/28/16</td>
</tr>
<tr>
<td>8</td>
<td>Phil Facchin</td>
<td>No affiliation however a list of names attached as: “list of people that agree with”</td>
<td>2/28/16</td>
</tr>
<tr>
<td>9</td>
<td>Larry and Barbara Stilley</td>
<td></td>
<td>2/28/16</td>
</tr>
<tr>
<td>10</td>
<td>Kathleen Martyn Goforth, Manager Environmental Review Section</td>
<td>United States Environmental Protection Agency (EPA), Region IX</td>
<td>2/29/16</td>
</tr>
<tr>
<td>11</td>
<td>Patricia Sanderson-Port, Regional Environmental Officer</td>
<td>United States Department of the Interior, Office of Environmental Policy and Compliance, Pacific Southwest Region</td>
<td>2/29/16</td>
</tr>
<tr>
<td>12</td>
<td>Mark Miyoshi and Luisa Navejas, Mount Shasta District Representatives/Water Advisors</td>
<td>Winnemem Wintu Tribe</td>
<td>2/29/16</td>
</tr>
<tr>
<td>13</td>
<td>Denise Boggs, Executive Director</td>
<td>Conservation Congress (CC)</td>
<td>3/3/16*</td>
</tr>
<tr>
<td>14</td>
<td>Tonja Y. Chi</td>
<td>Conservation Congress (CC)</td>
<td>3/3/16*</td>
</tr>
</tbody>
</table>

*Postmarked 2/29/16

The content analysis process considered comments received individually and collectively and considered them equally, not weighting them by the number received or by organizational affiliation, or by any other status of the respondent. The Forest reviewed all public comments received, extracted comments relating to specific concerns or issues about the project and the DEIS, integrated public input on the issues, and
developed a response using an interdisciplinary team of resource specialists. Possible responses to comments received on the preliminary DEIS are to: (1) modify existing alternatives; (2) develop and evaluate new alternatives; (3) supplement, improve, or modify the analysis; (4) make factual corrections; and (5) explain why the comment does not warrant further explanation or agency response.

Comments were grouped into concerns of similar comments, with the Forest Service response following. Concerns were grouped by resource or topic, and the topics are generally listed in alphabetical order. Concern group numbers and comment numbers are therefore, not in numeric order. Responses below each concern with group of comments are in numerical order. Gaps in comment/concern/response numbers are due to consolidation and process. Table Appendix I-2 lists the comments by comment letter, then by comment number for each letter, concern group number, topic, response number, and page number where the response starts. Table Appendix I-3 (starting p. I-11) is an index to responses and concern topics ordered by response number.

Pertinent documents in the project record or sections/page numbers in the DEIS are referenced for additional information. When the FEIS provided corrections or clarifications relating to the comment it is noted with a reference to the page number in the FEIS. Note that page numbers in the FEIS may have shifted with these edits from the DEIS page numbers cited in the responses.

### Table Appendix I-2. Comment List by Commenter

<table>
<thead>
<tr>
<th>Comment/Letter Number</th>
<th>Comment Number</th>
<th>Concern Group Number</th>
<th>Topic</th>
<th>Response Number</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>118</td>
<td>NEPA - General</td>
<td>33</td>
<td>I-44</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>25</td>
<td>Socioeconomics - Support for Project</td>
<td>84</td>
<td>I-88</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
<td>I-43</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
<td>I-43</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8</td>
<td>NEPA - Requests for Info and Letter Confirmation</td>
<td>42</td>
<td>I-50</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>49</td>
<td>NEPA - Decision Timing</td>
<td>32</td>
<td>I-43</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>30</td>
<td>Wildlife - Gen Wildlife Concerns</td>
<td>97</td>
<td>I-100</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>59</td>
<td>Botany - Hardwood Restoration</td>
<td>3</td>
<td>I-16</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>120</td>
<td>Botany - Survey &amp; Manage, Fungi</td>
<td>7</td>
<td>I-20</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>63</td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
<td>I-102</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>18</td>
<td>Range - Close Allotments</td>
<td>46</td>
<td>I-52</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>31</td>
<td>Wildlife - Poaching Enforcement</td>
<td>152</td>
<td>I-170</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>28</td>
<td>Hydrology - Create Ponds</td>
<td>20</td>
<td>I-29</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>47</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
<td>I-51</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>76</td>
<td>Range - Monitoring, Historic Transects</td>
<td>48</td>
<td>I-53</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>24</td>
<td>Hydrology - Elk Flat Washout</td>
<td>22</td>
<td>I-31</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>23</td>
<td>Wildlife - Bats Habitat Improvement</td>
<td>96</td>
<td>I-100</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>19</td>
<td>Range - Grazing Infrastructure</td>
<td>47</td>
<td>I-53</td>
</tr>
</tbody>
</table>

See 4/28/16 Errata following table for highlight cells
<table>
<thead>
<tr>
<th>Comment Number</th>
<th>Concern Group Number</th>
<th>Topic</th>
<th>Response Number</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>59</td>
<td>Botany - Hardwood Restoration</td>
<td>3</td>
<td>I-16</td>
</tr>
<tr>
<td>18</td>
<td>110</td>
<td>NEPA - Proposed Action, General Concerns</td>
<td>38</td>
<td>I-47</td>
</tr>
<tr>
<td>19</td>
<td>24</td>
<td>Hydrology - Elk Flat Washout</td>
<td>22</td>
<td>I-31</td>
</tr>
<tr>
<td>21</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
</tr>
<tr>
<td>22</td>
<td>23</td>
<td>Wildlife - Bats Habitat Improvement</td>
<td>96</td>
<td>I-100</td>
</tr>
<tr>
<td>23</td>
<td>120</td>
<td>Botany - Survey &amp; Manage, Fungi</td>
<td>7</td>
<td>I-20</td>
</tr>
<tr>
<td>24</td>
<td>24</td>
<td>Hydrology - Elk Flat Washout</td>
<td>22</td>
<td>I-31</td>
</tr>
<tr>
<td>25</td>
<td>28</td>
<td>Hydrology - Create Ponds</td>
<td>20</td>
<td>I-29</td>
</tr>
<tr>
<td>27</td>
<td>18</td>
<td>Range - Close Allotments</td>
<td>46</td>
<td>I-52</td>
</tr>
<tr>
<td>28</td>
<td>19</td>
<td>Range - Grazing Infrastructure</td>
<td>47</td>
<td>I-53</td>
</tr>
<tr>
<td>29</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
</tr>
<tr>
<td>31</td>
<td>18</td>
<td>Range - Close Allotments</td>
<td>46</td>
<td>I-52</td>
</tr>
<tr>
<td>32</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
</tr>
<tr>
<td>33</td>
<td>30</td>
<td>Wildlife - Gen Wildlife Concerns</td>
<td>97</td>
<td>I-100</td>
</tr>
<tr>
<td>34</td>
<td>86</td>
<td>Administration - KV Projects and Funds</td>
<td>1</td>
<td>I-15</td>
</tr>
<tr>
<td>35</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
</tr>
<tr>
<td>36</td>
<td>59</td>
<td>Botany - Hardwood Restoration</td>
<td>3</td>
<td>I-16</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>NEPA - Requests for Info and Letter Confirmation</td>
<td>42</td>
<td>I-50</td>
</tr>
<tr>
<td>3</td>
<td>130</td>
<td>Silviculture - LSR Consistency, LSOG, Effects to</td>
<td>57</td>
<td>I-62</td>
</tr>
<tr>
<td>4</td>
<td>103</td>
<td>Silviculture - Diameter Limits and LSR, RR, and CH</td>
<td>52</td>
<td>I-56</td>
</tr>
<tr>
<td>5</td>
<td>113</td>
<td>Silviculture - LSR Consistency, Risk Reduction</td>
<td>58</td>
<td>I-64</td>
</tr>
<tr>
<td>6</td>
<td>53</td>
<td>Wildlife - Habitat Impacts, Late-Successional</td>
<td>102</td>
<td>I-105</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
<td>I-55</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
<td>I-55</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
<td>I-55</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
<td>I-55</td>
</tr>
<tr>
<td>11</td>
<td>14</td>
<td>Silviculture - Size Classes and Tree Selection</td>
<td>73</td>
<td>I-77</td>
</tr>
<tr>
<td>12</td>
<td>14</td>
<td>Silviculture - Size Classes and Tree Selection</td>
<td>73</td>
<td>I-77</td>
</tr>
<tr>
<td>13</td>
<td>137</td>
<td>Wildlife - NSO, Diameter Limits</td>
<td>118</td>
<td>I-128</td>
</tr>
<tr>
<td>14</td>
<td>111</td>
<td>Wildlife - NSO/Fisher, Large Tree Retention</td>
<td>150</td>
<td>I-168</td>
</tr>
<tr>
<td>15</td>
<td>58</td>
<td>NEPA - Proposed Action, WA Recommendations, MFEA</td>
<td>40</td>
<td>I-49</td>
</tr>
<tr>
<td>16</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
<td>I-79</td>
</tr>
<tr>
<td>17</td>
<td>175</td>
<td>Wildlife - NSO, Connectivity</td>
<td>113</td>
<td>I-121</td>
</tr>
<tr>
<td>18</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
<td>I-103</td>
</tr>
<tr>
<td>Comment/Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>4, contin.</td>
<td>19</td>
<td>133</td>
<td>Silviculture - Large Tree and Snag Retention</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>12</td>
<td>Silviculture - Disease Effects</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>99</td>
<td>Hydrology - Roads and Flowpaths in RR</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>27</td>
<td>Transportation - Close FTS Roads</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>29</td>
<td>Soils - Timber Harvest Impacts, NFMA Consistency</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>138</td>
<td>Silviculture - Retention of Large Trees</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>27</td>
<td>Transportation - Close FTS Roads</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>63</td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>27</td>
<td>Transportation - Close FTS Roads</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>20</td>
<td>Soils - Road Impacts to Soils and Other Resources</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>51</td>
<td>NEPA - Cumulative effects</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>139</td>
<td>Silviculture - Concentrate on Young Trees</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>6</td>
<td>Wildlife - Migratory Birds, Effects</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>64</td>
<td>Wildlife - Migratory Birds</td>
<td>106</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>6</td>
<td>Wildlife - Migratory Birds, Effects</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>63</td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>16</td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>82</td>
<td>Soils - Existing Condition Information</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>29</td>
<td>Soils - Timber Harvest Impacts, NFMA Consistency</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>16</td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>16</td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>55</td>
<td>Fire and Fuels - Manual Piling Alternative</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>16</td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>134</td>
<td>Fire and Fuels - NFMA Compliance, Piling</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>16</td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>15</td>
<td>Hydrology - Project Actions in Riparian Reserves</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>53</td>
<td>20</td>
<td>Soils - Road Impacts to Soils and Other Resources</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>7</td>
<td>Wildlife - Road Impacts</td>
<td>153</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>7</td>
<td>Wildlife - Road Impacts</td>
<td>153</td>
</tr>
<tr>
<td></td>
<td>57</td>
<td>15</td>
<td>Hydrology - Project Actions in Riparian Reserves</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>58</td>
<td>125</td>
<td>Hydrology - Riparian Reserves, Thinning, ACS</td>
<td>27</td>
</tr>
<tr>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
<td>Page Number</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>4, contin.</td>
<td>59</td>
<td>Hydrology - Riparian Reserves, Thinning</td>
<td>26</td>
<td>I-36</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>Hydrology - Riparian Reserves, Thinning</td>
<td>26</td>
<td>I-36</td>
</tr>
<tr>
<td></td>
<td>61</td>
<td>Hydrology - Cumulative Watershed Effects, ERA</td>
<td>21</td>
<td>I-30</td>
</tr>
<tr>
<td></td>
<td>62</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
<td>I-51</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>Silviculture - Insects and Disease Effects</td>
<td>54</td>
<td>I-60</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>Silviculture - Insects and Disease Effects</td>
<td>54</td>
<td>I-60</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>Silviculture - Insects and Disease Effects</td>
<td>54</td>
<td>I-60</td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>Silviculture - Disease Effects</td>
<td>53</td>
<td>I-58</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
<td>I-151</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>Wildlife - NSO RRP</td>
<td>147</td>
<td>I-164</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>Hydrology - Project Actions in Riparian Reserves</td>
<td>24</td>
<td>I-33</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>Soils - Road Impacts to Soils and Other Resources</td>
<td>88</td>
<td>I-93</td>
</tr>
<tr>
<td></td>
<td>73</td>
<td>Silviculture - Salvage Adaptive Management</td>
<td>72</td>
<td>I-77</td>
</tr>
<tr>
<td></td>
<td>74</td>
<td>Silviculture - Disease Effects</td>
<td>53</td>
<td>I-58</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>Wildlife - NSO RRP</td>
<td>147</td>
<td>I-164</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>Silviculture - Thinning, Species Diversity</td>
<td>75</td>
<td>I-81</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>Silviculture - Thinning, Salvage Only Suggestion</td>
<td>76</td>
<td>I-81</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>Silviculture - Reforestation Proposed Action</td>
<td>70</td>
<td>I-76</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>Soils - Coarse Woody Debris and Soil Biota</td>
<td>85</td>
<td>I-88</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>Fire and Fuels - Fire Resiliency, Fuel Loading</td>
<td>11</td>
<td>I-23</td>
</tr>
<tr>
<td></td>
<td>81</td>
<td>Fire and Fuels - Fire Break Suggested Action</td>
<td>10</td>
<td>I-22</td>
</tr>
<tr>
<td></td>
<td>82</td>
<td>Silviculture - Thinning Recommendations</td>
<td>77</td>
<td>I-81</td>
</tr>
<tr>
<td></td>
<td>83</td>
<td>Silviculture - Thinning, Species Diversity</td>
<td>75</td>
<td>I-81</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>Silviculture - Salvage Adaptive Management</td>
<td>72</td>
<td>I-77</td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>Soils - Coarse Woody Debris and Soil Biota</td>
<td>85</td>
<td>I-88</td>
</tr>
<tr>
<td></td>
<td>86</td>
<td>Fire and Fuels - Fire Resiliency, Fuel Loading</td>
<td>11</td>
<td>I-23</td>
</tr>
<tr>
<td></td>
<td>87</td>
<td>Fire and Fuels - Fire Break Suggested Action</td>
<td>10</td>
<td>I-22</td>
</tr>
<tr>
<td></td>
<td>88</td>
<td>Silviculture - Thinning, Salvage Only Suggestion</td>
<td>76</td>
<td>I-81</td>
</tr>
<tr>
<td></td>
<td>89</td>
<td>Silviculture - Reforestation Proposed Action</td>
<td>70</td>
<td>I-76</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>Soils - Coarse Woody Debris and Soil Biota</td>
<td>85</td>
<td>I-88</td>
</tr>
<tr>
<td></td>
<td>91</td>
<td>Fire and Fuels - Fire Resiliency, Fuel Loading</td>
<td>11</td>
<td>I-23</td>
</tr>
<tr>
<td></td>
<td>92</td>
<td>Fire and Fuels - Fire Break Suggested Action</td>
<td>10</td>
<td>I-22</td>
</tr>
<tr>
<td></td>
<td>93</td>
<td>Silviculture - Thinning, Salvage Only Suggestion</td>
<td>76</td>
<td>I-81</td>
</tr>
<tr>
<td></td>
<td>94</td>
<td>Silviculture - Reforestation Proposed Action</td>
<td>70</td>
<td>I-76</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>Soils - Coarse Woody Debris and Soil Biota</td>
<td>85</td>
<td>I-88</td>
</tr>
<tr>
<td></td>
<td>96</td>
<td>Fire and Fuels - Fire Resiliency, Fuel Loading</td>
<td>11</td>
<td>I-23</td>
</tr>
<tr>
<td></td>
<td>97</td>
<td>Fire and Fuels - Fire Break Suggested Action</td>
<td>10</td>
<td>I-22</td>
</tr>
<tr>
<td></td>
<td>98</td>
<td>Silviculture - Thinning, Salvage Only Suggestion</td>
<td>76</td>
<td>I-81</td>
</tr>
<tr>
<td></td>
<td>99</td>
<td>Silviculture - Reforestation Proposed Action</td>
<td>70</td>
<td>I-76</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>Soils - Coarse Woody Debris and Soil Biota</td>
<td>85</td>
<td>I-88</td>
</tr>
<tr>
<td>Comment/Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------</td>
<td>----------------------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>8 contin.</td>
<td>9</td>
<td>26</td>
<td>Transportation - Public Road Access</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>88</td>
<td>NEPA - Public Involvement</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>26</td>
<td>Transportation - Public Road Access</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>109</td>
<td>Hydrology - Flooding on Roads/Trails</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>140</td>
<td>Botany - Mushroom Habitat Effects from Burning</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>26</td>
<td>Transportation - Public Road Access</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>80</td>
<td>Climate Change - Greenhouse Gas Reductions</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>128</td>
<td>Climate Change - Reforestation Species, Resilience</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>167</td>
<td>Heritage Resources - Tribal Consultation</td>
<td>18</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>141</td>
<td>NEPA - No Comment</td>
<td>42</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>142</td>
<td>Wildlife - NSO, Ponderosa Pine</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>65</td>
<td>Wildlife - NSO RRP</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>58</td>
<td>NEPA - Proposed Action, WA Recommendations, MFEA</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>135</td>
<td>Fire and Fuels - Fuel Ladders</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>169</td>
<td>NEPA - LSR Desired Condition</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>106</td>
<td>Wildlife - NSO, Habitat Baseline</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>170</td>
<td>Wildlife - NSO, Habitat, Foraging, Hardwoods</td>
<td>129</td>
</tr>
<tr>
<td>Comment Number</td>
<td>Comment Group Number</td>
<td>Topic</td>
<td>Response Number</td>
<td>Page Number</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------</td>
<td>-------</td>
<td>-----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>14</td>
<td>171</td>
<td>Silviculture - LSR, DC, Stand Density</td>
<td>59</td>
<td>I-65</td>
</tr>
<tr>
<td>15</td>
<td>12</td>
<td>Silviculture - Disease Effects</td>
<td>53</td>
<td>I-58</td>
</tr>
<tr>
<td>16</td>
<td>175</td>
<td>Wildlife - NSO, Connectivity</td>
<td>113</td>
<td>I-121</td>
</tr>
<tr>
<td>17</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>123</td>
<td>I-133</td>
</tr>
<tr>
<td>18</td>
<td>136</td>
<td>Fire and Fuels - Fuel Loading Determinations</td>
<td>13</td>
<td>I-23</td>
</tr>
<tr>
<td>19</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
<td>I-79</td>
</tr>
<tr>
<td>20</td>
<td>178</td>
<td>Hydrology - Riparian Reserves, LSRA Consistency</td>
<td>25</td>
<td>I-34</td>
</tr>
<tr>
<td>21</td>
<td>14</td>
<td>Silviculture - Size Classes and Tree Selection</td>
<td>73</td>
<td>I-77</td>
</tr>
<tr>
<td>22</td>
<td>87</td>
<td>Silviculture - Plantations, Existing</td>
<td>67</td>
<td>I-74</td>
</tr>
<tr>
<td>23</td>
<td>74</td>
<td>Transportation - Road Density</td>
<td>90</td>
<td>I-96</td>
</tr>
<tr>
<td>24</td>
<td>73</td>
<td>Transportation - Temporary Roads, Road Opening</td>
<td>94</td>
<td>I-98</td>
</tr>
<tr>
<td>25</td>
<td>175</td>
<td>Wildlife - NSO, Connectivity</td>
<td>113</td>
<td>I-121</td>
</tr>
<tr>
<td>26</td>
<td>50</td>
<td>Botany - Elk Flat Baseline, Boletus Habitat</td>
<td>2</td>
<td>I-16</td>
</tr>
<tr>
<td>27</td>
<td>47</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
<td>I-51</td>
</tr>
<tr>
<td>28</td>
<td>143</td>
<td>Silviculture - Baseline Conditions</td>
<td>82</td>
<td>I-86</td>
</tr>
<tr>
<td>29</td>
<td>90</td>
<td>NEPA - Proposed Action, MFEA Consistency</td>
<td>39</td>
<td>I-48</td>
</tr>
<tr>
<td>31</td>
<td>144</td>
<td>Silviculture - LSRA Consistency</td>
<td>63</td>
<td>I-70</td>
</tr>
<tr>
<td>32</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>130</td>
<td>I-143</td>
</tr>
<tr>
<td>33</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>128</td>
<td>I-140</td>
</tr>
<tr>
<td>34</td>
<td>114</td>
<td>Silviculture - Vegetation Diversity, Old Growth</td>
<td>81</td>
<td>I-86</td>
</tr>
<tr>
<td>36</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>130</td>
<td>I-143</td>
</tr>
<tr>
<td>37</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>105</td>
<td>I-109</td>
</tr>
<tr>
<td>38</td>
<td>119</td>
<td>Silviculture - Vegetation Diversity, LSOG-Mature</td>
<td>80</td>
<td>I-84</td>
</tr>
<tr>
<td>39</td>
<td>44</td>
<td>Silviculture - Vegetation Diversity Compliance, LS</td>
<td>79</td>
<td>I-83</td>
</tr>
<tr>
<td>40</td>
<td>41</td>
<td>Wildlife - NSO, Activity Center Protection, RA 25</td>
<td>113</td>
<td>I-121</td>
</tr>
<tr>
<td>41</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>143</td>
<td>I-160</td>
</tr>
<tr>
<td>42</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>143</td>
<td>I-160</td>
</tr>
<tr>
<td>43</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>143</td>
<td>I-160</td>
</tr>
<tr>
<td>44</td>
<td>42</td>
<td>Wildlife - NSO, Habitat, Dispersal</td>
<td>133</td>
<td>I-146</td>
</tr>
<tr>
<td>45</td>
<td>92</td>
<td>Wildlife - NSO, ESA Status</td>
<td>126</td>
<td>I-137</td>
</tr>
<tr>
<td>46</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>142</td>
<td>I-159</td>
</tr>
<tr>
<td>47</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>128</td>
<td>I-140</td>
</tr>
<tr>
<td>48</td>
<td>102</td>
<td>Wildlife - NSO, Habitat, Critical Habitat</td>
<td>132</td>
<td>I-146</td>
</tr>
<tr>
<td>49</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>143</td>
<td>I-160</td>
</tr>
<tr>
<td>50</td>
<td>42</td>
<td>Wildlife - NSO, Habitat, Dispersal</td>
<td>133</td>
<td>I-146</td>
</tr>
<tr>
<td>51</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>120</td>
<td>I-130</td>
</tr>
<tr>
<td>Comment/Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>13, contin.</td>
<td>52 145</td>
<td></td>
<td>Wildlife - NSO Hardwoods and Pine</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>53 37</td>
<td></td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>54 146</td>
<td></td>
<td>Compliance - REO Consistency Review, LSR</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>55 126</td>
<td></td>
<td>Wildlife - LSR Consistency, Habitat Needs</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>56 122</td>
<td></td>
<td>Silviculture - LSRA Consistency</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>59 181</td>
<td></td>
<td>Wildlife - NSO, Habitat, Post-Fire Use</td>
<td>139</td>
</tr>
<tr>
<td></td>
<td>61 124</td>
<td></td>
<td>Wildlife - NSO, ESA and Best Available Science</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>64 181</td>
<td></td>
<td>Wildlife - NSO, Habitat, Post-Fire Use</td>
<td>139</td>
</tr>
<tr>
<td></td>
<td>65 65</td>
<td></td>
<td>Wildlife - NSO RRP</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>66 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>67 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>68 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>69 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>70 34</td>
<td></td>
<td>Wildlife - NSO, Post Fire Habitat Use</td>
<td>146</td>
</tr>
<tr>
<td></td>
<td>71 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>72 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>73 147</td>
<td></td>
<td>Wildlife - NSO Protection of Mid Seral Forests</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>74 43</td>
<td></td>
<td>Wildlife - NSO, Demographic Information</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>75 148</td>
<td></td>
<td>Wildlife - NSO, Barred Owl Encounters</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>76 72</td>
<td></td>
<td>Wildlife - NSO, Effect Determination Standard</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>77 127</td>
<td></td>
<td>Wildlife - NSO, NRF Habitat, Group Selections</td>
<td>144</td>
</tr>
<tr>
<td></td>
<td>78 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>79 95</td>
<td></td>
<td>Wildlife - NSO, Habitat, Recommendations</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>80 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>81 181</td>
<td></td>
<td>Wildlife - NSO, Habitat, Post-Fire Use</td>
<td>139</td>
</tr>
<tr>
<td></td>
<td>82 60</td>
<td></td>
<td>Fire and Fuels - High Severity Fire Risk Trends</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>83 34</td>
<td></td>
<td>Wildlife - NSO, Post Fire Habitat Use</td>
<td>146</td>
</tr>
<tr>
<td></td>
<td>84 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>85 149</td>
<td></td>
<td>Wildlife - NSO, Barred Owl Competition</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>86 77</td>
<td></td>
<td>Wildlife - NSO, Prey Species, Effects</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td>87 38</td>
<td></td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
</tr>
<tr>
<td>Comment/ Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>13, contin.</td>
<td>88</td>
<td>96</td>
<td>Wildlife - NSO, Habitat, Mature Forest, Disturbance</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td>92</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>93</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>94</td>
<td>95</td>
<td>Wildlife - NSO, Habitat, Recommendations</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>98</td>
<td>Wildlife - NSO, Recovery Action 11</td>
<td>151</td>
</tr>
<tr>
<td></td>
<td>96</td>
<td>150</td>
<td>Wildlife - Barred Owl Protocols</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>97</td>
<td>41</td>
<td>Wildlife - NSO, Activity Center Protection, RA 25</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>98</td>
<td>65</td>
<td>Wildlife - NSO RRP</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>99</td>
<td>151</td>
<td>Silviculture - LSR Species Diversity Compliance</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>112</td>
<td>Wildlife - Large Tree/Snag Retention Long-Term</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>101</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>102</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>103</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>104</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>106</td>
<td>42</td>
<td>Wildlife - NSO, Habitat, Dispersal</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>107</td>
<td>57</td>
<td>Silviculture - Marking Supervision</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>108</td>
<td>71</td>
<td>Wildlife - NSO Cumulative Effects Methodology</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>109</td>
<td>71</td>
<td>Wildlife - NSO Cumulative Effects Methodology</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>110</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>111</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>112</td>
<td>176</td>
<td>Wildlife - NSO, Habitat, LSR, NWFP, ESA Compliance</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>113</td>
<td>41</td>
<td>Wildlife - NSO, Activity Center Protection, RA 25</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>114</td>
<td>75</td>
<td>Wildlife - NSO, Habitat, Capable</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>115</td>
<td>152</td>
<td>Silviculture - Ponderosa Pine and Mixed Conifer</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>116</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>117</td>
<td>154</td>
<td>Silviculture - Ponderosa Pine</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>118</td>
<td>163</td>
<td>Silviculture - Leave Tree Selection</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>119</td>
<td>155</td>
<td>Wildlife - NSO Detection - New Alternative</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>123</td>
<td>Silviculture - Tree Selection, LSR Consistency</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>121</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>122</td>
<td>78</td>
<td>Wildlife - Habitat, Underburning Effects</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>123</td>
<td>52</td>
<td>Wildlife - Gray Wolf, Limited Operating Period</td>
<td>106</td>
</tr>
<tr>
<td></td>
<td>124</td>
<td>52</td>
<td>Wildlife - Gray Wolf, Limited Operating Period</td>
<td>106</td>
</tr>
<tr>
<td></td>
<td>126</td>
<td>44</td>
<td>Silviculture - Vegetation Diversity Compliance, LS</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>127</td>
<td>44</td>
<td>Silviculture - Vegetation Diversity Compliance, LS</td>
<td>79</td>
</tr>
<tr>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
<td>Page Number</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>128</td>
<td>29</td>
<td>Soils - Timber Harvest Impacts, NFMA Consistency</td>
<td>89</td>
<td>I-95</td>
</tr>
<tr>
<td>129</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>129</td>
<td>I-142</td>
</tr>
<tr>
<td>130</td>
<td>66</td>
<td>NEPA - General Opposition, Economics</td>
<td>35</td>
<td>I-44</td>
</tr>
<tr>
<td>131</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>130</td>
<td>I-143</td>
</tr>
<tr>
<td>132</td>
<td>172</td>
<td>Silviculture - LSR, Ponderosa Pine</td>
<td>60</td>
<td>I-66</td>
</tr>
<tr>
<td>133</td>
<td>4</td>
<td>NEPA - Decision Process, Regulatory Compliance</td>
<td>31</td>
<td>I-43</td>
</tr>
<tr>
<td>134</td>
<td>32</td>
<td>NEPA - General Opposition to Project</td>
<td>34</td>
<td>I-44</td>
</tr>
<tr>
<td>135</td>
<td>156</td>
<td>NEPA - Revision and Comment Period</td>
<td>43</td>
<td>I-50</td>
</tr>
<tr>
<td>136</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>105</td>
<td>I-109</td>
</tr>
<tr>
<td>137</td>
<td>63</td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>104</td>
<td>I-108</td>
</tr>
<tr>
<td>138</td>
<td>182</td>
<td>Wildlife - NSO, Post-Fire Habitat</td>
<td>147</td>
<td>I-164</td>
</tr>
<tr>
<td>139</td>
<td>180</td>
<td>NEPA - Post-fire Salvage, Outside the Scope</td>
<td>37</td>
<td>I-47</td>
</tr>
<tr>
<td>141</td>
<td>158</td>
<td>Silviculture - Capability</td>
<td>49</td>
<td>I-53</td>
</tr>
<tr>
<td>142</td>
<td>159</td>
<td>Hydrology - Ash Creek Planning Watershed</td>
<td>19</td>
<td>I-29</td>
</tr>
<tr>
<td>143</td>
<td>47</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
<td>I-51</td>
</tr>
<tr>
<td>145</td>
<td>173</td>
<td>Wildlife - NSO, Habitat, MFEA Recommendations</td>
<td>137</td>
<td>I-151</td>
</tr>
<tr>
<td>146</td>
<td>125</td>
<td>Hydrology - Riparian Reserves, Thinning, ACS</td>
<td>27</td>
<td>I-38</td>
</tr>
<tr>
<td>148</td>
<td>50</td>
<td>Botany - Elk Flat Baseline, Boletus Habitat</td>
<td>2</td>
<td>I-16</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>Wildlife - NSO Prey</td>
<td>148</td>
<td>I-166</td>
</tr>
<tr>
<td>14</td>
<td>3</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>130</td>
<td>I-143</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>117</td>
<td>I-126</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>Wildlife - NSO Determination, BA</td>
<td>122</td>
<td>I-130</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>117</td>
<td>I-126</td>
</tr>
<tr>
<td>14</td>
<td>7</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>120</td>
<td>I-130</td>
</tr>
<tr>
<td>14</td>
<td>8</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>117</td>
<td>I-126</td>
</tr>
<tr>
<td>14</td>
<td>9</td>
<td>Wildlife - NSO, Barred Owl Interactions</td>
<td>116</td>
<td>I-126</td>
</tr>
<tr>
<td>14</td>
<td>10</td>
<td>Wildlife - NSO, Barred Owl Interactions</td>
<td>116</td>
<td>I-126</td>
</tr>
<tr>
<td>14</td>
<td>12</td>
<td>Wildlife - NSO Prey</td>
<td>148</td>
<td>I-166</td>
</tr>
<tr>
<td>14</td>
<td>13</td>
<td>Wildlife - NSO, Barred Owl Interactions</td>
<td>116</td>
<td>I-126</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>Wildlife - NSO, Habitat, Post-Fire</td>
<td>138</td>
<td>I-152</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
<td>Wildlife - NSO, Habitat, Post-Fire</td>
<td>138</td>
<td>I-152</td>
</tr>
<tr>
<td>14</td>
<td>16</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>120</td>
<td>I-130</td>
</tr>
<tr>
<td>14</td>
<td>17</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>120</td>
<td>I-130</td>
</tr>
<tr>
<td>14</td>
<td>18</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>117</td>
<td>I-126</td>
</tr>
<tr>
<td>14</td>
<td>19</td>
<td>Wildlife - NSO, Habitat, Recommendations</td>
<td>140</td>
<td>I-155</td>
</tr>
<tr>
<td>Comment/Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>--------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>14, contin.</td>
<td>20</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>162</td>
<td>Wildlife - NSO Short-term Survival</td>
<td>153</td>
</tr>
<tr>
<td>Commenter /Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>--------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>118</td>
<td>NEPA - General</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>25</td>
<td>Socioeconomics - Support for Project</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8</td>
<td>NEPA - Requests for Info and Letter Confirmation</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>49</td>
<td>NEPA - Decision Timing</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>30</td>
<td>Wildlife - Gen Wildlife Concerns</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>59</td>
<td>Botany - Hardwood Restoration</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>120</td>
<td>Botany - Survey &amp; Manage, Fungi</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>63</td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>18</td>
<td>Range - Close Allotments</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>31</td>
<td>Wildlife - Poaching Enforcement</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>28</td>
<td>Hydrology - Create Ponds</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>47</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>76</td>
<td>Range - Monitoring, Historic Transects</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>24</td>
<td>Hydrology - Elk Flat Washout</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>23</td>
<td>Wildlife - Bats Habitat Improvement</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>19</td>
<td>Range - Grazing Infrastructure</td>
<td>47</td>
</tr>
<tr>
<td>Commenter /Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
<td>----------------------</td>
<td>--------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>3, contin.</td>
<td>17</td>
<td>59</td>
<td>Botany - Hardwood Restoration</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>110</td>
<td>NEPA - Proposed Action, General Concerns</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>24</td>
<td>Hydrology - Elk Flat Washout</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>23</td>
<td>Wildlife - Bats Habitat Improvement</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>120</td>
<td>Botany - Survey &amp; Manage, Fungi</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>24</td>
<td>Hydrology - Elk Flat Washout</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>28</td>
<td>Hydrology - Create Ponds</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>18</td>
<td>Range - Close Allotments</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>19</td>
<td>Range - Grazing Infrastructure</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>18</td>
<td>Range - Close Allotments</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>30</td>
<td>Wildlife - Gen Wildlife Concerns</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>86</td>
<td>Administration - KV Projects and Funds</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>17</td>
<td>Range - Cattle Grazing</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>59</td>
<td>Botany - Hardwood Restoration</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1</td>
<td>NEPA - Requests for Info and Letter Confirmation</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8</td>
<td>NEPA - General Requests</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>130</td>
<td>Silviculture - LSR Consistency, LSOG, Effects to</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>103</td>
<td>Silviculture - Diameter Limits and LSR, RR, and CH</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>113</td>
<td>Silviculture - LSR Consistency, Risk Reduction</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>53</td>
<td>Wildlife - Habitat Impacts, Late-Succesional</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>2</td>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>14</td>
<td>Silviculture - Size Classes and Tree Selection</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>14</td>
<td>Silviculture - Size Classes and Tree Selection</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>137</td>
<td>Wildlife - NSO, Diameter Limits</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>111</td>
<td>Wildlife - NSO/Fisher, Large Tree Retention</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>58</td>
<td>NEPA - Proposed Action, WA Recommendations, MFEA</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>175</td>
<td>Wildlife - NSO, Connectivity</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
</tr>
<tr>
<td>Commenter / Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>19</td>
<td>133</td>
<td></td>
<td>Silviculture - Large Tree and Snag Retention</td>
<td>55</td>
</tr>
<tr>
<td>20</td>
<td>12</td>
<td></td>
<td>Silviculture - Disease Effects</td>
<td>53</td>
</tr>
<tr>
<td>21</td>
<td>99</td>
<td></td>
<td>Hydrology - Roads and Flowpaths in RR</td>
<td>28</td>
</tr>
<tr>
<td>22</td>
<td>27</td>
<td></td>
<td>Transportation - Close FTS Roads</td>
<td>92</td>
</tr>
<tr>
<td>23</td>
<td>9</td>
<td></td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
</tr>
<tr>
<td>24</td>
<td>29</td>
<td></td>
<td>Soils - Timber Harvest Impacts, NFMA Consistency</td>
<td>89</td>
</tr>
<tr>
<td>25</td>
<td>138</td>
<td></td>
<td>Silviculture - Retention of Large Trees</td>
<td>71</td>
</tr>
<tr>
<td>26</td>
<td>27</td>
<td></td>
<td>Transportation - Close FTS Roads</td>
<td>92</td>
</tr>
<tr>
<td>27</td>
<td>63</td>
<td></td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
</tr>
<tr>
<td>28</td>
<td>27</td>
<td></td>
<td>Transportation - Close FTS Roads</td>
<td>92</td>
</tr>
<tr>
<td>29</td>
<td>20</td>
<td></td>
<td>Soils - Road Impacts to Soils and Other Resources</td>
<td>88</td>
</tr>
<tr>
<td>30</td>
<td>51</td>
<td></td>
<td>NEPA - Cumulative effects</td>
<td>29</td>
</tr>
<tr>
<td>31</td>
<td>9</td>
<td></td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
</tr>
<tr>
<td>32</td>
<td>21</td>
<td></td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td>33</td>
<td>21</td>
<td></td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td>34</td>
<td>139</td>
<td></td>
<td>Silviculture - Concentrate on Young Trees</td>
<td>50</td>
</tr>
<tr>
<td>35</td>
<td>6</td>
<td></td>
<td>Wildlife - Migratory Birds, Effects</td>
<td>107</td>
</tr>
<tr>
<td>36</td>
<td>64</td>
<td></td>
<td>Wildlife - Migratory Birds</td>
<td>106</td>
</tr>
<tr>
<td>37</td>
<td>6</td>
<td></td>
<td>Wildlife - Migratory Birds, Effects</td>
<td>107</td>
</tr>
<tr>
<td>38</td>
<td>63</td>
<td></td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
</tr>
<tr>
<td>40</td>
<td>16</td>
<td></td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td>41</td>
<td>82</td>
<td></td>
<td>Soils - Existing Condition Information</td>
<td>86</td>
</tr>
<tr>
<td>42</td>
<td>29</td>
<td></td>
<td>Soils - Timber Harvest Impacts, NFMA Consistency</td>
<td>89</td>
</tr>
<tr>
<td>44</td>
<td>16</td>
<td></td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td>45</td>
<td>16</td>
<td></td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td>48</td>
<td>16</td>
<td></td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td>49</td>
<td>134</td>
<td></td>
<td>Fire and Fuels - NFMA Compliance, Piling</td>
<td>16</td>
</tr>
<tr>
<td>50</td>
<td>16</td>
<td></td>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
</tr>
<tr>
<td>51</td>
<td>15</td>
<td></td>
<td>Hydrology - Project Actions in Riparian Reserves</td>
<td>24</td>
</tr>
<tr>
<td>53</td>
<td>20</td>
<td></td>
<td>Soils - Road Impacts to Soils and Other Resources</td>
<td>88</td>
</tr>
<tr>
<td>54</td>
<td>7</td>
<td></td>
<td>Wildlife - Road Impacts</td>
<td>153</td>
</tr>
<tr>
<td>55</td>
<td>7</td>
<td></td>
<td>Wildlife - Road Impacts</td>
<td>153</td>
</tr>
<tr>
<td>57</td>
<td>15</td>
<td></td>
<td>Hydrology - Project Actions in Riparian Reserves</td>
<td>24</td>
</tr>
<tr>
<td>58</td>
<td>125</td>
<td></td>
<td>Hydrology - Riparian Reserves, Thinning, ACS</td>
<td>27</td>
</tr>
<tr>
<td>Commenter /Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
<td>----------------------</td>
<td>-----------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>4, contin.</td>
<td>59</td>
<td>100</td>
<td>Hydrology - Riparian Reserves, Thinning</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>100</td>
<td>Hydrology - Riparian Reserves, Thinning</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>61</td>
<td>81</td>
<td>Hydrology - Cumulative Watershed Effects, ERA</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>62</td>
<td>47</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>10</td>
<td>Silviculture - Insects and Disease Effects</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>10</td>
<td>Silviculture - Insects and Disease Effects</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>10</td>
<td>Silviculture - Insects and Disease Effects</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>12</td>
<td>Silviculture - Disease Effects</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>65</td>
<td>Wildlife - NSO RRP</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>15</td>
<td>Hydrology - Project Actions in Riparian Reserves</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>20</td>
<td>Soils - Road Impacts to Soils and Other Resources</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>73</td>
<td>79</td>
<td>Silviculture - Salvage Adaptive Management</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>74</td>
<td>185</td>
<td>Soils - Coarse Woody Debris and Soil Biota</td>
<td>85</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>8</td>
<td>NEPA - Requests for Info and Letter Confirmation</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5</td>
<td>Fire and Fuels - Fire Resiliency, Fuel Loading</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>25</td>
<td>Socioeconomics - Support for Project</td>
<td>84</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>5</td>
<td>Fire and Fuels - Fire Resiliency, Fuel Loading</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>84</td>
<td>Fire and Fuels - Fire Break Suggested Action</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>83</td>
<td>Silviculture - Thinning Recommendations</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>105</td>
<td>Silviculture - Thinning, Species Diversity</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>68</td>
<td>Wildlife - NSO/Goshawk, Habitat Availability</td>
<td>151</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>104</td>
<td>Silviculture - Thinning, Salvage Only Suggestion</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>89</td>
<td>Silviculture - Reforestation Proposed Action</td>
<td>70</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>129</td>
<td>Transportation - Add UA Routes, Mushroom Access</td>
<td>91</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>61</td>
<td>Socio-Economics - Mushroom Gathering</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>26</td>
<td>Transportation - Public Road Access</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>183</td>
<td>Wildlife-General Comment, New Alternative</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>61</td>
<td>Socio-Economics - Mushroom Gathering</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td>Commenter /Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>8 contin.</td>
<td>9</td>
<td>26</td>
<td>Transportation - Public Road Access</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>88</td>
<td>NEPA - Public Involvement</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>131</td>
<td>Botany, Mushroom Habitat</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>26</td>
<td>Transportation - Public Road Access</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>109</td>
<td>Hydrology - Flooding on Roads/Trails</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>140</td>
<td>Botany - Mushroom Habitat Effects from Burning</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>26</td>
<td>Transportation - Public Road Access</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>121</td>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>80</td>
<td>Climate Change - Greenhouse Gas Reductions</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>128</td>
<td>Climate Change - Reforestation Species, Resilience</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>167</td>
<td>Heritage Resources - Reforestation Species, Resilience</td>
<td>18</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>8</td>
<td>NEPA - No Comment</td>
<td>42</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>184</td>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>142</td>
<td>Wildlife - NSO, Ponderosa Pine</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>65</td>
<td>Wildlife - NSO RRP</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>58</td>
<td>NEPA - Proposed Action, WA Recommendations, MFEA</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>135</td>
<td>Fire and Fuels - Fuel Ladders</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>46</td>
<td>Silviculture - LSRA Consistency, P&amp;N</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>169</td>
<td>NEPA - LSR Desired Condition</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>106</td>
<td>Wildlife - NSO, Habitat Baseline</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>170</td>
<td>Wildlife - NSO, Habitat, Foraging, Hardwoods</td>
<td>129</td>
</tr>
<tr>
<td>Commenter /Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>13, contin.</td>
<td>14</td>
<td>171</td>
<td>Silviculture - LSR, DC, Stand Density</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>12</td>
<td>Silviculture - Disease Effects</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>175</td>
<td>Wildlife - NSO, Connectivity</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>136</td>
<td>Fire and Fuels - Fuel Loading Determinations</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>178</td>
<td>Hydrology - Riparian Reserves, LSRA Consistency</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>14</td>
<td>Silviculture - Size Classes and Tree Selection</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>87</td>
<td>Silviculture - Plantations, Existing</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>74</td>
<td>Transportation - Road Density</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>73</td>
<td>Transportation - Temporary Roads, Road Opening</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>175</td>
<td>Wildlife - NSO, Connectivity</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>50</td>
<td>Botany - Elk Flat Baseline, Boletus Habitat</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>47</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>143</td>
<td>Silvicultre - Baseline Conditions</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>90</td>
<td>NEPA - Proposed Action, MFEA Consistency</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>144</td>
<td>Silviculture - LSRA Consistency</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>114</td>
<td>Silviculture - Vegetation Diversity, Old Growth</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>119</td>
<td>Silviculture - Vegetation Diversity, LSOG-Mature</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>44</td>
<td>Silviculture - Vegetation Diversity Compliance, LS</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>41</td>
<td>Wildlife - NSO, Activity Center Protection, RA 25</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>42</td>
<td>Wildlife - NSO, Habitat, Dispersal</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>92</td>
<td>Wildlife - NSO, ESA Status</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>102</td>
<td>Wildlife - NSO, Habitat, Critical Habitat</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>42</td>
<td>Wildlife - NSO, Habitat, Dispersal</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>51</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
</tr>
<tr>
<td>Commenter/Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>13, contin.</td>
<td>52</td>
<td>145</td>
<td>Wildlife - NSO Hardwoods and Pine</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td>53</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>54</td>
<td>146</td>
<td>Compliance - REO Consistency Review, LSR</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>126</td>
<td>Wildlife - LSR Consistency, Habitat Needs</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>122</td>
<td>Silviculture - LSRA Consistency</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>181</td>
<td>Wildlife - NSO, Habitat, Post-Fire Use</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>61</td>
<td>124</td>
<td>Wildlife - NSO, ESA and Best Available Science</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>181</td>
<td>Wildlife - NSO, Habitat, Post-Fire Use</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>65</td>
<td>Wildlife - NSO RRP</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>66</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>69</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>34</td>
<td>Wildlife - NSO, Post Fire Habitat Use</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>71</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>73</td>
<td>147</td>
<td>Wildlife - NSO Protection of Mid Seral Forests</td>
<td>145</td>
</tr>
<tr>
<td></td>
<td>74</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>148</td>
<td>Wildlife - NSO, Barred Owl Encounters</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>72</td>
<td>Wildlife - NSO, Effect Determination Standard</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>127</td>
<td>Wildlife - NSO, NRF Habitat, Group Selections</td>
<td>139</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>95</td>
<td>Wildlife - NSO, Habitat, Recommendations</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>81</td>
<td>181</td>
<td>Wildlife - NSO, Habitat, Post-Fire Use</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>82</td>
<td>60</td>
<td>Fire and Fuels - High Severity Fire Risk Trends</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>83</td>
<td>34</td>
<td>Wildlife - NSO, Post Fire Habitat Use</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>149</td>
<td>Wildlife - NSO, Barred Owl Competition</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>86</td>
<td>77</td>
<td>Wildlife - NSO, Prey Species, Effects</td>
<td>144</td>
</tr>
<tr>
<td></td>
<td>87</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td>Commenter /Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>13, contin.</td>
<td>88</td>
<td>96</td>
<td>Wildlife - NSO, Habitat, Mature Forest, Disturbance</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td>92</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>93</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>94</td>
<td>95</td>
<td>Wildlife - NSO, Habitat, Recommendations</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>98</td>
<td>Wildlife - NSO, Recovery Action 11</td>
<td>146</td>
</tr>
<tr>
<td></td>
<td>96</td>
<td>150</td>
<td>Wildlife - Barred Owl Protocols</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>97</td>
<td>41</td>
<td>Wildlife - NSO, Activity Center Protection, RA 25</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>98</td>
<td>65</td>
<td>Wildlife - NSO RRP</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>99</td>
<td>151</td>
<td>Silviculture - LSR Species Diversity Compliance</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>112</td>
<td>Wildlife - Large Tree/Snag Retention Long-Term</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>101</td>
<td>21</td>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>102</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>103</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>104</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>106</td>
<td>42</td>
<td>Wildlife - NSO, Habitat, Dispersal</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>107</td>
<td>57</td>
<td>Silviculture - Marking Supervision</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>108</td>
<td>71</td>
<td>Wildlife - NSO Cumulative Effects Methodology</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>109</td>
<td>71</td>
<td>Wildlife - NSO Cumulative Effects Methodology</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>110</td>
<td>36</td>
<td>Wildlife - NSO, Impacts to NSO Habitat</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>111</td>
<td>39</td>
<td>Wildlife - NSO Habitat Connectivity, LSRs, CH</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>112</td>
<td>176</td>
<td>Wildlife - NSO, Habitat, LSR, NWFP, ESA Compliance</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td>113</td>
<td>41</td>
<td>Wildlife - NSO, Activity Center Protection, RA 25</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>114</td>
<td>75</td>
<td>Wildlife - NSO, Habitat, Capable</td>
<td>126</td>
</tr>
<tr>
<td></td>
<td>115</td>
<td>152</td>
<td>Silviculture - Ponderosa Pine and Mixed Conifer</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>116</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>117</td>
<td>154</td>
<td>Silviculture - Ponderosa Pine</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>118</td>
<td>163</td>
<td>Silviculture - Leave Tree Selection</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>119</td>
<td>155</td>
<td>Wildlife - NSO Detection - New Alternative</td>
<td>116</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>123</td>
<td>Silviculture - Tree Selection, LSR Consistency</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>121</td>
<td>35</td>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>122</td>
<td>78</td>
<td>Wildlife - Habitat, Underburning Effects</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>123</td>
<td>52</td>
<td>Wildlife - Gray Wolf, Limited Operating Period</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>124</td>
<td>52</td>
<td>Wildlife - Gray Wolf, Limited Operating Period</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>126</td>
<td>44</td>
<td>Silviculture - Vegetation Diversity Compliance, LS</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>127</td>
<td>44</td>
<td>Silviculture - Vegetation Diversity Compliance, LS</td>
<td>79</td>
</tr>
<tr>
<td>Commenter /Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>-------</td>
<td>-----------------</td>
</tr>
<tr>
<td>13, contin.</td>
<td>128</td>
<td>29</td>
<td>Soils - Timber Harvest Impacts, NFMA Consistency</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>129</td>
<td>38</td>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>130</td>
<td>66</td>
<td>NEPA - General Opposition, Economics</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>131</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>132</td>
<td>172</td>
<td>Silviculture - LSR, Ponderosa Pine</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>133</td>
<td>4</td>
<td>NEPA - Decision Process, Regulatory Compliance</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>134</td>
<td>32</td>
<td>NEPA - General Opposition to Project</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>135</td>
<td>156</td>
<td>NEPA - Revision and Comment Period</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>136</td>
<td>9</td>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>137</td>
<td>63</td>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>138</td>
<td>182</td>
<td>Wildlife - NSO, Post-Fire Habitat</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>139</td>
<td>180</td>
<td>NEPA - Post-fire Salvage, Outside the Scope</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>141</td>
<td>158</td>
<td>Silviculture - Capability</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>142</td>
<td>159</td>
<td>Hydrology - Ash Creek Planning Watershed</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>143</td>
<td>47</td>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>145</td>
<td>173</td>
<td>Wildlife - NSO, Habitat, MFEA Recommendations</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td>146</td>
<td>125</td>
<td>Hydrology - Riparian Reserves, Thinning, ACS</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>148</td>
<td>50</td>
<td>Botany - Elk Flat Baseline, Boletus Habitat</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>70</td>
<td>Wildlife - NSO Prey</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>33</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>160</td>
<td>Wildlife - NSO Determination, BA</td>
<td>117</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>33</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>33</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>94</td>
<td>Wildlife - NSO, Barred Owl Interactions</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>94</td>
<td>Wildlife - NSO, Barred Owl Interactions</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>70</td>
<td>Wildlife - NSO Prey</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>94</td>
<td>Wildlife - NSO, Barred Owl Interactions</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>179</td>
<td>Wildlife - NSO, Habitat, Post-Fire</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>179</td>
<td>Wildlife - NSO, Habitat, Post-Fire</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>43</td>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>33</td>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>95</td>
<td>Wildlife - NSO, Habitat, Recommendations</td>
<td>135</td>
</tr>
<tr>
<td>Commenter/Letter Number</td>
<td>Comment Number</td>
<td>Concern Group Number</td>
<td>Topic</td>
<td>Response Number</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>--------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>14, contin.</td>
<td>20</td>
<td>37</td>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>162</td>
<td>Wildlife - NSO Short-term Survival</td>
<td>148</td>
</tr>
</tbody>
</table>
### Table Appendix I-3. Index to Responses by Concern Topic

<table>
<thead>
<tr>
<th>Label</th>
<th>Response#</th>
<th>Response Page #</th>
<th>Concern #</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forest Administration</strong></td>
<td>I-15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration - KV Projects and Funds</td>
<td>1</td>
<td>I-15</td>
<td>86</td>
</tr>
<tr>
<td><strong>Botanical Resources</strong></td>
<td>I-16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Botany - Elk Flat Baseline, Boletus Habitat</td>
<td>2</td>
<td>I-16</td>
<td>50</td>
</tr>
<tr>
<td>Botany - Hardwood Restoration</td>
<td>3</td>
<td>I-16</td>
<td>59</td>
</tr>
<tr>
<td>Botany - Mushroom Habitat</td>
<td>4</td>
<td>I-17</td>
<td>131</td>
</tr>
<tr>
<td>Botany - Mushroom Habitat Effects from Burning</td>
<td>5</td>
<td>I-18</td>
<td>140</td>
</tr>
<tr>
<td>Botany - Mushroom Habitat Loss From Past Actions</td>
<td>6</td>
<td>I-20</td>
<td>121</td>
</tr>
<tr>
<td>Botany - Survey &amp; Manage, Fungi</td>
<td>7</td>
<td>I-20</td>
<td>120</td>
</tr>
<tr>
<td><strong>Climate Change</strong></td>
<td>I-21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Change - Greenhouse Gas Reductions</td>
<td>8</td>
<td>I-21</td>
<td>80</td>
</tr>
<tr>
<td>Climate Change - Reforestation Species, Resilience</td>
<td>9</td>
<td>I-22</td>
<td>128</td>
</tr>
<tr>
<td><strong>Fire and Fuels</strong></td>
<td>I-22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire and Fuels - Fire Break Suggested Action</td>
<td>10</td>
<td>I-22</td>
<td>84</td>
</tr>
<tr>
<td>Fire and Fuels - Fire Resiliency, Fuel Loading</td>
<td>11</td>
<td>I-23</td>
<td>5</td>
</tr>
<tr>
<td>Fire and Fuels - Fuel Ladders</td>
<td>12</td>
<td>I-23</td>
<td>135</td>
</tr>
<tr>
<td>Fire and Fuels - Fuel Loading Determinations</td>
<td>13</td>
<td>I-23</td>
<td>136</td>
</tr>
<tr>
<td>Fire and Fuels - High Severity Fire Risk Trends</td>
<td>14</td>
<td>I-24</td>
<td>60</td>
</tr>
<tr>
<td>Fire and Fuels - Manual Piling Alternative</td>
<td>15</td>
<td>I-26</td>
<td>55</td>
</tr>
<tr>
<td>Fire and Fuels - NFMA Compliance, Piling</td>
<td>16</td>
<td>I-26</td>
<td>134</td>
</tr>
<tr>
<td><strong>Heritage Resources</strong></td>
<td>I-27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heritage Resources - Compliance with NHPA</td>
<td>17</td>
<td>I-27</td>
<td>184</td>
</tr>
<tr>
<td>Heritage Resources - Tribal Consultation</td>
<td>18</td>
<td>I-28</td>
<td>167</td>
</tr>
<tr>
<td><strong>Hydrology</strong></td>
<td>I-29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrology - Ash Creek Planning Watershed</td>
<td>19</td>
<td>I-29</td>
<td>159</td>
</tr>
<tr>
<td>Hydrology - Create Ponds</td>
<td>20</td>
<td>I-29</td>
<td>28</td>
</tr>
<tr>
<td>Hydrology - Cumulative Watershed Effects, ERA</td>
<td>21</td>
<td>I-30</td>
<td>81</td>
</tr>
<tr>
<td>Hydrology - Elk Flat Washout</td>
<td>22</td>
<td>I-31</td>
<td>24</td>
</tr>
<tr>
<td>Hydrology - Flooding on Roads/Trails</td>
<td>23</td>
<td>I-32</td>
<td>109</td>
</tr>
<tr>
<td>Hydrology - Project Actions in Riparian Reserves</td>
<td>24</td>
<td>I-33</td>
<td>15</td>
</tr>
<tr>
<td>Hydrology - Riparian Reserves, LSRA Consistency</td>
<td>25</td>
<td>I-34</td>
<td>178</td>
</tr>
<tr>
<td>Hydrology - Riparian Reserves, Thinning</td>
<td>26</td>
<td>I-36</td>
<td>100</td>
</tr>
<tr>
<td>Hydrology - Riparian Reserves, Thinning, ACS</td>
<td>27</td>
<td>I-38</td>
<td>125</td>
</tr>
<tr>
<td>Hydrology - Roads and Flowpaths in RR</td>
<td>28</td>
<td>I-39</td>
<td>99</td>
</tr>
<tr>
<td>Label</td>
<td>Response#</td>
<td>Response Page #</td>
<td>Concern #</td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>National Environmental Policy Act (NEPA) Process</td>
<td>I-41</td>
<td>I-41</td>
<td>51</td>
</tr>
<tr>
<td>NEPA - Cumulative effects</td>
<td>29</td>
<td>I-41</td>
<td>51</td>
</tr>
<tr>
<td>NEPA - Decision Process, General Support</td>
<td>30</td>
<td>I-43</td>
<td>1</td>
</tr>
<tr>
<td>NEPA - Decision Process, Regulatory Compliance</td>
<td>31</td>
<td>I-43</td>
<td>4</td>
</tr>
<tr>
<td>NEPA - Decision Timing</td>
<td>32</td>
<td>I-43</td>
<td>49</td>
</tr>
<tr>
<td>NEPA - General</td>
<td>33</td>
<td>I-44</td>
<td>118</td>
</tr>
<tr>
<td>NEPA - General Opposition to Project</td>
<td>34</td>
<td>I-44</td>
<td>32</td>
</tr>
<tr>
<td>NEPA - General Opposition, Economics</td>
<td>35</td>
<td>I-44</td>
<td>66</td>
</tr>
<tr>
<td>NEPA - LSR Desired Condition</td>
<td>36</td>
<td>I-45</td>
<td>169</td>
</tr>
<tr>
<td>NEPA - Post-fire Salvage, Outside the Scope</td>
<td>37</td>
<td>I-47</td>
<td>180</td>
</tr>
<tr>
<td>NEPA - Proposed Action, General Concerns</td>
<td>38</td>
<td>I-47</td>
<td>110</td>
</tr>
<tr>
<td>NEPA - Proposed Action, MFEA Consistency</td>
<td>39</td>
<td>I-48</td>
<td>90</td>
</tr>
<tr>
<td>NEPA - Proposed Action, WA Recommendations, MFEA</td>
<td>40</td>
<td>I-49</td>
<td>58</td>
</tr>
<tr>
<td>NEPA - Public Involvement</td>
<td>41</td>
<td>I-49</td>
<td>88</td>
</tr>
<tr>
<td>NEPA - Requests for Info, Confirmations, or No Comment</td>
<td>42</td>
<td>I-50</td>
<td>8</td>
</tr>
<tr>
<td>NEPA - Revision and Comment Period</td>
<td>43</td>
<td>I-50</td>
<td>156</td>
</tr>
<tr>
<td>Range Management</td>
<td>I-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range - Cattle Grazing</td>
<td>44</td>
<td>I-50</td>
<td>17</td>
</tr>
<tr>
<td>Range - Cattle Impacts and Cumulative Effects</td>
<td>45</td>
<td>I-51</td>
<td>47</td>
</tr>
<tr>
<td>Range - Close Allotments</td>
<td>46</td>
<td>I-52</td>
<td>18</td>
</tr>
<tr>
<td>Range - Grazing Infrastructure</td>
<td>47</td>
<td>I-53</td>
<td>19</td>
</tr>
<tr>
<td>Range - Monitoring, Historic Transects</td>
<td>48</td>
<td>I-53</td>
<td>76</td>
</tr>
<tr>
<td>Silviculture and Forest Health</td>
<td>I-53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silviculture - Capability, Land Base</td>
<td>49</td>
<td>I-53</td>
<td>158</td>
</tr>
<tr>
<td>Silviculture - Concentrate on Young Trees</td>
<td>50</td>
<td>I-54</td>
<td>139</td>
</tr>
<tr>
<td>Silviculture - Diameter Limit</td>
<td>51</td>
<td>I-55</td>
<td>2</td>
</tr>
<tr>
<td>Silviculture - Diameter Limits and LSR, RR, and CH</td>
<td>52</td>
<td>I-56</td>
<td>103</td>
</tr>
<tr>
<td>Silviculture - Disease Effects</td>
<td>53</td>
<td>I-58</td>
<td>12</td>
</tr>
<tr>
<td>Silviculture - Insects and Disease Effects</td>
<td>54</td>
<td>I-60</td>
<td>10</td>
</tr>
<tr>
<td>Silviculture - Large Tree and Snag Retention</td>
<td>55</td>
<td>I-61</td>
<td>133</td>
</tr>
<tr>
<td>Silviculture - Leave Tree Selection</td>
<td>56</td>
<td>I-62</td>
<td>163</td>
</tr>
<tr>
<td>Silviculture - LSR, Consistency, LSOG, Effects to</td>
<td>57</td>
<td>I-62</td>
<td>130</td>
</tr>
<tr>
<td>Silviculture - LSR, Consistency, Risk Reduction</td>
<td>58</td>
<td>I-64</td>
<td>113</td>
</tr>
<tr>
<td>Silviculture - LSR, DC, Stand Density</td>
<td>59</td>
<td>I-65</td>
<td>171</td>
</tr>
<tr>
<td>Silviculture - LSR, Ponderosa Pine</td>
<td>60</td>
<td>I-66</td>
<td>172</td>
</tr>
<tr>
<td>Silviculture - LSR, Species Diversity Compliance</td>
<td>61</td>
<td>I-69</td>
<td>151</td>
</tr>
<tr>
<td>Silviculture - LSRA, Consistency</td>
<td>62</td>
<td>I-69</td>
<td>122</td>
</tr>
<tr>
<td>Silviculture - LSRA, Consistency, P&amp;N</td>
<td>63</td>
<td>I-70</td>
<td>144</td>
</tr>
<tr>
<td>Silviculture - LSRA, Consistency, REO Review</td>
<td>64</td>
<td>I-71</td>
<td>46</td>
</tr>
<tr>
<td>Silviculture - Marking Supervision</td>
<td>65</td>
<td>I-73</td>
<td>146</td>
</tr>
<tr>
<td>Silviculture - Plantations, Existing</td>
<td>66</td>
<td>I-73</td>
<td>57</td>
</tr>
<tr>
<td>Silviculture - Plantations, Existing</td>
<td>67</td>
<td>I-74</td>
<td>87</td>
</tr>
<tr>
<td>Label</td>
<td>Response#</td>
<td>Response Page #</td>
<td>Concern #</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>-----------</td>
<td>----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Silviculture - Ponderosa Pine</td>
<td>68</td>
<td>I-75</td>
<td>154</td>
</tr>
<tr>
<td>Silviculture - Ponderosa Pine and Mixed Conifer</td>
<td>69</td>
<td>I-75</td>
<td>152</td>
</tr>
<tr>
<td>Silviculture - Reforestation Proposed Action</td>
<td>70</td>
<td>I-76</td>
<td>89</td>
</tr>
<tr>
<td>Silviculture - Retention of Large Trees</td>
<td>71</td>
<td>I-76</td>
<td>138</td>
</tr>
<tr>
<td>Silviculture - Salvage Adaptive Management</td>
<td>72</td>
<td>I-77</td>
<td>79</td>
</tr>
<tr>
<td>Silviculture - Size Classes and Tree Selection</td>
<td>73</td>
<td>I-77</td>
<td>14</td>
</tr>
<tr>
<td>Silviculture - Snags and Downed Wood</td>
<td>74</td>
<td>I-79</td>
<td>21</td>
</tr>
<tr>
<td>Silviculture - Thinning Recommendations</td>
<td>75</td>
<td>I-81</td>
<td>83</td>
</tr>
<tr>
<td>Silviculture - Thinning, Salvage Only Suggestion</td>
<td>76</td>
<td>I-81</td>
<td>104</td>
</tr>
<tr>
<td>Silviculture - Thinning, Species Diversity</td>
<td>77</td>
<td>I-81</td>
<td>105</td>
</tr>
<tr>
<td>Silviculture - Tree Selection, LSR Consistency</td>
<td>78</td>
<td>I-82</td>
<td>123</td>
</tr>
<tr>
<td>Silviculture - Vegetation Diversity Compliance, LS</td>
<td>79</td>
<td>I-83</td>
<td>44</td>
</tr>
<tr>
<td>Silviculture - Vegetation Diversity, LSOG-Mature</td>
<td>80</td>
<td>I-84</td>
<td>119</td>
</tr>
<tr>
<td>Silviculture - Vegetation Diversity, Old Growth</td>
<td>81</td>
<td>I-86</td>
<td>114</td>
</tr>
<tr>
<td>Silviculture - Baseline Conditions</td>
<td>82</td>
<td>I-86</td>
<td>143</td>
</tr>
<tr>
<td><strong>Socio-Economics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-Economics - Mushroom Gathering</td>
<td>83</td>
<td>I-88</td>
<td>61</td>
</tr>
<tr>
<td>Socioeconomics - Support for Project</td>
<td>84</td>
<td>I-88</td>
<td>25</td>
</tr>
<tr>
<td><strong>Soils</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soils - Coarse Woody Debris and Soil Biota</td>
<td>85</td>
<td>I-88</td>
<td>185</td>
</tr>
<tr>
<td>Soils - Existing Condition Information</td>
<td>86</td>
<td>I-89</td>
<td>82</td>
</tr>
<tr>
<td>Soils - Machine Piling Effects to</td>
<td>87</td>
<td>I-91</td>
<td>16</td>
</tr>
<tr>
<td>Soils - Road Impacts to Soils and Other Resources</td>
<td>88</td>
<td>I-93</td>
<td>20</td>
</tr>
<tr>
<td>Soils - Timber Harvest Impacts, NFMA Consistency</td>
<td>89</td>
<td>I-95</td>
<td>29</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation - Road Density</td>
<td>90</td>
<td>I-96</td>
<td>74</td>
</tr>
<tr>
<td>Transportation - Add UA Routes, Mushroom Access</td>
<td>91</td>
<td>I-97</td>
<td>129</td>
</tr>
<tr>
<td>Transportation - Close FTS Roads</td>
<td>92</td>
<td>I-97</td>
<td>27</td>
</tr>
<tr>
<td>Transportation - Public Road Access</td>
<td>93</td>
<td>I-98</td>
<td>26</td>
</tr>
<tr>
<td>Transportation - Temporary Roads, Road Opening</td>
<td>94</td>
<td>I-98</td>
<td>73</td>
</tr>
<tr>
<td><strong>Wildlife</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife - Barred Owl Protocols</td>
<td>95</td>
<td>I-99</td>
<td>150</td>
</tr>
<tr>
<td>Wildlife - Bats Habitat Improvement</td>
<td>96</td>
<td>I-100</td>
<td>23</td>
</tr>
<tr>
<td>Wildlife - Gen Wildlife Concerns</td>
<td>97</td>
<td>I-100</td>
<td>30</td>
</tr>
<tr>
<td>Wildlife - General Comment</td>
<td>98</td>
<td>I-102</td>
<td>183</td>
</tr>
<tr>
<td>Wildlife - Goshawk and Landbird Protections</td>
<td>99</td>
<td>I-102</td>
<td>63</td>
</tr>
<tr>
<td>Wildlife - Goshawk Effects Analysis</td>
<td>100</td>
<td>I-103</td>
<td>9</td>
</tr>
<tr>
<td>Wildlife - Gray Wolf, Limited Operating Period</td>
<td>101</td>
<td>I-105</td>
<td>52</td>
</tr>
<tr>
<td>Wildlife - Habitat Impacts, Late-Successional</td>
<td>102</td>
<td>I-105</td>
<td>53</td>
</tr>
<tr>
<td>Wildlife - Habitat, Underburning Effects</td>
<td>103</td>
<td>I-106</td>
<td>78</td>
</tr>
<tr>
<td>Wildlife - Large Tree/Snag Retention Long-Term</td>
<td>104</td>
<td>I-108</td>
<td>112</td>
</tr>
<tr>
<td>Wildlife - LSR, Consistency, Habitat Needs</td>
<td>105</td>
<td>I-109</td>
<td>126</td>
</tr>
<tr>
<td>Label</td>
<td>Response#</td>
<td>Response Page#</td>
<td>Concern #</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------</td>
<td>----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Wildlife - Migratory Birds</td>
<td>106</td>
<td>I-110</td>
<td>64</td>
</tr>
<tr>
<td>Wildlife - Migratory Birds, Effects</td>
<td>107</td>
<td>I-111</td>
<td>6</td>
</tr>
<tr>
<td>Wildlife - NSO, Activity Center Protection, RA 25</td>
<td>108</td>
<td>I-113</td>
<td>41</td>
</tr>
<tr>
<td>Wildlife - NSO, Barred Owl Competition</td>
<td>109</td>
<td>I-114</td>
<td>149</td>
</tr>
<tr>
<td>Wildlife - NSO, Barred Owl Encounters</td>
<td>110</td>
<td>I-115</td>
<td>148</td>
</tr>
<tr>
<td>Wildlife - NSO, Barred Owl Interactions</td>
<td>111</td>
<td>I-118</td>
<td>94</td>
</tr>
<tr>
<td>Wildlife - NSO, Barred Owl Interactions, Surveys</td>
<td>112</td>
<td>I-119</td>
<td>33</td>
</tr>
<tr>
<td>Wildlife - NSO, Connectivity</td>
<td>113</td>
<td>I-121</td>
<td>175</td>
</tr>
<tr>
<td>Wildlife - NSO, Cumulative Effects Methodology</td>
<td>114</td>
<td>I-122</td>
<td>71</td>
</tr>
<tr>
<td>Wildlife - NSO, Demographic Information</td>
<td>115</td>
<td>I-124</td>
<td>43</td>
</tr>
<tr>
<td>Wildlife - NSO, Detection - New Alternative</td>
<td>116</td>
<td>I-126</td>
<td>155</td>
</tr>
<tr>
<td>Wildlife - NSO, Determination, BA</td>
<td>117</td>
<td>I-126</td>
<td>160</td>
</tr>
<tr>
<td>Wildlife - NSO, Diameter Limits</td>
<td>118</td>
<td>I-128</td>
<td>137</td>
</tr>
<tr>
<td>Wildlife - NSO, Effect Determination Standard</td>
<td>119</td>
<td>I-128</td>
<td>72</td>
</tr>
<tr>
<td>Wildlife - NSO, ESA and Best Available Science</td>
<td>120</td>
<td>I-130</td>
<td>124</td>
</tr>
<tr>
<td>Wildlife - NSO, ESA Status</td>
<td>121</td>
<td>I-130</td>
<td>92</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat Baseline</td>
<td>122</td>
<td>I-130</td>
<td>106</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat Connectivity, LSRs, Critical Habitat</td>
<td>123</td>
<td>I-133</td>
<td>39</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Active Management Effects</td>
<td>124</td>
<td>I-134</td>
<td>38</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Baseline</td>
<td>125</td>
<td>I-137</td>
<td>37</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Capable</td>
<td>126</td>
<td>I-137</td>
<td>75</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Critical Habitat</td>
<td>127</td>
<td>I-137</td>
<td>102</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Dispersal</td>
<td>128</td>
<td>I-140</td>
<td>42</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Foraging, Hardwoods</td>
<td>129</td>
<td>I-142</td>
<td>170</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, LSR, NWFP, ESA Compliance</td>
<td>130</td>
<td>I-143</td>
<td>176</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Mature Forest, Disturbance</td>
<td>131</td>
<td>I-144</td>
<td>96</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, MFEA Recommendations</td>
<td>132</td>
<td>I-146</td>
<td>173</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Post-Fire</td>
<td>133</td>
<td>I-146</td>
<td>179</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Post-Fire Use</td>
<td>134</td>
<td>I-147</td>
<td>181</td>
</tr>
<tr>
<td>Wildlife - NSO, Habitat, Recommendations</td>
<td>135</td>
<td>I-148</td>
<td>95</td>
</tr>
<tr>
<td>Wildlife - NSO, Hardwoods and Pine</td>
<td>136</td>
<td>I-150</td>
<td>145</td>
</tr>
<tr>
<td>Wildlife - NSO, Impacts to NSO, Habitat</td>
<td>137</td>
<td>I-151</td>
<td>36</td>
</tr>
<tr>
<td>Wildlife - NSO, NRF Habitat Effects</td>
<td>138</td>
<td>I-152</td>
<td>35</td>
</tr>
<tr>
<td>Wildlife - NSO, NRF Habitat, Group Selections</td>
<td>139</td>
<td>I-152</td>
<td>127</td>
</tr>
<tr>
<td>Wildlife - NSO, Ponderosa Pine</td>
<td>140</td>
<td>I-155</td>
<td>142</td>
</tr>
<tr>
<td>Wildlife - NSO, Post Fire Habitat Use</td>
<td>141</td>
<td>I-156</td>
<td>34</td>
</tr>
<tr>
<td>Wildlife - NSO, Post-Fire Habitat</td>
<td>142</td>
<td>I-159</td>
<td>182</td>
</tr>
<tr>
<td>Wildlife - NSO, Prey</td>
<td>143</td>
<td>I-160</td>
<td>70</td>
</tr>
<tr>
<td>Wildlife - NSO, Prey Species, Effects</td>
<td>144</td>
<td>I-162</td>
<td>77</td>
</tr>
<tr>
<td>Wildlife - NSO, Protection of Mid Seral Forests</td>
<td>145</td>
<td>I-162</td>
<td>147</td>
</tr>
<tr>
<td>Wildlife - NSO, Recovery Action 11</td>
<td>146</td>
<td>I-163</td>
<td>98</td>
</tr>
<tr>
<td>Wildlife - NSO, Revised Recovery Plan</td>
<td>147</td>
<td>I-164</td>
<td>65</td>
</tr>
</tbody>
</table>
Public comments on the DEIS are summarized below. The text from public comment letters is used wherever possible. Comment excerpts may be reordered and/or bulleted paragraphs added for clarity in the response. Comments are organized by general topic and subtopic by concern number, followed by the comment(s) and the response. Responses are numbered in the order displayed and may respond to several grouped comments in one response. All information presented in public letters was considered, although every item may not appear in this summary. Letters from agencies are included after the response to comments. Original full-text comment letters are available in the project record.

### Comments and Responses

#### Administration

**Concern # 86 - KV Projects and Funds**

3-34 - What are KV funds and proposed projects?

1. **Response**

   The Knutson-Vandenberg Act (KV) was passed by Congress on June 9, 1930. KV allows receipts collected from the sale of National Forest timber to be retained by the Forest Service and subsequently used to finance reforestation, noncommercial thinning, and other sale-area improvements. The proposed KV projects consist of reforestation work within the stands that have group selections. Approximately 248 acres within 9 stands may have KV funded site preparation, planting, monitoring of survival, and manual release work. A stewardship contract will also implement project activities such as road decommissioning.

#### Botany

**Concern # 50 - Elk Flat Baseline, Boletus Habitat**

13-148 - Remove conifers from Elk Flat causing negative impacts to Boletus mushroom growth based on a 1944 photo that does not represent the historic condition of the flat; and conduct numerous other activities. See pages 94-100 for full description of Alternative 1

13-26 - According to the DEIS, conifer encroachment is diminishing the dry meadow areas of the McCloud Flats including Elk Flat. The meadow at Elk Flat is less than 50% of its extent in 1944. Why is the Forest basing reference conditions on a 1944 photo taken after the end of railroad logging and many years of heavy grazing? This is not an accurate reflection of Elk Flat. What did Elk Flat look like in 1900?

---

150 Note the conversion of electronically submitted documents to formats used in the content analysis, and the scanning and conversion of hard copy submitted comment documents may have introduced typographical errors and formatting changes from the originally submitted letters. The Forest apologizes for any of these cosmetic changes from the original submissions, but the original comment letters were reviewed during the response to comment process.
2. Response

The Forest acknowledges that negative impacts to Boletus mushroom growth in Elk Flat are expected where its habitat occurs and activities are proposed under all action alternatives (DEIS pp. 192-193). Please see Response 4 to Concern#131, for further discussion of potential Boletus sp. habitat loss.

The best available information on the historical vegetative conditions come from literature dealing with fire regimes, old growth studies, and through the interpretation of aerial photos taken in 1944. The interpretation of the 1944 aerial photos is not designed to set the criteria for the development of a desired future condition nor to provide a complete picture of historical conditions (electronic version LSRA, p. 9).

Desired conditions of meadow restoration are explained on page 30 of the DEIS. Page 116 of the Edson Watershed Analysis (USDA-FS, 2011) identifies Elk Flat as a management opportunity to assess for restoration and continued maintenance. One of the first steps in an assessment is to quantify extent and this was done in two ways: changes in forest cover from 1944 until present (the practice in question) and soil classification. Figure 17 in the DEIS (page 214) illustrates differences in soil type. Elk Flat is in the Shasta Family (gentle sloping mudflows) with low-moderate seedling survival potential. The soils surrounding Elk Flat are of the Shasta-Germany Family (also gentle sloping mudflow) with moderate-high seedling survival potential. Seedling survival is different between the two soil types. In addition, the hydrologic soil groups, soil textures, and soil depths are different. Soils can take hundreds of years to develop. They retain an older record of reference condition(s) and were used in conjunction with changes in forest cover to delineate the Elk Flat meadow commensurate with other values. The soil survey and delineation of Elk Flat meadow mirror one another.

The LSRA pages 14-15 provides background and rationale for using the 1944 aerial photos for baseline conditions. The LSRA notes that fire suppression of all fires began after 1920 so that the 1944 photos fell within the interval of natural fire occurrence. The Forest Service acknowledges the limitations of the 1944 photo as a basis for reference conditions. However, it is the earliest photo that we have. The only other references available are from journals written by people travelling through the area. For example, one traveler's diary from 1860 (Feilner, 1864) describes an area along the Military Pass Road in the vicinity of Ash Sink as a desert between a station-house (Bartle Stage Stop) and Pilgrim's Camp. In his words: after having left the station-house two or three miles behind, we suddenly struck a desert of about 6 miles in extent, entirely of sand, and not a particle of snow to be seen. This sudden change from deep snow to a barren sand level, from cold to heat was very surprising. William H. Brewer recorded his observation on October 7, 1863: one plain, Elk Valley, three or four miles in width, is without trees (USDA-FS, 2011. P. 99). From descriptions of Elk Flat in these journals, it would seem conifer establishment started after 1863. Conifer as young as 30 years old may provide Boletus habitat so it is possible there was some habitat for Boletus species in 1900. The mushroom habitat within unthinned patches (UTPs) are within conifer stands showing on the 1944 photos.

Concern# 59 - Hardwood Restoration

3-36 - We object to the previous treatment of plowing aspen/oak groves, as did the previous biologist. "Just cut off the over story of conifers and stand back," he said.

3-2 - BTW I see nothing in the EIS about what the cows will do to the burned areas and aspen/oak sites. You know they will move in and flatten such areas.

3-17 - Release aspen/oak everywhere.

3. Response

Silviculture treatments include forest thinning to reduce stand density, address elevated levels of insects and disease, reduce fuels and promote the growth and development of late successional forest characteristics. Release of hardwoods (oak, 4 inches DBH and greater, aspen clones, 150-foot radius) (DEIS, pp. A-27, 28) and large predominant pine are part of the thinning treatments (Payne, 2015, Pg. 1). The purpose and need for treatments #2 and #4 are to promote growth and resilience of hardwoods, including aspen, commensurate with late successional stand development. The preferred alternative (Alt
1) will implement oak release in 567 acres of stands (approximately 30 acres total release) and 24 acres of aspen release (DEIS, Table 53. Pg. 148). Monitoring of these stands post treatment will measure the amount of browse from cattle. Appropriate fencing will be required if monitoring shows unacceptable levels of damage, especially to aspen sprouts, from cattle. If aspen monitoring indicates browse damage at a level that may prevent achievement of healthy aspen establishment, the appropriate type and size of fencing will be installed and maintained until monitoring indicates it is no longer necessary (DEIS, A-34).

Concern# 131 - Mushroom Habitat

7-2 - I am writing to request your consideration to help maintain the Bolete mushroom environment and population in the areas of Pilgrim Creek. My family has been in Siskiyou County since the early teens of 1900. My grandparents hunted mushrooms in the Pilgrim Creek area and the yearly family excursion has been passed down 4 generations. Our family recipes have always included the Bolete in pasta sauces, risotto and soups. We have eaten them sautéed and pickled and of course we dry them. Over the past few years the mushroom environment and population in the Pilgrim Creek area have been negatively impacted by the clearing of trees. Without the tree roots this fungus cannot grow because the trees are an important component of the soils chemistry. There is an amazing interaction between two different biological species. The Bolete is difficult to cultivate and probably impossible for the common person to ever try.

8-3 - The value of joy that families have hunting mushrooms cannot be calculated. Picking mushrooms is a generation to generation activity that could soon be lost without intervention. A practical and reasonable solution to thinning and logging the area is what the public deserves in order to maintain the mushroom concentration and the public needs your help in doing so.

8-4 - Here is a little history of Elk Flat to go along with your 1944 photo shown on the attached labeled page 31. In the 30s and 40smy father and his father were picking mushrooms there. As you can see the areas have been marked and are the same areas we are now trying to save. I see no reason not to save these areas now because as shown on your map the areas that we want saved were there then.

8-13 - The mushroom resource has never been taken into account with any of the US FS projects. I have always supported the US FS and want to make our forests better. I own a lumber yard in Mount Shasta and my living depends on a well-managed forest that can be used by everyone and not be shut down. But it's time to make a stand as we are down to the very last area out there that needs to be saved for future generations to enjoy. My granddaughter Cara who is in the fourth grade has gotten about how the forest is being managed is negative. Yes she is pro mushroom. But from what she sees so far she has not been impressed. Rhonda has met her. In closing I would like to still work with you so we can save an important resource and be able to restore the meadow. Before the final map is made on these areas I would like to get with Rhonda to make sure the perimeters are right. 20 to 30 feet off could be undesirable.

8-16 - there are some areas left that could use some responsible thinning, tree removal and logging. Thinning used to be done by hand in sensitive areas and not by machine. We are not talking about a big area that needs to be saved. Thinning in some areas and proper felling and skidding would go a long ways for the both of our quests. I know this because I was a logger/timber faller in the area when champion owned the mill in Mccloud.

8-17 - There is no better feeling than taking your family out on the weekend and telling them about papa’s spots or grandpa’s tree. You can stand back and let them pick mushrooms. It would be distressing if my grandchildren asked me what happened to this area and I had to tell them that there was no way to save the mushroom hunting spots. These children are our future. Do we want them to think that the United States forest service will not help maintain the forests? I want to teach my children to respect our forests and as I have said I will work with you to save some of the areas that are left.

8-17a - On Road two you can go out there on the weekend and see so many families with their children picking. This is been handed down from generation to generation.

4. Response

The mushroom habitat referenced by these commenters is located in conifer-covered areas scattered across Elk Flat Meadow (Unit 402). Pockets of mushroom habitat occur throughout the project area but mushroom habitat in the Elk Flat meadow area (especially in Unit 402) is of special concern to the commenter and is considered by enthusiasts to be some of the best habitat at the current time. Mushrooms are sensitive to activities that disrupt or destroy fine root systems. They are also sensitive to changes in soil temperature from overstory removal and loss of associated species. The more aggressive the thinning the longer it takes mushroom habitat to rebound (DEIS, p. 191). Habitat in Unit 402 (Elk Flat Meadow)
outside of the unthinned patches (UTPs) would be substantially decreased or eliminated by the removal of thermal cover, removal of associated species and ground disturbance. These areas will become habitat for grasses and forbs to restore the unique dry meadow habitat and maintained by repeated underburning activities to meet the Purpose and Need for the project.

The 33 acres of UTPs in Elk Flat meadow will continue to provide boletus habitat (DEIS p. 192). Areas providing habitat with mushroom locations were provided by local mushroom collectors during delineation of the UTPs, mushroom habitat was considered. Some but not all of the locations were included in UTPs (DEIS p. 118). The remaining UTPs were placed to preserve the largest and most established conifer patches consistent with the 1944 aerial photos.

The unthinned patches providing current Boletus habitat would not be mechanically disturbed but would be burned. The potential negative effects from underburning will be reduced by retaining ground cover (duff and or fine woody debris less than 3 inches) across at least 50 percent of all activity areas to maintain soil productivity. Season of burning can influence effects. Fewer negative effects occur during spring burns when there is more moisture in the soil. Underburning would be implemented to create a mosaic pattern where burn intensities will range from areas not burned at all to areas burned at low and moderate intensity. Burning in a mosaic pattern would retain areas of duff and down woody debris, preserving some habitat and reducing impacts to the remaining habitat. Resource protection measures in place to protect soils, wildlife habitat and down woody debris will also help protect duff layers, logs, snags and small trees which can provide Boletus habitat (Posey, 2016). Monitoring before and after treatments will provide information on treatment effects to fungi. Information learned from monitoring will be applied to ongoing and future project actions (DEIS, p. 91).

An alternative that changed the current delineation of the UTPs in Elk Flat to incorporate the newer areas submitted by the commenters was considered in the FEIS, but not in detailed analysis. See page 125, Alternative 11.

Concern# 140 - Mushroom Habitat Effects from Burning

8-20 - In the past, logging did not negatively impact the areas for mushroom hunting because skid trails were designated and everything was falling toward the trails. The smaller trees were left. We could go out and ask the loggers to be careful of the area and they would do their best. Of course it always cost you a few mush rooms. In the 80s the US FS started to burn the floor of the woods. This was done first off Pilgrim Creek Road, West of the experiment station and the old nursery. This did not work out to the benefit of the mushroom concentration. The burn was so hot around the big trees that still today there is no mushroom life around them. This area has lost tons of mushrooms from the burning. Then the grass came and it choked out the rest. In the late 80s the word of mushroom hunting became known to some of the people outside of the community. They came in and raked and trashed the area. But what were we going to do about that, it's America.

8-20 - Over the years logging has been done out there many times but it was with skid trails and selective cutting. Grass would come back in the trails but overall it had no major impact. After burning the whole area turns to grass and the mushrooms get choked out. The few that come back the next year after burning are not able to fully develop and become sunburned due to no cover. In my experience there are four things that need to happen for the King Bolete to grow. They need moist soil, cool temperatures, good groundcover, pine needles and cones. They need shade. They need to be able to mature in order for them to reproduce. After the last thinning project, there are none of the above except in a very few spots. Last year there was a lot of grass after the thinning. If you burn again, mushroom hunting will be all over. I can show you examples of areas that grass is 2 feet deep from past burning. This is where some real management is needed in our forest. In the areas I am trying to save the King Bolete, the needles from the trees are 4 inches to 18 inches deep. These, as we call them, are where the big boys are. We do not pick all of them. The bump coming up through the needles can reach 15 to 18 inches high. At this point you see a bright yellow area approximately 8 to 20 inches wide where they can release their spores for more to grow elsewhere. They can reach up to 5 pounds. It's like raising bees, no queen no bees. The area that was just done had flourished with exceptionally large specimens. Now they are gone.

5. Response
The Forest Service recognizes that burning practices in the 1980s were different than they are currently. The objective of burning at that time was to remove slash and other fuels. Elements to address for burning in the Elk Project include timber resources, wildlife habitat protection, protection of soils, protection of archeological sites, and hydrological and botanical concerns. The objective is not to remove all fuels from the ground as it was in the 1980s. There is more integration with Resource specialists being present out on the ground during burning to help with the burning as well as keep an eye on their resources.

The burning will create a mosaic pattern where most areas will burn in the light to moderate range, some areas won’t burn at all and a few areas may burn hot. Resource protection measures in place for the protection of soils and wildlife habitat and hydrological concerns call for a consumption level of 30-50 per cent of the duff layer as well as the retention of down woody debris in all age classes (DEIS, p. 83, 85, 86, 87 and C-3, #17).

Ectomycorrhizal fungi surviving within these areas may facilitate re-establishment by propagules that may persist in forest soils even after fire. Colonization from lightly burned and persistence in deeper soil layers of intensely burned patches may mitigate short-term declines in species richness and spur recovery at the stand level. Prescribed burns implemented in the spring will have little effect on fungal communities. Fires implemented in the fall significantly reduce fungal productivity and shift fungal fruiting patterns, but do not suppress mycorrhizal fungi entirely.

The Project will be implemented consistent with Forest Plan standards and guidelines which include modification of site treatment practices (prescribed fire and harvest) to minimize soil and litter disturbance. Monitoring is required post treatment to provide information for before and after treatment effects for mushrooms including the spring bolete. The amount of duff and down woody debris as well as understory vegetation will also be monitored (DEIS, p. 91). The design criteria to protect northern spotted owl (NSO) and goshawk habitat will also retain habitat for many fungi species including Boletus by retaining tree and shrub species, down woody debris, snags and overstory cover. Using the RPMs in place for survey and manage fungi and the best management practices discussed in the project soil report will also help retain and improve fungi habitat by retaining 30% to 50% of the duff layer and down woody (DEIS, p. 193). Resource protection measures mentioned above will maintain these habitat components across much of the project area even after underburning providing habitat for soil biota including mushrooms.

Concern# 121 - Mushroom Habitat Loss From Past Actions

8-1 - I would like to thank you for letting Rhonda Posey and Brenna, the map maker help me identify the few King Bolete concentrations left in the Elk flat area. She understands the negative effect to the area caused by the thinning and ground disturbance from the recent projects. The type of logging and thinning in the areas south of Pilgrim Creek that was the beginning of this project has resulted in the loss of 2/3 of mushroom beds. So far this project has eliminated 7-8 tons of mushrooms. This can be proven.

8-8 - Last year off of Road 2 some old-timers came into the area to hunt mushrooms. They are from South San Francisco. Their names are Bruno, Franco, Aldo and Llorenzo. They have been picking there for 70+ years. They come here and stay in Mccloud for the season. They were so upset at the way the logging had been done to this area. They could not remember where there spots were. They were lost. I took them to where their spots were because I've seen and talked to these guys over the years and I know where the spots were. The only mushrooms they were able to find were old sunburnt ones in the grass. I felt bad. I took them along with my grand daughter, Cara and grandson, Connor across the road to a spot I have. I've defined that spot on your map as an area to save. These gentlemen got many nice mushrooms. The grandchildren thought this was a nice thing to do for them but asked why I showed them my spot. I told them that when I was young and just starting mushroom hunting in the area that Bruno and Llorenzo's father showed my father where to hunt Elk Flat mushrooms. I told the old timers of the new logging that was going to happen here from last year's project. I explained to them the closing of the roads and where that would happen. I do not want to say what they told me about the USFS but it was not nice. This was the final blow to them on mushroom hunting. I told them that I would include them in the letter to you.

8-10 - I would like to point out what the USFS did to another one of the big mushroom beds on the last thinning project next to Ash Creek. X marks the spot on the following page. I was told and read that you would only work thinning and logging when there was little chance to disturb the forest floor. Well, that did not happen hear. There is a skid trail on the East side of Ash Creek that is apx. 20' wide and 3 + feet deep in spots, big
spots. This whole area is so torn up that last year even the lizards moved out. The best part of this is I can show you this skid trail on google earth from space. The only way I can figure out how this happened is it must have been Christmas vacation and no one was around to stop it. Sorry about the comment, but this really made a lot of people mad. Now, how do we believe your going to do what you say you are? This area is gone. If this was your purpose, then the public needs to see this and I would like to know from you how this will not happen again. I hope this wasn't done on purpose. This is an area that should be shown on one of your field trips. I don't think the people will be happy.

8-21 - The last logging in this area did not help. The ground was so torn up that the beds are now gone. The decision to burn in this area will only damage it more. Burning is not a good idea. The US FS started this in the 80s and it completely ruined the mushroom habitat as you well know

9-2 - We have lost much of our area in the McCloud Flats area due to clear cutting and burning. When areas are clear cut there is no shade and the spores do no reproduce. When the areas are burned it destroys existing good trees and the burnt stumps and roots destroy spores that are thousands of years old, never to produce again. It is necessary to harvest ripe timber. Selected logging areas and skidding practices would benefit the hundreds of people using the forests to harvest another natural resource.

6. Response

The Forest Service recognizes that actions taken in the past, as well as mortality events from combined drought, disease and insect, may not have produced conditions now regarded as desirable for Boletus mushrooms. Monitoring for the Elk Project is required before and after treatments are implemented to provide information regarding the effects on mushrooms including the spring bolete. Monitoring will help us to understand how ecosystem components work together.

The amount of duff and down woody debris as well as understory vegetation will also be monitored (DEIS, p. 91). The project design criteria to protect northern spotted owl and northern goshawk habitat will also retain habitat for many fungi species including Boletus by retaining tree and shrub species, down woody debris, snags and overstory cover. The resource protection measures in place for survey and manage fungi and the best management practices discussed in DEIS Appendix C (pages C-1 - C-2) will help keep and improve fungi habitat by retaining 30% to 50% of the duff layer and down woody debris (DEIS, p. 193). Monitoring for the effects of project treatments on fungi, duff, down wood and understory vegetation was not included in past projects. Monitoring with the Elk project will provide more information regarding which treatments have positive effects and which have negative effects on mushrooms and mushroom habitat, which will improve project planning in the future.

Concern# 120 - Survey & Manage, Fungi

3-4 - We also note the dead-fir mushroom Mycena overholtii is present. What are you doing to protect TES S&M mushroom habitat? Logging off the fir will remove it. I see the boletus is a concern, but not this one what is the present status of this Mycena? Are you leaving enough big old fir for it?

3-23 - We also note the dead-fir mushroom Mycena overholtii is present in Sec. 30. What are you doing to protect TES S&M mushroom habitat? Logging off the fir will remove it. I see the boletus is a concern, but not this one what is the present status of this Mycena? Are you leaving enough big old fir logs/snags per acre for it? After burning or site prep?

7. Response

The Forest Service recognizes the importance of fungi in maintaining the health and resilience of all vegetation types found within the project area and the Project was designed to protect these species. Mycena overholtii and Cantharellus subalbidus are the only known S&M fungi species known to occur in the project area. There is one known site for Mycena overholtii, a Category D* fungi in unit 150 and one site for Cantharellus subalbidus (white chanterelle), a Category D fungi, in unit 165.\textsuperscript{151} The Mycena

\textsuperscript{151} Mycena overholtii was a Category B fungi in 2001. After the 2001 species review, it was changed to a Category D fungi. There was new direction regarding S&M issued pursuant the district court's remedy order issued on February 18, 2014 (Conservation Northwest v. Bonnie, W. WA No. C08-1067-JCC). This direction is consistent with the Survey and Manage program requirements listed in the 2001 Record of Decision and Standards and Guidelines for Amendments to Survey and Manage Protection Buffer and
site in unit 150 is protected from all activities including underburning and the site in unit 165 is within an unthinned patch and will have a cool, light underburn. Individual legacy old growth trees and large woody debris will be retained (DEIS, p. H-26). There are no known sites for TES fungi species within the project area.

Climate Change

Concern# 80 - Greenhouse Gas Reductions

10-2 - In the discussion of compliance and consistency with California Assembly Bill 32 in Appendix H, the Forest Service states that the project "will have a negligible effect on climate change" because greenhouse gas emissions from the project "would mix readily into the global pool of GHG". EPA recommends avoiding comparisons of a project's GHG emissions to total global or U.S. GHG emissions, as this approach does not provide meaningful information for a project level analysis. Rather, we recommend the Forest Service further consider providing a frame of reference, such as applicable Federal, state, tribal or local goals for GHG emission reductions, and discuss whether the projected emissions levels would be consistent with such goals.

8. Response

Thank you for the suggestion. The reference in the DEIS of concern has been deleted in the Final EIS and the frame of reference is described. As noted in the discussion of California Assembly Bill 32 on page H-6 of the DEIS, the Scoping Plan target for California's forest sector is to maintain the current sequestration through sustainable management practices (CARB, 2008). Sustainable management practices are the framework in which forest vegetative management projects are gauged. The project is designed to reduce risk to loss of forest stands through large-scale disturbance and would then as a matter of course retain carbon stores. As noted on DEIS H-6 the carbon storage capacity will increase in the long term through accelerated growth. (see FEIS Appendix H – Compliance and Consistency, Climate Change compliance section under NFMA and Forest Plan Compliance).

While the Forest acknowledges the project will produce smoke and vehicle emissions (DEIS p. H-1), it is typical for the types of forest restoration activities that occur in the area, and these vehicles and activities are included in the projected emissions inventories for Siskiyou County (DEIS p. H-1). It is expected to result in emissions from equipment and truck use, and prescribed burning similar to other forestry projects. In addition, timber harvest contractors are required to use equipment that complies with California and federal mobile source emissions requirements (DEIS p. H-1). Prescribed burning will be done in compliance with a smoke management plan approved by the Siskiyou County APCD (DEIS H-3-4). With these considerations in mind, green house gas (GHG) emissions from the project are expected to be consistent with APCD anticipated emissions, which are within the emissions of the California Air Resources Board.

Concern# 128 - Reforestation Species, Resilience

10-3 - The DEIS includes a brief discussion of climate change, which notes that "trees retained or planted as part of this project will likely compose much of the forests in the project area over the next century" and that "existing species or genotypes may be poorly adapted to future climate conditions during all or various parts of their life cycles". It states that the reduction of stand density that would result from the proposed treatments "may increase the resilience of the stands to climate change". The Reforestation discussion on page A-33 notes that a mix of species would be selected for planting that would promote diversity and include non-host trees for specific diseases. It is unclear to what extent resilience to climate change would

other Mitigation Measure Standards and Guidelines ((USDA-FS & USDI-BLM, 2001)) [or 2001 ROD]. Once this direction was issued, the revised list that came out in 2003 was legally valid. On the 2003 list, *Mycena overholtssii* is listed as a Category D fungi. Also see the Survey and Manage Categories and pre-disturbance survey requirements in the 2001 ROD (pp. 7-14).
also be a factor in selecting species for replanting. EPA suggests that the Final EIS include a discussion of the increased vulnerability of certain species under a reasonably anticipated climate change scenario, and any projected shift of forest species to new range elevations that may occur under such a scenario. We recommend that the FEIS disclose any additional climate change adaptation measures that may be appropriate, such as the selection of certain species for replanting of decommissioned roads and landings.

9. Response

As described in the DEIS, with over 100 years of fire suppression the forests have grown increasingly dense, particularly with the ingrowth of shade tolerant species in the understory (DEIS page 10). Prior to historical logging, under a natural fire regime of frequent low to moderate intensity fire, much of the forest stands would have been fairly open-canopied with brush, forbs and grasses underneath. More dense stands of mixed conifers would have likely been present at higher elevations, along riparian corridors and on north-facing slopes where local moisture levels are higher and fires were less frequent (DEIS page 23).

Most if not all of the project area was extensively logged between the late 1800s and early 1900s. Historical logging favored the removal of larger ponderosa and sugar pine over other species and smaller trees (Payne, 2015, page 10). These past management activities, both logging and fire suppression, have led to the current dense conditions of these stands and the increased mortality of the shade intolerant species due to increasing density. The treatments described in Alternative 1 are designed to improve forest resiliency and help restore a natural fire regime while accelerating development of late-successional and old-growth forest characteristics (DEIS pg. 39-40). The aim of reforestation with a mix of native species more reflective of the historic stand composition (dry site species such as ponderosa and sugar pine, Douglas-fir, incense cedar, and black oak at the lower elevations) is to develop stand diversity and help establish a cohort (i.e. age diversity with a stand) under conditions of lower stand density than current conditions, such that seedlings can both survive and thrive. With lower stand densities more reflective of frequent natural fire, trees will have less competition for resources and be more able to survive warmer drier conditions. Promoting stand heterogeneity and resiliency including a mix of species, especially species suitable for dry sites, and densities more reflective of frequent natural fire is a viable management approach in Response to climate change as many climate models predict warmer drier conditions into the future.

Fire and Fuels

Concern# 84 - Fire Break Suggested Action

6-2 - I would like to see the perimeter dozer line cut as a true fire break, ie 200 or more feet wide (some trees can be left such as was done on the breaks you did several years ago off highway 97)

10. Response

Thank you for the suggestion, however a fuel break is not necessary to achieve the Purpose and Need for Action, and the project will have a similar effect as designed. Dozer line is being constructed along the Forest Service - Private property boundary to keep the prescribed fire from crossing to private lands. The maps available in the project record (DEIS Appendix D) indicate where vegetation treatments will also occur in those areas. They vary by alternative, but much of the perimeter dozer line will have vegetation and fuels treatments completed next to them. This treatment will have much of the same effect as the Hwy. 97 treatment, only it will not be limited to a certain distance from the boundary line. The overall change in fire behavior is described in Chapter 3 Fire and Fuels section.

Concern# 5 - Fire Resiliency, Fuel Loading

5-3 – While we realize that the production of timber is not a purpose of the project since it is in an LSR, we feel this project needs to treat as many acres as possible in order to fully meet your non-timber designated purpose and need including increasing the resiliency of the current LSR to survive wildfire. We encourage you not to reduce the project any further. A project that treats only limited acres undermines the objective of providing a landscape-scale benefit that enhances the resiliency of the LSR to withstand wildfire and avoid loss of late successional wildlife species.
The more area that can be treated to reduce fuels, the better

11. Response

Thank you for your comment. The preferred alternative is treating the maximum acres in the project.

Concern# 135 - Fuel Ladders

The FS states by suppressing fire in the area a natural process was removed that would have periodically removed surface fuels, much of the young small diameter understory trees and a portion of other trees. We agree yet this project doesn't propose to remedy the situation by removing young small diameter trees - something that should occur and that we would support. Rather this project will log the majority of the LSR including large old trees and 720 acres of designated critical habitat.

12. Response

The project does remove small ladder trees, including biomass-size trees in many units (see DEIS/FEIS Table Appendix A-2). The description of variable density thinning from below can be found in the DEIS starting on pages 47 and A-22. Also see responses 52, 123, 127 for effects regarding Critical Habitat, responses 50, 51, 52, 55, and 71 regarding retention of large trees and responses 57 to 65, 78, regarding the project’s LSR consistency.

The thinning and fuel reduction actions will create conditions conducive to the return of natural fire to the ecosystem. A series of prescribed underburns will address surface fuel conditions and help remove small ladder fuels to achieve more natural fuel models so that wildfire behavior would meet the desired condition and return a natural fire return interval (DEIS starting pp. 51 and A-35). Stands that are currently far in excess of the natural fuel loading would be treated with piling so that prescribed and natural fire would behave more naturally. Changes to fuel ladders and fuel profiles from project implementation are found in the DEIS starting on page 152).

Additionally, Alternatives were considered that treat only smaller diameter trees. See the DEIS Alternatives 6 and 8 (DEIS p. 119 and 120). These Alternatives were not considered in detail because they would not meet the Purpose and Need for Action.

Concern# 136 - Fuel Loading Determinations

The comment refers to the 1995 McCloud Flats Ecosystem Analysis (USDA-FS, 1995a p. 96), which was replaced by the 2011 Edson Watershed Analysis, 1999 Forest-wide LSRA, and the existing conditions in the Elk Flat LSR (EIS Chapter 1, fire and fuels specialist report, wildlife reports, silviculture report). See also Responses 39 and 40 regarding the 1995 MFEA.

The increase in snag and dead and down log availability from the 1995 MFEA to current conditions is the result of increased tree mortality from a combination of root disease, over dense stand conditions (notably in the pine component), numerous years of drought and bark beetles. This has increased the amount of snags and deadfall in the Elk Flat LSR since the 1990s. AS described in the Final BA (p. 12), “since 1993, mortality in the LSR has been monitored annually through observation flights. Endemic levels of mortality were observed during 1993, 1995 and 1997. Light mortality was observed on ~40 acres in 1994
and moderate levels were observed on ~100 acres in 1996; confined to ponderosa pine in both years (USDA-FS 1999 p. 125).”

The DEIS describes current conditions (pp. 12 and 21), including the recent (2009-2012) outbreak that has caused additional mortality. This occurred after the 1990 snag and down wood analysis.

Regarding deadfall, Landram et. al. (2002) indicates about half of existing pine snags would fall and become dead and down wood within 8 years of mortality. Laudenslayer (2005) indicated fall rates at 4% for white fir and 7% for pine per year (Laudenslayer, 2005). Observation of pine mortality on the McCloud Flats reflects the numbers indicated in the study (i.e. recent pine snags have short time span of remaining prone).

The Forest is not claiming that 10% of the LSR contains 60 tons per acre of dead and down material. The DEIS (p. 151) describes the current conditions for fuel loading. Current surface fuel loadings in portions of the project area range from 5 to 60 tons per acre. Where there are high levels of existing and ongoing mortality, it is expected to increase to 35 to 100 plus tons per acre when these dead and dying trees fall over the next 3-5 years. Pages 26-27 (and 156-157) of the DEIS also describe the potential fire behavior that could result from the current fuel loading.

The Fire and Fuels analysis section describes fuel analysis methodology starting on page 149 of the DEIS. Stand exams were conducted in 2007, which included Brown's Transects to measure the surface fuel loading. This was after the 1990 survey mentioned by the commenter. In 2011, due to the on-going mortality, additional inventories were conducted utilizing the photo series (Maxwell et al. 1979). Photos of the current conditions are available within the DEIS and in the project record.

Concern# 60 - High Severity Fire Risk Trends

13-82 - High Severity Fire HAS NOT Increased - In mixed evergreen forests of southwest Oregon and northern California, fire severity has been shown to decline as forests mature. In mixed conifer and drier ponderosa pine forests of eastern Oregon and Washington, the amount of high-severity fire has not increased in decades. In dry forests of northern California, fire extent increased only slightly in the past century and far too little to compensate for fire suppression effects in reducing high-severity fire. Even with climate change, natural recruitment of forests into owl habitat should outpace fire effects for decades.

14. Response

See Response 141 (page I-156) for detailed information regarding high severity fire effects to NSO habitat.

Chapter 3 of the EIS includes an analysis of fuels and wildfire. Page 151 discusses the historical fire return interval within the project area. 91% of the project area historically experienced a high frequency (0-35 years), low to mixed severity fire return interval. Fire suppression has not allowed for this fire return interval to occur, resulting in a build-up of surface, ladder and overstory fuels in the project area.

The fire and fuels analysis includes the potential effects from a wildfire during summer conditions (97th percentile weather conditions) under no action and all of the action alternatives. The analysis is available in the project record.

The Northwest Forest Plan, The First 15 Years (1994-2008), Status and Trends of Northern Spotted Owl Populations and Habitats, described the impacts of wildfire on owl habitat. This report states that "Wildfire remains the leading cause of owl habitat loss. About 2.6 million acres of nesting/roosting habitat remain in landscapes that are naturally prone to large wildfires. Most of this 'fire-prone' habitat (85

152 Widespread ponderosa pine mortality has been occurring on the McCloud Flats for several years (Snyder 2015. Ponderosa Pine Mortality on McCloud Flats: the western pine beetle, blackstain root disease, and drought connection). The Mud Creek and Ash Creek watersheds are at risk for up to 25% basal area loss between 2012 and 2027 due to blackstain root disease and western pine beetle (Snyder 2015). Also see DEIS pp. 12 and 21.
percent) occurs within the 'core' of the owl's range. Not all habitat burned is lost to owls, as fire intensity and frequency play a role in the effect of fire on owl habitat use. Our monitoring showed that large wildfires resulted in 30 to 62 percent loss of the nesting/roosting owl habitat within the perimeters." It also describes that “Wildfire is a natural ecological process under which northern spotted owls have evolved, but the landscapes in which this occurred were heavily altered during the 20th century. Most remaining nesting/roosting habitat is now contained on federal land, and its fragmented condition makes it, and the populations that rely on it, more vulnerable to future large wildfires.”

Chapter 4 of the 15-Year report is specific to wildfires within the NSOs range. In the short term, wildfires may be detrimental to NSOs by decreasing survival and occupancy rates because high severity fire caused/causes loss and fragmentation of suitable nesting and roosting habitat, contributing to existing spotted owl sites becoming unoccupied.

The recent 20-year report for the Northwest Forest Plan (1994-2013) and the Status and Trends of Northern Spotted Owl Habitats found that, “…rangewide losses of nesting/roosting habitat on federal lands were estimated at 5.2 percent (474,300 ac) from wildfire, 1.3 percent (116,100 ac) from timber harvesting, and 0.7 percent (59,800 ac) from insects, disease, or other natural disturbances. Rangewide, the observed rate of habitat loss on federal lands was less than what was anticipated when the NWFP was designed, mostly due to less timber harvesting than was anticipated. Losses from wildfire were slightly higher than anticipated in federal reserved land use allocations at the range-scale. Insects and disease accounted for less than 1 percent of losses” (Davis, et al., 2015 p. 38). Cascades Province losses of nesting/roosting habitat were approximately 5.5 percent from wildfire (Ibid. Table 5, p. 19). The Draft and Final BA discuss the NWFP 20-year monitoring report, and the recent demography study area meta-analysis for the NWFP area, which also describes barred owls as the likely greatest threat to NSO population (Draft BA pp. 39-40, 111; Final BA pp. 88, Appendix D pp. D4 to D5).

Mallek and others (2013) found a large modern deficit in low and moderate severity fire in lower and middle elevation forest types (pp. 11-12). The authors concluded that it is telling that conifer types in their study region that supported the lowest severity fires during the pre-settlement period (yellow pine, dry mixed conifer, moist mixed conifer), now support the highest severity fires (Ibid. p. 13).

On the Shasta-Trinity National Forest (STNF) owl habitat has been adversely affected by high severity fire. The Bagley fire in 2012 resulted in a large area of high severity fire that occurred within NSO habitat. Within this area, there was 100% mortality of all vegetation. In 2015, the west side of the STNF and Six Rivers National Forest had large fires. In the areas that had not burned within the last 20 years or more, high severity, fast-moving fire behavior was observed. In 2014, the Klamath National Forest experienced numerous wildfires. There were large areas of high intensity fire. This fire behavior was the result of overcrowded forests, weather, dry conditions, and surface fuel loading. On the Shasta-McCloud Management Unit, in 2015, there were over 30 fire starts, more than in the last 10 years.

The analysis for the Elk LSR project and the purpose and need take into account site-specific vegetation conditions, NSO habitat, the predicted fire behavior and fuels modeling and treatment were designed to meet the management direction in the Forest Plan, intent of LSRs under the NWFP, and the guidance in the 1999 Forest-wide LSRA.

Concern# 55 - Manual Piling Alternative


Our organizations remain convinced that manual piling is far preferable to tractor piling. Manual piling has none of the negative impacts to soils associated with tractor piling, provides an increased opportunity for local employment and significantly reduces long- term damage to soil health and productivity. Hence manual piling would better achieve the stated forest health purpose and need for the project.
15. Response
The Forest shares the concern regarding machine piling on sensitive soils in riparian reserves and has
found hand piling activity slash along Ash Creek Riparian Reserves to be a reasonable option to maintain
soil and hydrologic resources. Please see Response 24 (p. I-33) for further description on hand piling
within equipment exclusion zones in Riparian Reserves. Machine piling and burning are fuel treatments
that appropriately reduce fuel loads that are too large and heavy to be done by hand. Alternative 7
eliminated machine piling but was dropped from detailed consideration due to feasibility as explained in
the DEIS pages 119-120.

Machine piling earned a reputation as a harmful practice on soils in the past, from the era where machine
piling almost exclusively referred to site preparation for planting after a clearcut, and often occurring on
moderately steep slopes. Impacts from tractor piling can be high if done improperly; it is estimated to
add two percent detrimental soil disturbance as displacement to the activity units (Young, 2009).
However, slash piling as practiced in the past no longer occurs on National Forest lands since the mid-
1990s. Mechanical operations are limited to slopes less than 35%. Much smaller tractors equipped with a
brush rake on the blade are used, which result is little to no topsoil displacement or compaction that
would be of any detrimental degree. Piles are to be “clean” (without soil), which helps them burn
properly. Tractor piling often takes place in thinned stands, so there is much less slash generated when
compared to regenerated stands. Combined with whole tree yarding, the overall results are much less
slash material being moved into piles, and much less equipment traffic on the soils compared to past
practices (Elk DEIS page 220). Every effort will be utilized to maintain the necessary large woody debris
tonnage and size classes necessary to protect soil productivity (Elk DEIS page 52 and pages 83 to 87).

While hand piling, along with all implementation on the project, has the potential to positively affect
employment, generation of employment is not a Purpose and Need for the project. Employment is
discussed in the DEIS on page 246.

Technical Reference 1730-2 is not applicable to the soils in the project area. GTR-391 is concerned
primarily with wildlife, not soil soil health and watershed effects.

(Also see Responses 85, p. I-88 and 87 p. I-91)

Concern# 134 - NFMA Compliance, Piling
4-49 - Please further note that the proposed machine piling violates NFMA requirements that a given logging
system cannot be chosen because of dollar value alone. There is no other justification for implementing the
proposed tractor piling provided in the administrative record other than economic considerations and many
reasons why the use such systems is not appropriate.

16. Response
DEIS (p. 52) describes the machine piling treatment. This description includes when and where machine
piling would occur. Only those areas where surface fuel loads exceed the desired condition will receive
the machine piling treatment. DEIS (p. 57) describes the machine piling as needed due to the size of the
material being piled.

The National Forest Management Act (NFMA) [16 USC 1604] requires projects to be consistent with the
Forest Plan. This project is consistent with the Forest Plan. NFMA consistency was addressed in the DEIS

153 Heavy slash accumulations were “straight-bladed” into piles, often also piling large amounts of topsoil into the piles
(sometimes purposely, to reduce re-growth of sprouting species as competition for planted trees). This practice was
eventually widely recognized as harmful to soil productivity, and one of a few practices that directly led to topsoil
displacement standards incorporated in national and regional soil management direction from 1991 to 1995.

154 The Forest has a long track record of working directly with equipment operators to achieve minimal soil displacement
or other soil impacts historically associated with this practice.
Harvesting systems were selected based on a variety of factors. The systems used to accomplish the purpose and need were proposed to most efficiently achieve project objectives, minimize impacts to resources and took into account a variety of factors, including reduced impacts to soils and reduced activity fuels, topography, cost and efficiency.

The Management Unit currently owns two bulldozers and an excavator that are utilized for machine piling. The last timber sale sold on the McCloud Ranger District had no purchaser-required machine piling, other than the landings. Due to the success of past operations, all treatment unit piling for the Elk LSR project is planned for completion by Forest Service equipment operators. Therefore, the machine piling is not influencing the logging system.

Additionally, machine piling is proposed in areas with high levels of mortality (~50-80% of more of a stand), where the size and volume of fuels are too larger to safely or effectively hand pile or underburn. Where there are heavy concentrations of surface and standing dead fuels that exceed desired conditions (as specified in the resource protection measures and typically more than 40 tons per acre), machine piling and burning of some piles would occur as a pretreatment before underburning. This would increase consumption of excess fuels over what underburning could accomplish alone, and is expected to reduce if not eliminate adverse effects to residual overstory and understory trees, soils and wildlife habitat during underburning in these areas (Draft BA pp. 82-83; Final BA p. 59).

As described in the monitoring section of Table 6 in the Draft and Final BA, and other wildlife reports, “treatment units will be monitored post-harvest by the fuels specialist, silviculturist and wildlife biologist to validate project treatment and habitat objectives, incorporate project monitoring results and check for changed circumstances prior to reentry for follow-up fuels work. This includes evaluating and determining the most appropriate fuels management practice to avoid unnecessary disturbance to understory vegetation. Specifically, the need for machine piling and burning prior to underburning will be evaluated in units designated for possible machine piling. Post-harvest and post-piling fuels monitoring would compare effectiveness, soils impacts, and costs, with other nearby projects. Public participation in monitoring will be encouraged.”

The project is in compliance with NFMA.

Heritage Resources

Concern# 184 - Compliance with NHPA

[Note - The Forest received a copy of the February 29, 2016 letter from the Winnemem Wintu Tribe addressed to the State Historic Preservation Officer (SHPO) and interpreted this letter as a comment on the project. In the letter, the Winnemem Wintu allege the following:]

12-1 - The WWT has been denied full and meaningful consultation by the Shasta Trinity National Forest (STNF) regarding the Elk Late-Successional Reserve (LSR) Enhancement Project. Therefore the Tribe is requesting that your office withhold concurrence for the DEIS and Section 106 review and direct STNF to fully comply with the National Historic Preservation Act and the National Environmental Policy Act and respect the rights of the WWT in regards to the Tribe’s Traditional Cultural Properties.

12-3 - To add insult to injury, the Elk Late Successional Reserve Enhancement Project Cultural Resource Report No. R2009051410088 (by Leslie A. Johnson), sent to the Tribe for review, was heavily redacted of even the information that WWT provided STNF. The Tribe has no way to know if the redacted information was correct, complete or accurate and in some instances, there is no way to even discern the subject of sections of the report.

12-9 - STNF has requested that WWT make comments about the effects of the Elk Flat Project on Coonrod Flat without an on-the-ground explanation of prescriptions, boundaries, buffer zones, etc.

12-10 - Later documentation by the STNF even claims that the WWT had agreed to boundaries of a buffer zone around Coonrod Flat, a claim that is entirely and unequivocally false

17. Response
The historic preservation review process mandated by Section 106 of the National Historic Preservation Act (NHPA) is outlined in regulations issued by Advisory Council on Historic Preservation (ACHP), "Protection of Historic Properties" (36 CFR Part 800). The Winnemem Wintu Tribe (WWT) has participated in the Section 106 process under 36 CFR 800.2(d) and has participated in the National Environmental Policy Act (NEPA) public scoping process (DEIS p.264). The tribe is invited by the Forest to participate in these processes further.

The Forest Service sent information about the Elk LSR Enhancement Project to Winnemem Wintu Chief Caleen Sisk and WWT cultural representatives for consideration. The Winnemem Wintu cultural representatives participated in multiple field trips to the project area, during which proposed project prescriptions were discussed (DEIS pg.264; Effects Analysis p.11-12). Field visits included the Stewardship Collaboration field trip hosted by the Forest on July 26, 2012, with stops at various proposed project unit locations, and a site visit with members of the project interdisciplinary team to an area of concern on September 13, 2012. Additionally, on April 19, 2013, the Winnemem Wintu cultural representatives, the Forest Heritage Program Manager, and a Forest Service archaeologist visited the Coonrod Flat Traditional Cultural Property (TCP), which is adjacent to the project area.

While there are no project activities proposed within the boundary of the Coonrod Flat TCP, the participants discussed the adjacent treatments and related resource protection measures. On April 11, 2014, a Winnemem Wintu cultural representative again accompanied interdisciplinary team members to a location where fuels treatments similar to those proposed adjacent to the Coonrod Flat TCP had been completed, so the results of the treatments could be reviewed.

Contrary to the statement in the WWT letter to SHPO, neither the Forest nor any project-related document has indicated or claimed that the Winnemem Wintu have agreed to the proposed buffer zone around the edge of the Coonrod Flat TCP adjacent to the project. A buffer zone was created around the adjacent edge of the TCP as one of the resource protection measures proposed for the TCP and the associated features that were identified by the WWT (Effects Analysis p.11-12). The Forest Service sent this information, including a map with the proposed buffer zone and adjacent treatment proposals, to the WWT chief and cultural representatives on March 4, 2015, and again on June 10, 2015, in the form of the draft Elk Late Successional Reserve Enhancement Project Cultural Resources Report (No. R2009051410088) and draft Effects Analysis (DEIS p.264). The Forest Service also sent these materials by electronic mail to the WWT chief and cultural representatives on June 29, 2015. The Forest Service letter accompanying these materials explained that the portions of these documents that contain confidential cultural information about other interested parties were redacted. No information pertaining to or previously provided by the Winnemem Wintu Tribe was redacted from these documents. The accompanying letter also invited a Response from the Winnemem Wintu to ensure that their concerns were addressed, specifically regarding the proposed buffer zone and resource protection measures for the TCP and associated features.

The Forest Service received no Response from the WWT (DEIS p.264). In consultation with the State Historic Preservation Officer and in compliance with Section 106 of the National Historic Preservation Act, the Forest has and continues to make a good faith effort to consider the views of the WWT as interested members of the public under 36 CFR 800.2(d) and NEPA (DEIS p.264-265; Effects Analysis p.11-14).

Concern# 167 - Tribal Consultation

10-5 - We recognize that tribal consultation is an important component of the decision-making process associated with this project, and encourage the Forest Service to continue meaningful consultation, throughout the NEPA process, with all potentially affected tribal governments. We recommend that the results of consultations with tribal governments and with the Tribal Historic Preservation Office/State Historic Preservation Office be included in the FEIS.

18. Response
The Forest is committed to our trust responsibility with tribes and pursuant to the National Historic Preservation Act and 36 CFR 800, has consulted (DEIS p.264) and will continue meaningful consultation throughout the NEPA process with all potentially affected tribal governments. The results of consultations with tribal governments and with the Tribal Historic Preservation Office and State Historic Preservation Office will be included in the FEIS or Record of Decision except where prohibited by Section 304 of the National Historic Preservation Act, which provides protection from public disclosure of information about a historic property that might result in harm to the property, a significant invasion of privacy, or impediments to traditional religious practice at a site.

Hydrology

Concern# 159 - Ash Creek Watershed

13-142 - Ash Creek is also not a fifth field watershed at least it was not used in the watershed assessment rather the Edson and Mt. Shasta WAs were used for water quality analysis. The FEIS should explain this discrepancy.

19. Response

The Forest acknowledges that there are numerous watershed boundaries that are used for different analyses for the Elk project.

The Ash Creek Watershed is a 5th field, or HUC5 watershed as established by the most recent watershed mapping standards by the U.S. Geological Survey. The hydrologic unit code for the Ash Creek Watershed is 1802000401. The Edson and Mount Shasta Planning Watershed boundaries were derived from the most recent Forest Service Watershed Analysis layer and have different boundaries than the Ash Creek HUC5 watershed.

The Edson and Mount Shasta watershed analyses are not true HUC5 watersheds. One of the main reasons for the boundary discrepancies is that the Mount Shasta Watershed Analysis required a different boundary than the HUC5 watershed in order to comprehensively analyze resource issues on the mountain. Because Mount Shasta is a conical feature it has numerous 5th field watersheds that drain its summit. Depending on where it falls, precipitation on Mount Shasta's summit can drain to the Shasta, McCloud or Sacramento Rivers. In all, seven HUC5 watersheds drain Mount Shasta's summit. The Forest Service elected to analyze the upper portions of all seven of the HUC5 watersheds in one Mount Shasta Watershed Analysis because it would not make sense to analyze resource issues on Mount Shasta in seven different watershed analyses.

The Edson WA, Mount Shasta WA and older McCloud Flats Ecosystem Analyses are the 3 Forest Service Watershed Analyses utilized for the Elk project (Edson WA, 2011 and Mount Shasta WA, 2012). The Ash Creek HUC5 watershed is utilized for cumulative effects analysis for hydrology because HUC boundaries are the standard for cumulative effects modeling for hydrology resources. See Responses to Concern# 58 (Response 40, p. I-49) for additional information on how the older McCloud Flats Ecosystem Analysis relates to the above watershed boundaries.

Concern# 28 - Create Ponds

3-8 - We recommend earth/dugout ponds, where intermittent streams come out of the hills. The flat itself would not hold water in any practical way due sandy soils. We prefer vandal proof natural-looking ponds rather than some grandiose pipe/guzzler project.

3-25 - We recommend earth/dugout ponds, where intermittent streams come out of the hills. The flat itself would not hold water in a practical way due sandy soils. We prefer vandal-proof seasonal ponds rather than a pipe/guzzler project. We are delighted that the previous pipeline attempt into Elk Flat was terminated by the previous biologist.

20. Response
The construction of earth or dugout ponds to provide new water sources was not considered for the project because this was not identified in the purpose and need. Another concern that the Forest Service has is that dugout ponds excavated in intermittent channels at the base of the hills surrounding Elk Flat could have the potential to cause headcuts and gullies if not constructed properly. While water is limited over a large portion of the east side of the McCloud Ranger District, this is not as much the case in the Elk project area. Both Ash and Swamp Creeks flow through the project area. Both are intermittent streams, however Ash Creek is fed by melt water from snow fields and glaciers. Due to its high elevation source Ash Creek generally flows through the majority of the hottest summer months when snow and ice melt is occurring and when water is generally the most limited on the McCloud Ranger District. The Forest Service acknowledges that summertime water availability can be limited on the east side of the McCloud Flats management area and that is the natural condition. This recommendation was forwarded to the line officer for consideration however.

Concern# 81 - Cumulative Watershed Effects, ERA

4-61 - Please note that at 202 and 203 of the DEIS the Forest Service does acknowledge that due to the combination of road construction, landing establishment, tractor yarding and machine piling “results from the ERA analysis at the sub-drainage scale shows a general increase in disturbance for 6 of the 7 sub-drainages from the project.” This result indicates that the timber sale will trend the project area away from obtaining the objectives of the Aquatic Conservation Strategy (ACS) in violation of the NW Forest Plan.

21. Response

It is true that disturbance will increase in six of the seven Sub-Drainages that the project intersects, resulting in a generally increasing trend of disturbance in the ERA model for these areas (DEIS pp. 202, 203, George, 2015). One Sub-Drainage drops to 0 percent, while the other Sub-Drainages increase up to nearly 40% disturbance). This is an important result from the analysis and emphasizes the level of ground-disturbing activity in these watersheds. However, the Shasta-Trinity Forest Plan established thresholds of concern at the watershed scale. The DEIS states the following pertaining to Ash Creek Watershed and the project: "Existing Condition ERA for the watershed is 8.3%, Alternative 1 increases ERA by 0.7%, additional future planned activities modeled for the watershed on public and non-public lands raises ERA by 1.3% totaling 10.3% ERA for the Ash Creek Watershed" (DEIS, p. 204). The threshold of concern for the Ash Creek Watershed is 18% (DEIS, p. 204) and the future ERA for the watershed is 10.3% (DEIS, p. 203), which is within the established threshold of concern.

Even though these Sub-Drainages (the 8th field HUC Sub-Drainage scale) have existing disturbance levels as high as 27% ERA and the project increases ERA up to 40% for some of the six subdrainages, it does not infer that the project is trending away from meeting ACS objectives for several reasons. Nearly all ground disturbing activities (e.g. timber harvest, burning, road construction and use) result in an increase of ERA at any scale; this is an inherent outcome of the model using the product of a weighted value by acre for each ground disturbing activity (George, 2015. Appendix D - ERA). Based on field review of previous activities the response from such disturbance in this area has not shown a trend away from attaining ACS objectives, but rather indicate that the project will have many benefits that will result in a slightly positive trend for riparian vegetation processes and functions. These Sub-Drainages are highly resilient to disturbance with high permeability, low slopes, low runoff rates and low erosion rates (DEIS, p. 203).

Additionally, all project activities are designed to meet the purpose and need, which are restorative in nature, for the project area as described in the DEIS. The primary purpose and need for the project is risk reduction in early, mid and late-successional habitat and increased stand resilience to disturbance. Secondary purposes of the project are to accelerate development of late-successional habitat and increase stand resilience to disturbance, restore meadow habitat in Elk Flat, retain hardwoods as a stand component at density levels commensurate with development of late-successional stands, increase streamflow, raise water table elevation and improve water quality and vegetation conditions within
Riparian Reserves associated with Elk Flat, Ash and Swamp Creeks and their tributaries, and manage the National Forest transportation system and decommission unauthorized routes (DEIS, pp. 9-10).

Lastly, the proposed action for the project and alternatives are designed to be consistent with, and not prevent attainment of ACS objectives. Because past practices continue to impact attributes that affect the ACS: "In some areas, effects from past activities continue to this day, interrupting and relocating surface and subsurface runoff, stream flow and floodplain interaction during large storm events" (DEIS, p. 203), efforts were made to address these effects. The treatments that are planned for the project will result in incremental positive watershed effects that will be consistent with the ACS. These benefits are noted in the DEIS and include the following (DEIS, pp. 203-204): increase floodplain and meadow function, infiltration and channel stability; increase sunlight to riparian understory vegetation (see Concern 125, Riparian Sunlight and Shade); reduce unauthorized route runoff and sedimentation to channels; reduce the risk and increase resilience to disturbance from high intensity fire and associated runoff and sedimentation to channels. The Forest Service concludes that the proposed activities will increase the ERA but that these increases fall within the established threshold of concern for the Ash Creek Watershed.

Concern# 24 - Elk Flat Washout

3-14 - We have seen that since the logging of the 1990s and 2000s that a big washout has taken out the center of the flat, and possibly a transect. Was a creek diverted by logging or SUV ruts? Why? Who is responsible for the damage? How will you correct this error?

3-19 - We are not generally concerned with soil factors except for the washout in Sec. 28.

3-24 - We have seen that since logging 1990s and 2000s that a big washout has occurred in the north center of the flat, and possibly removed a range transect. Was a creek diverted by logging or SUV ruts? Why? Who is responsible for damage? How will you correct this?

22. Response

The Forest Service is aware of the washout (gully) in Elk Flat and evaluated the potential for restoration of the gully during the development of the proposed action. The large washout referenced by the commenter is located on Swamp Creek in Elk Flat. Restoring hydrology would require thoroughly investigating the ultimate cause of channel instability prior to engaging in site specific channel modification and upper watershed restoration of road drainage; this is outside the scope of this project and is recognized as an issue identified for further consideration in the Edson WA (USDA-FS, 2011); (George, H. 2015, p. 24, Preliminary Hydrology Report). The Forest Service notes that restoration of the washout is not being pursued in the project in footnote 20 on FEIS page 33. The footnote states, "Restoring the full hydrology would require upper watershed restoration of road drainage. This is outside the scope of this project and is recognized as needing further consideration in the Edson WA (USDA-FS, 2011)."

For more background: The washout is actually a long linear gully located out in the center of Elk Flat. The DEIS (p. 36) attributes the cause of the gullying as follows: "Historical road systems have diverted flow from Swamp Creek, concentrating flow and eroding Swamp Creek into a gully, disconnecting it from spreading out over the meadow". Additional information on the possible causes of gullying in Elk Flat is provided in the Preliminary Hydrology Report. "Results from aerial photography, Lidar imagery and field examination indicate that Swamp Creek was likely diverted by unauthorized roads several times thus disconnecting the runoff in the original multiple channel alluvial fan system. Swamp Creek channel within Elk Flat has developed from road capture, where the channel was intercepted or diverted by a road" (George, H. 2015, p. 24). "North of the project area, off public land, Swamp Creek is crossed by FR 41N01Y. Now a ford, it was once an elevated crossing with three culverts. Pipe culverts significantly increase stream energy, and may be the root cause or contributing factor to initial degradation of the channel, leading to increased concentration of flow and stream power in the channel. Remnants of the original channels, prior to diversion from road capture, are seen in the north and eastern corner of Elk Flat continuing south down FR 41N12 before heading eastward out of the project area" (George, H. 2015, p. 24, Preliminary Hydrology Report).
Addressing the influence of road stream capture on a comprehensive scale to restore the hydrologic processes in Elk Flat is recognized as needed to return hydrologic function to Elk Flat. Restoration of the gully would be best addressed in a future project focused on this particular situation. As noted in the Edson WA (p. 120): "Elk Flat and Swamp Creek are expected to be responsive to restoration of their floodplain and meadow processes, however, the potential to increase in floodplain inundation and water table elevation and storage is dependent on restoring hydrologic processes in the upper watershed where streams are intercepted by roads and drainage."

Concern# 109 - Flooding on Roads/Trails

8-19 - I've read that one of the reasons you want to close the road that goes through to the top of Elk Flat was the standing water that's in the tire ruts. Well where the skid trail is, it will be a long lake. Me and many other pickers have gotten mushrooms here as the waters recede. This area, on a good wet year and lots of snow on the mountain, always floods, has forever. When that happens this year, we are going to have a very dangerous spot. If someone is walking through the area and thinks it's only 2-3 inches deep, someone could fall in. When this area floods you could still go out and pick around the trees that were above the water level. This year when this happens, because you never left any ground cover or small trees for erosion control, Pilgrim Creek Road will be a nice place to back up to and fill you truck with sand and gravel that was washed down. Sorry again for the negativity, but this was bad.

23. Response

The flooding problems in Unit 401 ("road that goes through to the top of Elk Flat") have been noted by Forest Service employees and are tied to pre-existing conditions including unauthorized routes and skid trails. The proposed action for the Elk project involves floodplain restoration activities in Unit 402 which will benefit hydrologic function downstream, including within Unit 401. Although the concern the commenter brings forth is referencing flooding in Unit 401, restoring the hydrology in Unit 402 will benefit Elk Flat.

Additional thinning will be occurring in Unit 401 that was planned under an earlier project, the Plymouth Timber Sale (see FEIS, footnote 29, p. 60, DEIS #28, p. 58 for additional information). Post-harvest activities associated with implementing the Plymouth Timber Sale includes implementing BMPs to ensure proper drainage to prevent further flooding and erosion impacts associated with skid trails.

While maintaining proper drainage through BMP implementation planned under the Pilgrim project, Plymouth Timber Sale, will address some of the commenter's concerns regarding safety in wet areas it should be noted that flood prone areas are present on Elk Flat and other Forest areas. Visitors should continue to use caution when surface water is present.

Concern# 15 - Project Actions in Riparian Reserves

4-51 - Page 83 of the DEIS indicates that the Forest Service intends to conduct machine piling within designated riparian reserves in order to facilitate logging activities designed to reduce shade within the reserves. We know of no other District within the NW Forest Plan that has proposed such an activity as it is a clear violation of the Aquatic Conservation Strategy.

4-57 - The Forest Service is proposing logging activities within designated riparian reserves. Aquatic conservation is therefore a significant issue for this action. Our scoping comments requested site-specific information regarding proposed logging, yarding and machine piling within the riparian reserves that was not responded to in the DEIS. The public and the decision maker have not been informed as to how many large trees will be removed, how many snags will be felled, how many skid trails will be utilized for tractor yarding, or how many riparian reserve acres will be subject to machine piling.

4-70 - The location and impacts of riparian reserve tractor piling and tractor yarding are not disclosed or analyzed in the DEIS.
24. Response

See also Response 25 (p. I-34 below). Machine Piling and Watershed Health was identified as a key issue during scoping for the project and was analyzed in the DEIS. Approximately 50 acres of Riparian Reserves may be treated to reduce excess fuels by machine piling and pile burning within units being thinned for stand health. As noted in the DEIS (DEIS p. 203), some units will require greater [harvest] volume removal, more harvest equipment, skidding and heavy equipment use. Equipment exclusion zones (EEZ) were identified within riparian reserves to protect sensitive soils. RPM 6 (see p. 85) describes the EEZ that varies in width from a minimum of 20 feet from the inner gorge of the channel to a distance determined by field review. RPM 11 describes that hand piles will be burned 20 feet from the inner gorge in the Ash Creek RR. The Forest would like to clarify that only hand piling will occur within the EEZ and this RPM has been updated in the FEIS (see RPM 11 p. 86.)

All areas where disturbance from harvest activity, including machine piling, will occur are expected to result in none-to-slight ground disturbance. All treatments within riparian reserves are designed to contribute to attaining and to be consistent with ACS objectives. Citing from Chapter 4 - Riparian Reserves and Key Watersheds of the Forest Plan, The Aquatic Conservation Strategy of the NWP does "Prohibit timber harvest...in Riparian Reserves, except as described below...(3) Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives."

Watershed analysis identified the need to reduce fuel loads and vegetation density: "V.10.2 - Restore and maintain riparian plant communities with mechanical or hand thinning and prescribed fire using best management practices" (Edson WA, 2011 p. 121.)

Thinning activity for this project is expected to be beneficial in acquiring desired vegetation characteristics needed to attain ACS objectives in two ways: 1. because forest stand health will promote a favorable rate and size of coarse woody debris input into the channel in contrast to the whole tree failure presently occurring and 2. field review found that riparian vegetation species occur in very limited numbers within the RR along Ash Creek where there is dense conifer shading and that greater species and numbers occur in reaches where there is more sunlight (See George, 2015, Figures 1 and 2). Also see the compliance with the ACS objectives in Appendix H – Compliance and Consistency (DEIS and FEIS).

Because of the observed contrast in dense shade with few riparian plants and other areas with sufficient sunlight having more plants, the increase in sunlight from thinning prescriptions is expected to increase riparian vegetation diversity and abundance along Ash Creek (Edson WA, 2011 p. 115). In addition, the increase in riparian vegetation is expected to increase streambank strength and benefit channel width and depth and near-surface water shade (George, 2015) and (Gregory, et al., 1991).

Other activities identified to attain ACS objectives are to recontour landings from past harvest activities within Riparian Reserves to restore hydrologic function. There are no new landings or existing landings to be utilized within RR. The treatment units that contain RR can be found in Table Appendix A-1 Unit-Specific Existing Condition and Objective Information Pertaining to Treatment Prescriptions (DEIS, A-1) under the column "Riparian Reserve in Unit" and depicted by a "yes" identifying that there are RR within units that may be machine piled and burned" (DEIS, Appendix A-3).

Estimation of Actual Machine Piling by Unit (Table Appendix A-3, DEIS p. A-37, FEIS p. also p. A-31) identifies the units that will be machine piled by Alternative. When used with Appendix A-1, riparian reserves that may be machine piled can be ascertained, but we wish to respond directly to the commenters concern and are including Table 4- Riparian Reserve Acres and Treatment from the Preliminary Hydrology Report in the FEIS to clearly show the units with piling within the RR (George, 2015) FEIS. FEIS Table Appendix A-4 (p. A-33) is updated with more accurate acres to show the acres of machine piling and burning within RR in Response to the commenters request to disclose the location of activities. Machine piling was added to this list as well as clarification that machine piling in Riparian Reserves is
limited to areas outside of equipment exclusion zones (EEZ) and that fuels identified for piling within the EEZs will be hand-piled 20 feet away from the inner gorge in the Ash Creek RR (DEIS p. 203).

Cumulative Effects from past activities and the activities from the project are discussed in terms of equivalent roaded area on a project, sub-drainage and watershed scale. On the project scale it is noted that more entries will result in potentially more ground disturbance with harvest followed by machine piling and burning followed by fuel treatments and that implementation of BMPs and project resource protection measures will prevent water quality impacts and maintain soil and watershed resources. We expect short-term disturbance to water-holding properties from site specific treatment but little or no effects outside of the treated units or project area (DEIS p. 205).

See also Response 73, p. I-77

Concern# 178 - Riparian Reserves, LSRA Consistency

13-20 - The project proposes to thin 211 acres if riparian reserves. Are all 131 acres in the LSR included in this figure? Considering the LSRA states there is no need to enter the riparian reserves it appears arbitrary to log all riparian acres at one time.

25. Response

The DEIS Summary at p. xi; Tables 11, 16, 26; and the ‘Purpose and Need #5’ table (DEIS p. 98) did state that 211 acres of Riparian Reserves (RRs) would be thinned. This was an error and it has been corrected in the Final EIS, hydrology report, and other applicable reports to “treated”. Based on GIS data and the Forest Plan-designated widths of RR for Ash and Swamp Creeks (and their tributaries) there are about 211 acres of potential treatment area (thinning, meadow enhancement and burning-only) in the RRs. This 211-acre amount excludes the proposed and designated unthinned patches within RRs and it is important to understand that not all 211 acres are proposed for thinning. Alternative 1 includes 64 acres of thinning, 65 acres of meadow enhancement, and 80 acres of underburn only outside of the UTPs and within the RRs.

For the Elk LSR project, RR widths follow direction from the Forest Plan (and 2011 Edson Watershed Analysis) and are designated within 150 feet to each side of a channel (DEIS p. 199). Table 3 of the DEIS displays the total acreage of RR in the project area, and further by land allocation (240 acres of RR in the Project area; with 204 acres in LSR and 36 acres in matrix, DEIS p. 4).

In reference to the comment’s request if all 131 acres in the LSR are included in the 211-acre figure, the comment mistakenly includes outdated information from the 1995 McCloud Flats Ecosystem Analysis (MFEA) regarding RR acreage along Ash Creek. The comment cites the 1995 MFEA at p. 96 that discusses “approximately 131 acres are riparian reserve”. Based on the Elk LSR project analysis, there are about 105 acres associated with the Ash Creek RR that may be thinned and burned (~43 ac of natural stands; ~8 ac of plantations) or burned only (~54 ac). See also Response 24 (to Concern No. 15) that provides further details on treatments in RRs in the project area and how they are designed to meet the NWFP ACS Objectives.

The 1999 Forest-wide LSRA does not state that “there is no need to enter the riparian reserves” as noted in the comment. The LSRA does reference the use of Watershed Analysis to guide entry into Riparian Reserves in LSRs and Managed Late-Successional Areas, outlining criteria for selecting treatment areas to include: "Areas of early- and mid-successional forest that coincide with landscape features that may be important to dispersing animals (along riparian areas, within saddles, for example)" (LSRA, p. 180). The timing of treatments in RR is also discussed in the LSRA, recognizing that "treatments must be designed and implemented in a manner which is consistent with Aquatic Conservation Strategy Objectives. Assurance of meeting ACS Objectives is best achieved through resource specialist input at the project level and collaboration with other appropriate agencies and stakeholders" (LSRA, p. 195).

Formal and informal scoping with the appropriate agencies, public and stakeholders was conducted throughout development of the project (DEIS, pp. 43-44). From this effort, key issues were identified,
including those centered on RR, and were addressed in the proposed treatments and protection measures. Resource protection measures for RR articulate what activities, and under what conditions, can occur (DEIS, p. 83). The timing of entry(ies) into RR was not identified as a key issue under the hydrology analysis, with the exception of RPM No. 10 that requires at least 6 inches of frozen ground in the meadow at Elk Flat prior to treating unit 402 (DEIS, p. 83). For the Equivalent Road Area (ERA) modeling and cumulative effects analysis however, sequential entries of harvest activities in RR, and post-harvest activity in the first year of treatment followed by fuels treatment the second year, was assumed. Other follow-up activities (including road use and maintenance over five years, with decommissioning occurring the sixth year, were also included (George, 2015. p. 58 and 59). No mechanical site preparation will occur in RR (DEIS p. 83), and machine piling/burning of piles may occur on up to 49 acres in all areas of RR, not just along those associated with Ash Creek.

There is no plan to “log all riparian acres at one time” as noted in the comment. There is currently no schedule of operations planned for treatments in RR in terms of directing thinning and any piling, and follow-up underburning, in all RR units all at once, or within one season or year, etc. Treatments are typically completed in prioritized units first, and in the case of the Elk LSR project, priority units would likely be focused in areas where mortality in the pine component is ongoing and heavy. Completing all treatments over a short time frame, such as a month or season, in RR areas important for wildlife use (e.g. fisher/marten travel corridors, other areas not exempt from treatment in RR) may be beneficial in terms of having the disturbance occur over a shorter period, vs. a prolonged period. However, there is no current plan to prioritize treatments in RR units. Follow up fuels treatments would also not occur until thinning units are released from the timber sale or other contract. Critical areas for fisher denning, resting and foraging; Nesting/roosting and high value habitats for NSO; portions of the ST-205 northern goshawk territory; and other heavy down wood areas in units 157, 163, 154 and 152-1 along Ash Creek are exempted from mechanical treatment in order to conserve these areas for these species. The project also includes Limited Operating Periods in treatment areas, including RR, to protect these species and riparian-obligate migratory bird species during critical breeding periods. Refer to the Wildlife section of the RPMs in DEIS and FEIS Chapter 2 pg. 84; Table 6 in the Biological Assessment; Table 17 in the Biological Evaluation; and Table 2 in the migratory bird report.

Concern# 100 - Riparian Reserves, Thinning

4-59 - Information contained in a National Marine Fisheries Service memorandum dated July 23, 2010 indicates that the proposed riparian reserve thinning would not achieve aquatic conservation objectives. All stream channels must receive a minimum 150 ft. no cut buffer. We provided a copy of the National Marine Fisheries Service 84 page memo (NMFS 2010) to the Administrative Record to support our contention that commercial thinning the riparian reserve is not appropriate and is likely harmful for achieving aquatic conservation objectives. NMFS 2010 p. 8 states that "in examining forest thinning proposals designed to accelerate the development of late-successional forest conditions and restore instream fish habitat, NMFS is finding that, in many cases, they are likely to do neither. NMFS 2010: 31 states "our results suggest that the thinning regimes proposed by the Siuslaw National Forest will delay the development of key structural elements of forest and stream habitat by more than a century. The delay in stream habitat recovery can be minimized by creating a no cut buffer of 150 feet or more in width between streams and any forest thinning operations." The NMFS 2010: 4 states that "[t]he tradeoff of getting a few more large standing live trees sooner at the expense of a continuous supply of both large and small trees over the long term period always needs to be considered."

4-59 - With regard to "large wood" (EA p. 50), NMFS 2010:9 states that "[a]lthough NMFS included this [24 inch diameter] value in NMFS (1996), and did not advocate changing the value during negotiations on the AP document, we recognize now that (1) it does not provide a target that is based on reference conditions for Westside forests, (2) this target is not sensitive to site-specific conditions (e.g., stream size and power), and (3) use of this target exclusively results in analyses that do not adequately address other sizes of wood that provide important ecological functions in streams." Thus the size standards used for the desired condition are not appropriate because all sizes wood entering small streams would improve channel function. NMFS 2010 p.6 states: "[a]ll wood and other organic material, whether large or small, is important to the proper functioning of streams; none of it is unimportant." NMFS further states that "[o]f particular note is that large wood that cannot singly form pools will form pools in combination with other pieces of wood and other
obstructions by forming "wood jams." The NMFS 2010:4 state: 
"While thinning increases tree diameters, it does not increase tree heights; thus, it will not increase the length of tree boles entering streams."

4-60 - Please acknowledge the following recommendations made in NMFS 2010:10

- The USFS and BLM should include all sizes of wood in describing environmental baseline conditions and in analyzing the effects of its proposed actions, not just pieces of wood that are greater than 24 inches in diameter and greater than 50 ft. in length. 
- The USFS and BLM should adjust their tree diameter targets based on stream size. 
- Database curves are available for both functional-sized and key pieces of wood (e.g., Fox and Bolton 2007). 
- The USFS and BLM should leave more thinned trees on the ground in riparian areas, particularly close to streams, on floodplains, and on steep sideslopes where some trees are likely to slide down into streams, than are required to meet wildlife needs. 
- In order to better portray environmental baseline conditions and to understand the likely effects of thinning proposals, the USFS and BLM should develop stand data separately for riparian and upland forests. 
- Rather than incorporate the NMFS recommendations cited above (and included in our scoping comments), the Forest contends in Appendix B that because salmonids do not occur in the project area it need not consider opposing science, implement the NMFS recommendations or implement the Aquatic Conservation Strategy of the NW Forest Plan. These assertions are in error.

26. Response

In the Forest's response to similar comments during scoping, it did not state that it would not implement the Aquatic Conservation Strategy. The DEIS (pp. H-13 to H-15) addresses how the project meets, or does not prevent attainment of, the nine ACS Objectives (see also the project-level hydrology report).

The July 23, 2010 memo and issue paper from NMFS cited in the comment, and in the scoping comments, is specific to west side forests in Oregon and consisted of addressing streamlined consultation issues and recommendations for consultations with NMFS in the future (pp. 29-30). The 2010 NMFS document also addresses concerns and questions regarding large wood recruitment, riparian forest restoration (specific to western Oregon), instream anadromous fish habitat and the 2004 Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (or 2004 AP) in Westside forests. The recommendations made in the 2010 NMFS document (p. 9) are specific to Westside forests in Oregon and while these recommendations are informative for the purposes of riparian forest restoration in anadromous watersheds, they are taken out of context relative to the Elk LSR project.

The ACS Objectives apply to perennial, intermittent, and ephemeral streams, ponds/lakes, constructed water sources and wetland areas (Forest Plan pp. 4.53-4.54). As described in the response to similar comments during scoping, the Forest recognizes the need for, and benefits of, large woody debris within Riparian Reserves. The Elk LSR project includes retention guidelines and resource protection measures to assure that large down wood remains in the Riparian Reserves, and LWD remains in Ash Creek (DEIS Appendix B pp. B-34 response to comment 89; p. B-35 response to comment 93).

No LWD would be removed from Ash Creek, the project design includes designated unthinned patches where no thinning or machine piling would occur, and minimum 20-foot (and larger) equipment exclusion zones along channels where thinning is proposed. The hydrologist, wildlife biologist, and silviculturist completed field reviews and determined where thinning could restore riparian vegetation and reduce stand density.

All size classes of woody debris and larger logs have been described for the existing condition, based on inventories and project-field reviews. Woody debris levels and cover was assessed during the Soil Disturbance Monitoring and the Fire and Fuels condition monitoring. A formal survey of woody material was not conducted for the hydrology analysis, but an abundance of woody material in and along the channel was documented using photographs during field review. The project Soils Report provides information by unit of Down Woody Debris in tons per acre (T/ac) and percentage of wood cover (Rust et al. 2015. Appendix C. Summary of Field Work-Current Conditions). This information was collected between 2009 and 2013 during soils monitoring. It is used in connection with the Fuels Monitoring completed in 2007 (Browns Transects under the 2007 Common Stand Exam), photo series monitoring in 2011 of stands with high levels of pine mortality, and field reviews to describe the existing conditions for
down wood. See also Response 85, page I-88 for further description on the Soil Monitoring methods and results for woody material, and Response 13 for further description on down wood levels. In general, all units have adequate cover with the exception of some plantations.

The Forest acknowledges that woody debris recruitment is a necessary component in stream channels (DEIS pp. 34, 36), regardless of fish-bearing status. The Forest addresses ACS Objective #8 and the need to "...supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability” in the DEIS (p. 35). The Forest has addressed this need by: 1) excluding some areas along Riparian Reserves from thinning/piling (unthinned patches, equipment exclusion zones), and 2) including measures to retain large (and small) down wood for riparian, soils and wildlife needs in a range of class sizes throughout the project area (DEIS p. 83, RPM 11 and DEIS pp. 87-89, RPM 40). Responses from initial scoping (DEIS Appendix B, Comments 89 and 90) describe that an average of 6 to 10 large down logs per acre would be retained (RPM 40e, DEIS p. 88) and that these will be in a variety of decay classes with a preference for the largest size class available. RPM 11 (DEIS p.83) describes that embedded downed logs, stumps and riparian plants and root systems in Riparian Reserves would also be retained with minimal damage up to five percent. While the project design does not take all of the NMFS 2010 recommendations into account, the project is consistent with the desired future condition for down wood from the Forest Plan and LSRA (DEIS pp. 88-89).

Future instream large woody debris will be provided by restoring hydrologic function within the Riparian Reserves, as stream banks stabilize with riparian vegetation and incremental input of woody debris replaces whole-tree failure along Ash Creek’s banks. The EIS Alternative 1 Conclusions (DEIS p.100) state, “Thinning within the Riparian Reserve will favor diversity, health and vigor of riparian vegetation and [lead to] regulating the incremental input of woody debris to enhance instream aquatic bedform structure.” There will be no machine piling within the EEZ (RPM 11); snags and down logs will be retained (RPM 40), and by adding embedded woody debris (DEIS p.54) on approximately 7.2 acres of floodplain after recontouring, large woody debris will be integrated into the surface roughness. The response to Comment-90 during scoping also discusses the issues with the current rate of woody debris entering the channel and the need for an incremental input to help reduce excessive erosion (DEIS p. B-34).

Fox and Bolton (2007) address instream wood quantities and volumes in unmanaged basins within Washington State. They refer to that research as a reference condition for use by resource managers. Like Fox and Bolton's findings regarding channel width to depth ratio being the dominant influence on woody debris concentration and distribution, the channels in the Elk LSR project area may be similar. However, debris flows are the dominant geomorphic process within the Ash Creek watershed and naturally high sediment loads under the managed Ash Creek and Swamp Creek landscape likely have a greater influence on woody debris occurrence than bankfull width and depth. Field review, knowledge of flood events in the project area and watershed, and continued interpretation of the environmental conditions provide the landscape and site-specific context for making resource management decisions in the project area’s Riparian Reserves.

Concern# 125 - Riparian Reserves, Thinning, ACS

4-58 - Please note that while every other riparian reserve project we have observed in over 20 years of NW Forest Plan implementation attempts to increase shade cover of riparian features, the Elk timber sale intends to reduce riparian shade in direct contravention of the objectives of the Aquatic Conservation Strategy.

13-146 - Instead is proposed to log 2,236 acres of natural stands leaving only 60 to 100 trees per acre underburn 3,482 acres; plant 313 acres with more ponderosa pine; thin in riparian reserves that would retain current stand densities for terrestrial shading and thermal regulation in some...locations and in other locations reduce densities and shade to promote development of riparian understory, stream bank stabilizing vegetation such as willow and near stream shading...however according to the DEIS it appears all 211 acres of riparian reserves will promote an increase in sunlight therefore it is not explained how some would retain current stand densities for shading and thermal regulation;
27. Response

The intent of the Riparian Reserve treatments are to retain adequate canopy cover and shade in the Ash Creek Riparian Reserve while promoting conditions that improve riparian vegetation numbers and diversity. Maintaining a healthy forest is one of the main objectives of the proposed and this includes maintaining shade in Riparian Reserves for aquatic and terrestrial organisms.

Riparian plant reproduction is currently limited by high stand density and the lack of sunlight. Because of a lack of riparian vegetation along Ash Creek, increasing riparian vegetation is needed to be consistent with ACS objectives. Thinning in Riparian Reserves will promote sunlight and other positive functions such as stand health. Stand health includes benefits designed to improve shade and thermal regulation from larger trees that meter large woody debris onto the floodplain and into the channel. The DEIS also notes that: "Shade from dense overstory vegetation prevents sun-loving riparian vegetation from establishing and thriving" (DEIS, p. 35) and "Over-story shading from conifer is the dominant shade source and also functions to shade-out riparian plants that would normally occur along the banks" (DEIS, p. 198).

All action alternatives would increase sunlight within RR and lead to improved conditions for riparian plant reproduction growth and vigor. (George, 2015, Preliminary Hydrology Report, p. 38). Of the 240 acres of Riparian Reserve in the project area, approximately 65 acres will be thinned. Thinning will improve stand conditions and provide increased sunlight to the Riparian Reserves and in turn improve riparian vegetation. Sixty-five acres of Riparian Reserve occurs in Elk Flat under the meadow enhancement prescription to restore meadows (FEIS, Table Appendix A-4, p. A-33). Eighty acres of Riparian Reserve is underburn only.

DEIS page 201 explains that riparian vegetation is limited within the Ash Creek Riparian Reserve due to a dense conifer overstory in contrast to greater population and diversity where sunlight reaches the forest floor. "Sunlight is often limited within riparian areas where past harvest has occurred and natural regeneration of conifer species develops dense stands in the project area. Sunlight reaches through the conifer forest in only a few places between the uppermost reach of the project area and the crossing of Forest Road 19 upstream of the project area in the watershed. These few sunny sites contain the greatest riparian plant numbers and diversity with willow and alder forming dense pockets on large mid-stream gravel bars, and the channel has a lower width/depth ratio and much higher degree of sinuosity than the other channel reaches. Here, deeper water allows higher soil moisture and favorable conditions for riparian plant species" (DEIS, p. 198).

The Forest Service recognizes the importance of shade and notes that thinning treatments will result in additional sunlight but that this will allow for the growth of riparian vegetation that will maintain or increase shade cover over time. The DEIS notes that Riparian vegetative cover along the stream should increase by harvesting dense conifer and creating openings for sunlight needed for growth. Although riparian vegetation growth along the channel will increase stream surface shading (Gregory, et al., 1991), an overall negligible effect on water temperatures is expected due to the small scale of the treatment area relative to the size of the watershed upstream that carries the most influence to stream temperature.

The botany report identifies that riparian vegetation is restricted to a narrow band along upper reaches of Ash Creek in the project area. These areas are located in areas thinned or salvaged in past projects or areas with high mortality. Examples of riparian species found on Ash Creek include Serviceberry Mountain Alder, Douglas spirea, blue elderberry, red-stemmed Dogwood, and 3 species of willow: Lemmons, McKenzie and Pacific (Posey, 2016, Final Botany Report). These species have the potential to grow along Ash Creek in the project area where sunlight is currently limited and thinning treatments are proposed. Slightly further away from the creek, and not right on the creek bank, other riparian species such as wild plum, choke cherry, Prince's pine and wintergreen are expected to do well. These examples illustrate the species diversity expected from increased sunlight within the Riparian Reserve.
Prescriptions within RR are designed to be consistent with ACS objectives. Thinning dense stands to promote stand health not only will improve the existing stand but will allow for the attainment of ACS objectives #8 and #9 (DEIS, H-15). The ACS of the NWP allows for treatment within Riparian Reserves only if it is necessary to contribute to attaining ACS objectives. In this case, the thinning of stands located along Ash Creek will allow for the restoration of riparian plant communities that have been shaded out by the dense overstory. The riparian vegetation will in turn produce streamside shade. ACS #8: Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to support amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability. ACS #9: Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species (DEIS, H-15).

The Forest Plan also contains direction to improve and maintain riparian habitat (p. 4.5).

Concern# 99 - Roads and Flowpaths in RR

4-21 - Roads have altered groundwater flowpaths in riparian meadows. Page 81. Additional road and landing construction will not remedy this problem and my increase it.

28. Response

The commenter's concern regarding additional roads and landings altering groundwater flowpaths cites page 81 of the McCloud Flats Ecosystem Analysis (McCloud Flats EA, p. 81). Additional clarifying information is provided on page 47 of the same analysis where it states that "The largest impact of roads occurred in locations where they crossed riparian meadows (McCloud Flats EA, p. 47). In these areas roads compacted the soil and inhibited groundwater movement beneath the road surface. The reduction in groundwater supplied to riparian meadows below roads may result in a lower watertable and a change in vegetative composition" (McCloud Flats EA, p. 47). The commenter's concern is addressed by decommissioning existing unauthorized routes, decommissioning new temporary roads and recontouring landings in Riparian Reserves.

The McCloud Flats Ecosystem Analysis is an older watershed analysis. Like all watershed analyses, it covers large areas and therefore much of the coverage is outside of the project area. The Edson and Mount Shasta Watershed Analyses are newer watershed analyses (Edson WA, 2011 and Mount Shasta WA, 2012). Many of the observations from the McCloud Flats Ecosystem Analysis are applicable to the Elk project area, but additional clarification on the problems with roads and Elk Flat hydrology is needed to explain how the McCloud Flats Ecosystem Analysis comments pertain to Elk Flat.

The hydrology restoration actions specified in the Elk DEIS best characterize the issues with roads and runoff in the Elk project area described in the Purpose and Need Objectives: Hydrologic Function Restoration (DEIS, p. 41) Maintain or increase water table elevation and remove unauthorized route interactions with channels. Restore floodplain function, drainage network connectivity and natural contours. Proposed Action: Decommissioning of Unauthorized Routes (DEIS, p. 41) decommission unauthorized routes, which capture and concentrate runoff causing channel erosion, to improve groundwater retention. The Proposed Action includes Hydrologic Function Restoration (DEIS, p. 41) by contouring floodplain geometry in Elk Flat Riparian Reserves where needed along decommissioned unauthorized routes and old skid trails to restore natural flooding between floodplains and channels to improve sheetflow, infiltration and groundwater storage.

The Forest would like to clarify that roads have altered groundwater flowpaths in the sense that they are compacted surfaces that restrict infiltration of water downward in the soil profile. The larger effect however is that the roads intercept water that would have infiltrated into the ground and route this water over the surface thereby altering surface flow patterns. The water that is intercepted by roads can cause erosion, gully and in many cases is routed off the meadow or floodplain as surface flow.
We acknowledge the concern that additional roads and landing construction will not remedy this problem. Other than the 0.1 miles of existing UA route added to the FTS, the project does not add permanent roads. No new permanent road construction will occur under any of the action alternatives. 0.1 mile of unauthorized road will be added to the system as a maintenance level 2 road (DEIS, p. 62). The addition of this road segment to the transportation system will not add to the problem since this road already exists. The proposed action improves infiltration and eliminates numerous unauthorized road and water interactions (DEIS, p. 41, 42, 54, 202). 6.4 miles of unauthorized routes will be decommissioned, which will restore natural drainage patterns and infiltration for roads located in wet meadow areas (DEIS, p. 62). An additional 2.9 miles of new temporary road would be built and then decommissioned following use (DEIS, p. 63).

In response to this comment, RPM 13 has been clarified to read: “Existing landings will be utilized outside of the Ash Creek RR; and no new landings will be constructed within the Ash Creek RR; existing landing areas from past activities within RR will be recontoured and restored to properly functioning conditions” (FEIS, p. 86).

NEPA

Concern# 51 - Cumulative effects

4-30 - The DEIS fails to provide a thorough cumulative impacts analysis of the proposed logging in combination with other federal logging and private logging activities. Private timberlands interspersed throughout the McCloud Ranger District have been managed exclusively for short-rotation timber production. It appears that much of the LSR and surrounding Forest Service lands have been subjected to logging, road construction and fire exclusion. We have also observed implementation of regeneration logging, large tree logging, large snag logging, tractor yarding and machine piling activities in the matrix land use allocation in the Pilgrim and Mayflower timber sales on the McCloud District. These prescriptions have turned public forestlands into compacted dirt fields largely devoid of vegetation as evidenced in the photos that were attached to our scoping comments. The cumulative impacts of these practices are severe and significant, yet the DEIS largely neglected to quantify the cumulative impacts of widespread and ongoing logging in the area.

A proper consideration of the cumulative impacts of a project requires "some quantified or detailed information; general statements about some possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." Neighbors of Cuddy Mountain v. United States Forest Serv., 137 F3d 1372, 1379-80 (9th Cir. 1998). The analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present and future projects." Id.

The many severe cumulative impacts from timber sale activities, road construction, fire suppression, and machine piling for this planning area must meet the requirements of NEPA such that:

“A proper consideration of the cumulative impacts of a project requires "some quantified or detailed information; general statements about possible effects and some risk do not constitute a hard look absent a justifications regarding why more definitive information could not be provided." Ocean Advocates, 361 F.3d at 1128 (quoting Neighbors of Cuddy Mountain v. US Forest Service, 137 F.3d 1372, 1379-80 (9th Cir. 1998) . The analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present, and future projects." Id. -KS Wild v. BLM 387 F 3d. 15269 (9th Cir. 2004)."

As discussed in the Ninth Circuit's July 24, 2007 decision regarding cumulative effects NEPA analysis:

“One of the specific requirements under NEPA is that an agency must consider the effects of the proposed action in the context of all relevant circumstances, such that where "several actions have a cumulative environmental effect, this consequence must be considered in an EIS." Neighbors of Cutty Mountain v. US Forest Service, 137 F3d 1372, 1378 (9th Cir. 1998) quoting City of Tenakee Springs v. Clough, 915 F.2d 1308, 1312 (9th Cir. 1990) . A cumulative effect is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or persons undertakes such other actions." 40 CFR § 1508.7.

Our cases firmly establish that a cumulative effects analysis "must be more than perfunctory; it must provide a useful analysis of the cumulative impacts of past, present, and future projects." Klamath Siskiyou Wildlands Center v. BLM, 387, F.3d 989, 993 (9th Cir. 2004). To this end, we have recently
noted two critical features of a cumulative effects analysis. First, it must not only describe related projects but also enumerate the environmental effects of those projects. See Lands Council v. Powell, 395 F.3d 1019, 1028 (9th Cir. 2005) (holding a cumulative effects analysis violated NEPA because it failed to provide adequate data of the time, place, and scale" and did not explain in detail "how different project plans and harvest methods affects the environment"). Second, it must consider the interaction of multiple activities and cannot focus exclusively on the environmental impacts of an individual project. See Klamath Siskiyou Wildlands Center, 387 F.3d at 996 (finding a cumulative effects analysis inadequate when "it only considers the effects of the very project at issue" and does not "take into account the combined effects that can be expected as a result of undertaking" multiple projects). - Oregon Natural Resources Council et al. v. Brong. 9th Circuit. July 24, 2007.

Given the repeated acknowledgements in the watershed analysis regarding the impacts of past logging and road activities on the hydrological and terrestrial health of the project area, it is vital that the Forest Service analyze and disclose the cumulative impacts of past activities and its future plans.

29. Response

The project cumulative effects analyses meet the requirements under 36 CFR 1508.7, 36 CFR 220.4(f), and in the Council on Environmental Qualities Memorandum to the Heads of Federal Agency on the Consideration of Past Actions in Cumulative Effects Analysis (Connaughton, 2005 pp. 2, 3). Per 36 CFR 220.4(f):

“Cumulative effects considerations of past actions. Cumulative effects analysis shall be carried out in accordance with 40 CFR 1508.7 and in accordance with “The Council on Environmental Quality Guidance Memorandum on Consideration of Past Actions in Cumulative Effects Analysis” dated June 24, 2005. The analysis of cumulative effects begins with consideration of the direct and indirect effects on the environment that are expected or likely to result from the alternative proposals for agency action. Agencies then look for present effects of past actions that are, in the judgment of the agency, relevant and useful because they have a significant cause-and-effect relationship with the direct and indirect effects of the proposal for agency action and its alternatives. CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR 1508.7)”

The analysis meets the “hard look” requirement of the NEPA. The DEIS p. 123 and Appendix F (updated in FEIS, p. F-1) describe the general approach to cumulative effects analysis. In summary, each resource section in Chapter 3 describes the spatial and temporal bounding defined based on the specific direct and indirect effects to the resource.

In accordance with Forest Service Handbook 1909.15 (15.2), spatial and temporal boundaries are the two critical elements to consider when deciding which actions to include in a cumulative effects analysis. Spatial and temporal boundaries set the limits for selecting those actions that are most likely to contribute to a cumulative effect. The effects of those actions must overlap in space and time for there to be potential cumulative effects. Therefore, relevant boundaries and projects assessed for cumulative effects vary by resource. Each resource’s cumulative effect area can be different and possibly larger or smaller (DEIS/FEIS p. F-1).
For each resource area, direct and indirect effects of the proposed action were reviewed, and relevant spatial and temporal boundaries for cumulative effects analysis were determined. The largest relevant cumulative effects boundary in the review encompassed cumulative watershed effects at the Ash Creek 5th Field HUC watershed scale, for 30 years (DEIS/FEIS, p. F-1).

To create a project master list of potentially cumulative actions, this 5th field HUC boundary was then modified where other resources cumulative effects boundaries extended beyond the 5th field boundary in limited selected areas. Within this modified 5th field HUC boundary, a listing of all past, present and reasonably foreseeable future projects was compiled, and updated in March of 2016 prior to the final FEIS (see Appendix F, Table Appendix F-1, p. F-2, and Figure Appendix F-1 and Figure Appendix F-2). The actions were compiled from available information on federal and private lands within the modified 5th field boundary. The master spreadsheet and the GIS maps from which Table Appendix F-1 and the figures were derived are available in the project record. The listing provided the quantities, timing, and extent of the actions and the maps depict a spatial arrangement.

Past, present, and reasonably foreseeable future actions in the master list were considered, in order to assess accumulated impacts. Actions in the master list were assessed for whether they were within the resource identified spatial and temporal scales, and whether the impacts overlapped in time and space as well.

As part of the process, the IDT did look at the best information available for the past 30 years (as well as present and reasonably foreseeable future actions). In accordance with the 2005 Council on Environmental Quality (CEQ) letter, the specialists reviewed past actions to (1) determine if past actions are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency proposal for action and its alternatives may have a continuing, additive and significant relationship to those effects, and (2) determine if past actions help illuminate or predict direct and indirect effects of the proposed action or its alternatives. In the Memorandum, the CEQ provides guidance on the extent to which agencies of the Federal government are required to analyze the environmental effects of past actions when they describe the cumulative environmental effect of a proposed action. The Memorandum states:

“Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.” For most resources, the specialists determined the current environmental conditions on the landscape reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and can be used as a proxy for the impacts of past actions. Each resource section and Chapter 1 provides information on the existing condition.

Like the bounding and the selection of past, present, and reasonably foreseeable actions, the methodology utilized is specific to each resource. An example of a resource that provides detailed and quantified analysis for each action is the Equivalent Roaded Area (ERA) as part of the cumulative watershed effects analysis. ERA quantifies ground disturbance from all of the master listed ground disturbing sources at the 5th field scale by applying coefficients of disturbance attributed to each ground disturbing activity applied over the area disturbed and the time of occurrence (see DEIS p. 193, 19-197, 199-201, 203-204, 206-207). Other resources use the existing condition within the spatial bounding to assess the accumulation of effects from all past actions. The spatial bounding may eliminate the activities occurring on private lands (as with any area outside the specific spatial bounding for that resource) if there is no cause-effect relationship that would necessitate a more expanded boundary.

Discussions of bounding and cumulative effects for Alternative 1 specific to the resources analyzed in Chapter 3 were in the DEIS p. 127, 135-136, 150-151, 153, 162-164, 180-182, 188, 192, 212-213, 221, 229, 233, 236, 238, 241, 247) as well as the appropriate specialist reports and/or supporting documents (e.g. cumulative effects worksheets in the project record). Updates to these sections in response to the updated CE master list in March 2016 were provided if necessary in the FEIS Cumulative effects and resource reports.
Concern# 1 - Decision Process, General Support

2-1 - Sierra Pacific Industries wants to go on record in support of Alternative 1 - Modified Proposed Action and Preferred Alternative for the Elk LSR Project.

5-1 - AFRC wants to go on the record in support for your decision in selecting Alternative 1 - Modified Proposed Action and Preferred Alternative for the Elk LSR Project for the Final Decision Notice and Finding of No Significant Impact. This was the only feasible alternative that met the purpose and need for the project.

10-1 - EPA has rated the DEIS and Preferred Alternative 1 as Lack of Objections (LO; see enclosed "Summary of Rating Definitions"). We support the best management practices and resource protection measures and monitoring included in the project design.

1-3 - I am so thankful that the Forest Service is doing this project. I hope you are quick about getting this project done, before it ends up burning up and being wasted.

30. Response

Thank you for your support.

Concern# 4 - Decision Process, Regulatory Compliance

13-133 - The FS has also violated the RRP for the NSO; the NWFP; and numerous federal environmental laws.

31. Response

The DEIS, FEIS, incorporated project record, and Draft Record of Decision found that the project is entirely consistent with the Forest Plan and regulatory framework. With regards to the Forest Plan and Northwest Forest Plan (NWFP): As noted on page 4.1 of the Forest Plan, substantial portions of the management direction for the Forest and LSRs and matrix allocation were directed by the Record of Decision (ROD) the FEIS for the NWFP. The NWFP ROD, with its attached Standards and Guidelines (and revised standards and guidelines in 2001 for Survey and Manage) provide direction in the form of land allocations and associated goals, standards, and guidelines. Direction from the NWFP ROD has been integrated with other Forest Plan management direction for the Shasta-Trinity National Forest (Chapter 4 of the Forest Plan). See the DEIS, pp. 39, 135, 149-151, 157, 179-180, 193, 207-208, 225, 235, 239, H-5, H-12 - H-30.

The description of how the project is consistent with the applicable recommendations in the Revised Recovery Plan (RRP) is also provided in the DEIS (p. 180) and the wildlife BA. See also Responses 79, 113, 128, 129, 132, 147, 151, and 153.

Consistency with the primary laws that apply to the project include: the Endangered Species Act (ESA; DEIS pp. 180, 193, Appendix E (entire, note Appendix E is just the ESA Consultation Record to date in the DEIS. In the FEIS Appendix E is the Wildlife BA including the Consultation Record), pp. H-6 to H-7 and FEIS Appendix H p. H-1); the National Forest Management Act (NFMA; DEIS pp. 180, H-12 to H-13. See also Response 16; the laws pertaining to heritage resources (DEIS pp. 238, 239) and the Cultural Resources Report and Consultation Record; the Federal and California Clean Air Acts (DEIS pp. H-1 to H-3); and the Clean Water Act (DEIS pp. H-11 to H-12). Additionally, see the "Findings Required by Other Laws, Regulations and Executive Orders" section in the Preliminary Record of Decision for the project. More information may be found in the resource reports including the Biological Assessments for wildlife and botany, the cultural resource reports and consultation processes that are incorporated by reference and cited near the beginning of each corresponding resource analysis section of Chapter 3.

Concern# 49 - Decision Timing

2-4 - I am concerned that a final EIS and decision will be made and a contract awarded this federal fiscal year in light of the contentious comments submitted during the scoping period.

32. Response

The Forest Service will proceed through the Decision process per the 36 CFR 218 Objection regulations. Once a Record of Decision is signed, steps will be initiated to complete implementation.
Concern# 118 - General
1-1 - There are many other areas on the McCloud and Mt. Shasta districts that need to be thinned before it ends up looking like the Hat Creek area and we totally lose our remaining LSR.

33. Response
Thank you for the input. For the purposes of this environmental impact statement, areas outside of the project boundary are not being evaluated for treatment. However other projects are in the planning and implementation stage on the Shasta-McCloud Management Unit that address identified needs.

Concern# 32 - General Opposition to Project
13-134 - This project needs a major revision or should be dropped entirely. We suggest it be dropped permanently.

34. Response
The Elk project was developed to meet an identified need for action in the area, to meet the standards and guidelines of the Forest Plan, other laws, regulations, policies, and guidance. This comment and all other public input and comments will be considered by the responsible official in deciding which alternative to implement with this project, including the no-action alternative.

Concern# 66 - General Opposition, Economics
13-130 - Logging the Elk LSR will cost the taxpayers almost $2 million. The FS claims the local economy will benefit from this timber sale at the cost of threatened species and their habitat. But according to the latest west-side economic atlas [2016 Headwaters Economics] manufacturing including forest products provides about 10% employment in all of Siskiyou County.

35. Response
The cost of the Elk project to taxpayers can only be estimated at this time and will ultimately vary based on final volumes of timber and biomass harvested, and changes in unit costs and timber values at the time of harvest. Stewardship contracts will partially offset the total costs of the project. The project is expected to generate jobs locally for the duration of project implementation.

Preliminary estimates of the costs and benefits for the Elk project action alternatives are presented in Table 7 (Costs and Benefits of the Action Alternatives) in the Socio-Economic report (Glubczynski 2015, pp. 10-11), and the DEIS (pages 244-245). The true purpose gathering this data is to compare the costs/benefits and present net values of the alternatives. An accurate total volume for the project cannot be estimated until the timber marking is completed. Also, some unit costs may change before the project is implemented, including the value of the timber and biomass material. Therefore the numbers presented are only estimates generated for the purpose of comparing alternatives.

The project is likely to be funded in part through stewardship contracts, which will offset part of the project costs by implementing the service work and collecting KV for reforestation. That amount will not be known until contract bids are received and contracts awarded.

Minnesota IMPLAN data from 2006 put forestry and agriculture at approximately 6.6% of employment in Siskiyou County (Glubczynski 2015, page 7). The Headwaters Economics West-Wide Economic Atlas estimates forestry and manufacturing that includes forest products as contributing 8.76% of employment in the county in 2014 (note the number of jobs for forestry, fishing, and agriculture services is not disclosed and forest products is lumped into manufacturing, so numbers are not specific to forestry jobs only, and are inclusive of other non-forestry work) (http://headwaterseconomics.org/dataviz/west-wide-atlas).

Implementing the Elk project is expected to generate jobs for the duration of project implementation that will contribute to the local economy as per the Socio-economic report (Glubczynski 2015, p. 13, and DEIS p. 246), which will reduce unemployment and the associated costs of unemployment insurance, and reduced spending.
Concern# 169 - LSR Desired Condition

13-10 - The DEIS states the desired condition "is to achieve and maintain individual tree growth, health and resilience of contiguous early and mid-successional pine and mixed conifer habitat across the Elk Flat LSR and adjacent matrix lands to foster connectivity and develop late successional habitat.", This desired condition may be a whim of the FS but it is not the desired condition for an LSR designated through the NWFP. In fact the FS desired condition is opposite to what the LSR desired condition should be, and the LSR is currently functioning as late successional habitat for species dependent upon it.

36. Response

The desired condition relating to the purposes of the Elk project are entirely consistent with desired conditions for the Elk Flat LSR. As noted in the DEIS page 9, the purposes, or objectives, of the project are derived from the project area management direction, including the Forest Plan and LSRA objectives, priorities and criteria. The need for action is determined by comparing the existing conditions with the desired conditions relative to the identified purposes. Each of the 6 identified purposes have at least one desired condition statement. These desired condition statements are in the DEIS described under each Purpose and Need.

The Primary purpose, #1 and secondary purpose #2 are related to late-successional habitat and respond to LSRA Objectives I, II, III, and IV:

1. Risk Reduction in Early, Mid and Late-Successional Habitat and Increased Stand Resilience to Disturbance (Objectives I and III of the LSRA) (LSRA pp. 174-179)


2. Accelerate Development of Late-Successional and Old-Growth Forest Characteristics (LSRA Objective II) and Promote Late-Successional Habitat Connectivity (LSRA Objective IV)

   Desired Condition - DEIS p.28

The commenter is referring to part of the desired condition statement on the DEIS page 28, for secondary purpose #2: This purpose covers approximately 1,500 acres of early and mid-successional plantations and some of the mid-successional natural stands in the 3,519-acre project area. The desired condition statement is put in context for the needs identified in these specific stands, not the entire LSR or Old-growth in general.

Context is framed through the background information preceding it, and the existing condition description following. As noted on page 27 of the DEIS, "Action is needed because the existing conditions will delay or prevent development of late-successional forest in early and mid-successional forested stands in the project area." The same conditions that affect successional development reduce the value of these forests for connectivity to existing late-successional forest. Under the current conditions of increasingly high density and competition for resources, tree growth slows, tree vigor declines and attainment of late-successional status and quality of connectivity is decreased, delayed or prevented (DEIS p. 28). This desired condition for LSR is supported by the Forest Plan (pp. 4.5, 4.14, 4.81, 4.85) and the LSRA (p. 162-163, 178, 181-182).

The desired condition specific to stand composition, structure, and density is found under the primary purpose and need relates more to the commenter's concerns about late-successional habitat. The DEIS described the desired condition for late-successional habitat pages 17 to 19. DEIS Table 4 lists desired late-successional and old-growth characteristics from the NWFP and the LSRA. As noted, the Forest Plan (pp. 4.81, 4.85) describes late-successional stands as containing large numbers of "Old-Growth" trees with large branching, flattened or dead tops, and high levels of decadence (broken tops, old and decaying wood). These older stands are structurally diverse and often multi-storied. The LSRA describes late-
successional conditions as structurally diverse (p. 169). Conditions should not be uniform across the landscape. Denser patches should be intermixed with the more open areas. Decadence should be present or even obvious in the stand; snags and coarse woody material would be common, although in varying concentrations throughout the stand. Deformed, broken and diseased trees would also be common enough to provide nesting and roosting opportunities for wildlife. There would be gaps created by natural mortality where early-successional vegetation is present. Desired forest vegetation structure and composition would vary according to the vegetation community, soil conditions, site class, elevation, slope, aspect, climatic influences and other site circumstances.

**Concern# 180 – Owls Use of Burned Forest and Post-fire Salvage**

Impacts of fire and salvage logging on Northern Spotted Owls can be assessed by examining how these disturbances influence probability of site-occupancy as well as survival and reproduction of owls. In addition, we can examine how fire and salvage logging influences habitat selection, or the probability of a particular forest stand being used by owls for nesting, roosting, and foraging. Due to the relative paucity of published studies investigating the impacts of fire on Northern Spotted Owls, studies conducted on all three subspecies of spotted owl are discussed with the presumption that these studies constitute the best available science.

Jenness et al. (2004) examined pre- and post-fire occupancy and reproduction of 64 Mexican Spotted Owl sites in mixed-conifer, pine, and pine-oak forests in four national forests in New Mexico and Arizona. The authors selected owl sites in fires that burned from 1993-1996, and in 1997 compared levels of occupancy [single, pair, failed reproduction, successful reproduction] in 33 burned and 31 unburned sites, including 29 paired burned and unburned sites within 12 km of each other. Post-fire occupancy rates were not significantly different between burned and unburned sites, and did not statistically differ with time since fire. The percent of high-severity fire in a burned territory had no significant influence on whether the site was occupied (P = 0.26, n = 33 burned sites). Post-fire salvage logging was relatively minor in most of the fires (J. Jenness, personal communication).

Jenness et al. (2004) did not model occupancy rates while accounting for detectability, but four subsequent studies examining site-occupancy in relation to fire used open-population occupancy models to account for detection probability. Roberts (2011) banded California Spotted Owls in burned and unburned mixed-conifer forests in Yosemite National Park. Because this study was conducted in a national park, no post-fire or recent pre-fire logging had occurred. This study compared occupancy of sites in 16 randomly selected burned and 16 unburned “owl survey areas.” Nineteen owl pairs were monitored, and vegetation compared at owl sites with sites that yielded no owl Response. Roberts et al. found no support for a model of occupancy rates that distinguished between burned and unburned sites (wi = 0.00). The mean “owl survey area” that burned at high severity was 12%, with the greatest amount of high-severity burn in a survey area being 52%. Occupancy and detection rates and densities of spotted owls were similar between burned and unburned sites in the absence of salvage logging. Vegetation structure was main determinant of occupancy rather than whether or not the site had burned. Not surprisingly, total basal area was higher at burned and unburned sites with owls than at sites without owls.

Clark’s (2007) M.S. thesis was a pre- and post-fire study of a large sample of banded (and some radio-marked) Northern Spotted Owls occupying burned and adjacent unburned mixed-conifer and mixed-evergreen forests in in three burned areas in the Klamath province of southwestern Oregon. The major areas of his study were on or adjacent to BLM lands that were interspersed with private lands, which were salvage-logged shortly after the fires. Due to the high prevalence of post-fire salvage logging of high-severity burned areas, Clark’s study examined effects of fire and logging rather than fire alone. Data on demography and habitat selection of owls were also available for owls prior to the fires. Clark (2007) found that occupancy of nesting territories declined rapidly following the Timbered Rock Fire and subsequent salvage logging when compared to unburned landscapes of the southern Cascades. Abandonment of nesting territories (extinction rates) increased in a quadratic manner as the amount of unsuitable habitat (defined as a combination of severely burned or salvage logged or early seral forest) within the core nesting area increased, and colonization of nesting territories was influenced by the amount of nesting, roosting and foraging habitat that burned with low severity.

Lee et al. (in press) compiled an 11-year data set (1997-2007) of 41 burned California Spotted Owl sites within six fire areas and a sample of 145 unburned control sites from throughout the Sierra Nevada. The authors found no significant effect of fire on extinction or colonization probabilities. The authors did not have spatially explicit data on salvage logging but were aware that timber harvest occurred within two years post-fire in proximity to at least eight of the 41 burned sites. Seven of the eight sites that were later logged were occupied by California Spotted Owls post-fire but none of the eight sites were occupied post-logging. Thus,
post-fire salvage logging may have adversely impacted occupancy rates of the burned sites but the sample size was too small to include this effect as a covariate.

In general, studies on reproduction of all three subspecies of spotted owl after fire indicate that as long as a burned territory is capable of supporting a pair of owls, productivity in burned sites will be no different (Bond et al. 2002, Jenness et al. 2004, Clark 2007), or in some cases may be greater than in unburned sites (Roberts 2008). Bond et al. (2002) found that productivity of burned spotted owl territories was higher than overall annual rates of reproduction for unburned territories (Table 1 on page 1026) although sample size was small. Jenness et al. (2004) observed Mexican Spotted Owls successfully reproducing at 3 sites with 8, 31, and 32% high severity fire within a 1-km circle of their nest. Moreover, reproductively successful sites had a significantly higher percentage of burned area than other occupied sites affected by fire (including single owls and non-reproducing pairs). Clark et al. (2007) found no evidence of a difference in Northern Spotted Owl productivity among burned and unburned study areas in southwestern Oregon. Clark postulated that "as long as a territory is capable of supporting a pair of spotted owls following wildfire, owl pairs in burned landscapes will produce young at a similar rate as unburned landscapes." In her dissertation about fire effects on productivity of California Spotted Owls in Yosemite National Park, Roberts (2008) found no support for a model of reproduction that included burn history. As with occupancy, reproduction was influenced by habitat variables, where basal area of all trees >10 cm was associated with increased occupancy and reproduction. However, when characterizing the reproductive output as number of fledglings produced per territorial owl pair (i.e., excluding no-Response survey sites), more fledglings were produced in burned than unburned forests. Roberts noted "these Results indicated that pristine mixed-conifer forests in the Sierra Nevada have inherent robustness and resiliency in maintaining breeding habitat for spotted owls after fire."

37. Response

While some of the literature provided in this comment has been taken into consideration for the no action alternative and northern spotted owl's use of burned areas (DEIS pp. 185-186), the majority of the comment is outside the scope of this project. The Elk LSR Enhancement Project does not propose any activities in a post-fire landscape or salvage of burned forest. See Response 141 starting on page I-156 pertaining to northern and California spotted owl's use of post-fire landscapes. The project area is also outside the known or expected range for the Mexican spotted owl and this species occupies and is reliant on different habitat conditions for survival and reproduction than the NSO or CSO.

Concern# 110 - Proposed Action, General Concerns

3-18 - We are delighted at the prospect of releasing aspen and oak in the Elk Flat area, but questions remain. We are concerned with preservation of old growth habitat and range.

38. Response

The Forest is also concerned with the preservation of older forest habitat (i.e. late-successional stage of forest development) and range. Desired conditions, definitions and Forest direction for late-successional habitat are described on page 17 of the DEIS and management of natural openings (i.e. range) explained on page 30 of the DEIS. The project would not interfere with management of the existing range allotment, as stated on page 247 (DEIS). Aspen release retains all predominant trees unless they pose a risk to human safety (DEIS, page 49).

Where older forest habitat is present, specific management actions are described in the Silvicultural Prescription Descriptions section starting on page A-22 (DEIS), Tree Selection Criteria for Thinning Conifers. Effects of variable density thinning are described on page 48 (DEIS) and are intended to reduce the risk of losing habitat for late-successional species, increase conifer species diversity in plantation areas and natural stands, treat blackstain and Heterobasidion root disease, and reduce the risk of developing future extensive mortality areas. Proposed actions are to preserve existing late-successional forests and to accelerate the development of younger stands (i.e. plantations) toward a structure similar to late-successional forests.

Concern# 90 - Proposed Action, MFEA Consistency

13-29 - 1. Approximately ten percent of the 477 acres of recently established plantation could benefit from a thinning of dense clumps of advance regeneration. Thinning will emphasize retention of conifers other than
ponderosa pine retaining all hardwoods. 2. Rototilling or cultivating to reduce competition from rabbit brush, and reduce gopher damage, is needed in plantation 12-112. 3. The installation of removable barricades is recommended on roads 41N96, 41N77, 41N02Y, 42N13E, 41NJ3, and 41N33 and 41N14A, and an unnamed adjacent spur. With the agreement of adjacent landowners, additional barricades can be installed on roads 41N09 and 41N64. 4. Unnamed temporary roads can be closed by spreading debris, logs and rocks in the northeast and southeast of section 30, at Ash Creek and the pilgrim Creek Road, near the center of section 33. It appears that none of the four specific areas of treatment were implemented and the current proposal certainly does not meet these recommendations.

39. Response

The comment is referencing "Specific Areas for Treatment" attributed to the LSRA; however, the quoted text comes from the 1995 McCloud Flats Ecosystem Analysis, not the LSRA. The McCloud Flats Ecosystem Analysis has been overlapped by more up to date Watershed Analyses. Please refer to the DEIS pages 7 and B-23 "Discussion" in response to Comment 50, for a description of the appropriate Watershed Analyses (Edson and Mt. Shasta) for the Elk Project. The FEIS footnote 8 (p. 9) has provided further clarification. The McCloud Flats Ecosystem Analysis is cited in the project record for background information. Please refer to Response 40 below for further explanation about the relationship of the McCloud Flats Ecosystem Analysis to current Watershed Analyses.

The Purpose and Need for Action evaluated the departure from existing and desired conditions as derived from the Forest Plan, LSRA, and the Edson and Mt. Shasta Watershed Analyses as described in the DEIS pages 9 and 10. The project considers the topics brought up in the comment as follows:

- **Plantation Thinning** - Plantations in the project area were evaluated for thinning and are listed in Table Appendix A-2 of the FEIS. The plantation thinning treatments include promoting species diversity (DEIS p. A-23-24, A-27-30). Reforestation of group selections in plantations will also promote diversity (DEIS p. A-33). The project retains and treats hardwoods, including those in plantations (DEIS p. A-26-27).

- **Rototilling Plantations and Gopher Control** - Rototilling existing plantations and gopher control are not treatments responsive to the Purpose and Need for Action for this Project and were therefore not proposed.

- **Barricades** - The 2010 MTM ROD established 41N33, 41N09, 41N64 as a maintenance level 2 roads and as such they are not closed. Roads 41N77 and 41N02Y are already closed maintenance level 1 roads. The Forest TAP, project TAP and RAP evaluated maintenance levels for the project and did not recommend changes beyond the proposed action. Roads 41N96, 42N13E 41NJ3, and 41N14A are not FTS roads within the project area and are out of the scope of the proposed action (U41N96A is an unauthorized route to be decommissioned with the project). All Maintenance Level-1 roads are currently closed, typically with barricades. The project opens those needed for implementation, and recloses them again at the end of the project.

- **Decommissioning Unauthorized Routes** - Purpose and Need #6 was developed from the Forest Travel analysis (Forest TAP)(USDA-FS 2015a), the project Travel analysis (TAP) (Bonivert, 2015a), the Record of Decision for Motorized Travel Management (MTM) USDA-FS, 2010a for removal of unauthorized routes from the landscape, and the Pilgrim Vegetation Management Project Road Analysis Process (RAP) that considered some of the transportation system within the Elk project boundary. (See DEIS page 37 and 38). All inventoried unauthorized routes in the project area are proposed for decommissioning with the exception of 1/10th of a mile that accesses an established dispersed use site on the edge of Elk Flat meadow in the Matrix land allocation, as recommended by the project level TAP.

Concern# 58 - Proposed Action, WA Recommendations, MFEA

4-15 - Please note that at E-20, The Northwest Forest Plan requires that: [The Watershed Analysis] will serve as the basis for developing project-specific proposals, and determining monitoring and restoration needs for a watershed. Some analysis of issues or resources may be included in broader scale analyses because of their scope. The information from the watershed analyses will contribute to decision making at all levels.
Project-specific NEPA planning will use information developed from watershed analysis. For example, if watershed analysis shows that restoring certain resources within a watershed could contribute to achieving landscape or ecosystem management objectives, then subsequent decisions will need to address that information. Hence the following findings of the McCloud Flats Ecosystem Analysis should have been addressed in project development and implementation.

13-3 - It also fails to follow the McCloud Flats Ecosystem Analysis or the Elk Flat LSR Assessment.

40. Response

The McCloud Flats Ecosystem Analysis (Flats EA) did provide pertinent findings prior to more recent watershed analysis. The Flats EA was written in 1995 and identified opportunities and activities that have been implemented over the past 21 years in the project area. For example, road closures were incorporated into the Pilgrim Roads Analysis Process (Huhtala, 2005) and subsequently implemented road closure actions. The Flats EA identified 4 priority areas for road closures including Elk Flat.

Due to improvements in watershed delineation, new watershed boundaries for watershed analysis areas were needed for many watersheds on the Forest. Two such newer watershed analysis incorporated the area originally analyzed by the Flats EA. These two newer watershed analyses cover some, but not all, of the same area as the Flats EA and have incorporated information from the McCloud Flats Ecosystem Analysis for the overlapping area. The watershed analysis were updated through the WA process, and though there is specific overlapping information pertinent to the project area in the Flats EA, the more recent watershed analyses (Edson WA, 2011; Mt. Shasta WA 2012) provide the current basis for developing project proposals for the project area.

The Forest has incorporated some pertinent findings from the McCloud Flats Ecosystem Analysis into the more recent watershed analysis of the Edson WA. Many of the recommendations from the McCloud Flats Ecosystem Analysis area were updated in the Edson WA while others are no longer applicable.

The Forest Service Response 28 (p. I-39) provides another example of how the Forest Service considers findings from the McCloud Flats Ecosystem Analysis.

The FEIS provides the following footnote that describes the context of the different Watershed Analyses. "The analysis area of the Edson WA (USDA-FS, 2011) and the Mt. Shasta WA (USDA-FS, 2012) encompass the Ash Creek Watershed. The Edson WA covers part of the area originally included in the McCloud Flats Ecosystem Analysis (USDA FS, 1995). The McCloud Flats EA is cited in the Edson WA for specific information but the Edson WA is the most current watershed analysis for this area of overlap." (FEIS footnote 8, p. 9)

Concern# 88 - Public Involvement

8-12 - If you need more people to sign this letter, give me one week and I can get a lot more. 95% of the people don't see your small, publications in the newspaper.

41. Response

We do consider each unique comment received with equal attention and provide a response in this Appendix of the FEIS whether the comment is submitted by a single person, or an organization or with multiple signatories.

Thank you for the feedback on our outreach process and for helping to inform other community members about the Elk project. The public involvement process is described in the DEIS on page 43. In addition to the legal notice that was published in the Redding Record Searchlight on January 19, 2016, a 2 inch by 8 inch advertisement appeared in the Mt. Shasta Herald on January 20, 2016, publicizing the availability of the DEIS for comment. The Shasta-McCloud Management Unit also attempts to reach out to the local communities through periodic open houses in McCloud and Mt. Shasta where several projects at various stages of planning or implementation are presented, and staff are available for questions.
Concern# 8 - Requests for Info and Letter Confirmation

2-2 - Please keep me informed of any objections/litigation towards the decision you make on this project. I would like to receive copies of those challenges and take an active role in any resolution meeting that may occur.

4-1 - Please send hard copies of all forthcoming documents regarding this project to our mailing addresses.

5-2 - Since there is a high probability this project will be litigated we would still like to be kept in the loop on this project. We would like to be notified and receive any copies of litigation that may be filed for this project.

4-2 - Please Confirm Receipt

11-1 - The Department of the Interior has received and reviewed the subject document and has no comments to offer. Thank you for the opportunity to review this project.

42. Response

Requests acknowledged. No further response is required within the NEPA analysis

Concern# 156 - Revision and Comment Period

13-135 - Please keep us on the mailing list for this project. If the FS revises this project significantly then another draft comment period must be provided. If it sticks with this illegal project and develops an FEIS, please send us a copy as soon as it is available. We also request a response to these comments in the FEIS.

43. Response

As noticed in the introductory paragraph to this appendix (Appendix I, p. I-1) of this FEIS, responses to comments are provided consistent with 40 CFR 1503.4. The Forest follows the 36 CFR 218 requirements for comment. The commenter remains on the project mailing list.

Range

Concern# 17 - Cattle Grazing

3-32 - The project will remove some range areas, so reduction of cows and a shortened season is desirable due to degradation. Grazing should definitely not be allowed in May under any circumstances, and open only after fawning season for deer (July 1 recommended). Cows are a fierce competitor of all ungulate game species, and degrade it for many others. USFS always had survival trouble planting trees or grass in this poor sandy soil type. Don't tear up range to plant something unless you reduce cows for 30 years. You will create enough disturbance by the logging itself for conifer reproduction.

3-35 - We do not recommend fencing out deer and elk, but recommend a shorter allotment season (open allotment July 1) and fewer cows for 5 years as calculated in the 1990s.

3-3 - I recommend a later opening date for the allotment, fewer cows for 5 years, too expensive to fence all that.

3-9 - Public grazing should be reduced if any part of the allotment is overgrazed, which is mismanagement. We expect that the cows will move in on the burned areas and aspen/oak regeneration areas as they have done in the past. We do not recommend fencing out the deer and elk, but a shorter season and fewer cows for 5 years.

3-10 - The project will likely remove some range areas, so reduction of cows and a shortened season is desirable due to degradation. Grazing should not be allowed in May, and open only after fawning season for deer (July 1). Cows are a fierce competitor for deer. USFS always had trouble planting trees or grass in poor sandy soil. Don't tear up range to plant trees unless you reduce cows for 30 years.

3-21 - Why fence deer out of aspen/oak areas? Snow damage is rather heavy, noted in RIR 2200 form 1a. The upkeep on fences will be prohibitive; always was. This area is not deer winter range and never was, but forest diversity is always good.

3-29 - Public grazing should be reduced if any part of the allotment is overgrazed, especially within a mile of Ash Creek. Overgrazing is mismanagement. We expect cows to concentrate on burned areas, riparian, and aspen/oak regeneration areas as usual, and this is unacceptable management. Adjust the grazing permit appropriately.

44. Response

The Forest Service thanks you for your comments and acknowledges that the project does not include recommendations for adjusting grazing practices (e.g. changing livestock numbers or season of use). The Forest Service also recognizes that some grazing areas may be degraded by project implementation. It is expected that this degraded habitat will recover quickly and rangeland health will be improved overall.
Permitting cattle grazing through range allotments is a Forest Service action taken to meet direction provided by the Multiple Use Act and direction in the Forest Service Handbook (FSH 2209.13, Chapter 90); grazing permit decisions are outside the scope of this project's decision framework.

The number of cattle and the season of use is determined by the permit and the permit, which is administered under the Allotment Management Plan. Numbers of animals and season of use can be changed for many reasons including resource protection. However, this would be accomplished through the permit process and authorized in advance by an authorized Forest Service Officer (such as the Forest Supervisor, District Ranger or someone acting in that capacity).

The fencing used to protect aspen is a let-down, mesh fence that is put up in the spring and let down in the fall. In the past, inmate crews have been used to accomplish this. At the present time, the aspen stands in the Elk project area do not show signs of detrimental browsing but this could change after the project is completed. Monitoring for browsing activity is mentioned on page 91 of the DEIS. Oak release areas will not be fenced. This type of fencing has been used to protect aspen after conifer removal in several areas across the McCloud Flats with excellent results. Three of these fences were removed between 2014 and 2015. One new fence was put up in 2015. All of these areas were fenced due to detrimental deer browse. We know it was deer because three of these areas haven't had livestock grazing since 2004 and the new, 2015 fence was put up in May after monitoring showed a need. Livestock didn't come onto this allotment (Bartle) until June 1. If the potential for fencing, based on a need identified from monitoring, is eliminated, the ability to meet the Purpose and Need for hardwood restoration would be compromised.

Concern# 47 - Cattle Impacts and Cumulative Effects

4-62 - The meadow, aspen and riparian restoration objectives of the Elk Project, and attainment of ACS objectives, are directly inhibited by the agency's refusal to address adverse aquatic impacts from its grazing program in this planning effort. It is counterproductive to engage in road construction and logging activities to restore these features in the LSR while continuing and facilitating the significant underlying damage from grazing. Page 198 of the DEIS acknowledges: The project area lies within the Battle Grazing Allotment. The meadows and riparian areas attract livestock and receive livestock use. Trailing is evident along both sides of Ash Creek. Livestock congregate along Ash Creek near the junction of U41N96A and U41N97A where the area is trampled and bare of vegetation from livestock use. Page 202 of the DEIS discloses that: Because the area is in an active cattle allotment and livestock graze within the project area and riparian reserves, riparian plant community improvement will be influenced by livestock grazing as managed by the grazing permit. Unfortunately, while the Forest Service is committed to logging, road construction, landing construction, tractor yarding, machine piling and yarding in the LSR, the Elk Project does nothing to actually address the primary source of damage to aquatic ecosystems- namely inappropriate cattle grazing. Attached to these DEIS comments is a peer-reviewed study indicating that termination of grazing, as opposed to sporadic grazing regulation, more than doubles aspen recruitment.

3-12 - The EIS has almost no mention of cattle management or range as a cumulative or indirect effect on the project areas.

13-143 - Grazing - The present permit has approximately 300 cattle and a season from 6/1 to 10/15. It is possible that cattle have retarded the development of riparian vegetation on Ash Creek.

13-27 - additional loss of the meadow could be attributed to continued grazing but the FS is not proposing to eliminate livestock or lessen current numbers.

45. Response

The Forest Service acknowledges the concern that riparian and meadow areas proposed for restoration occur within the Bartle Grazing Allotment and that there is a potential for grazing activities to impact them. The DEIS acknowledged that grazing activities associated with the Bartle Allotment occur within the Elk project area and that there are observable impacts from grazing (DEIS, p.198). Grazing concerns will be addressed through established management practices and controls associated with the Bartle Grazing Allotment permit and administration. The Bartle Allotment permit management includes annual operating instructions to maintain best management practices grazing.
Because the area is in an active cattle allotment and livestock graze within the project area and riparian reserves, riparian plant community improvement will be influenced by livestock grazing as managed by the grazing permit (DEIS, p.202).

The meadow restoration activities proposed for the project (e.g. thinning, prescribed burning, aspen release) represent a step forward in the restoration of meadow habitats but do not address grazing management. While the project does not make decisions pertaining to grazing management directly, it does consider the potential for grazing activities to affect project treatment areas. For example, aspen stands targeted for restoration will be monitored to ensure that natural grazers or cattle do not hinder aspen recovery. If monitoring results indicate that grazing impacts are occurring then fencing of aspen stands will occur (DEIS A-34, p. 91).

Adverse aquatic impacts are not expected from the effects of proposed activities. With respect to cumulative effects, impacts of cattle grazing are noted in the DEIS (DEIS p. 202 and p. 198). Appendix F, Table F-1 (starting on page F-2 of the DEIS) lists the Bartle Grazing Allotment as an ongoing and future foreseeable activity. Each resource area considered this list as it applies to the individual resource when identifying potentially cumulative effects based on a temporal and spatial overlap with the direct and indirect effects of the project, if any, on the respective resource. See DEIS pages 180-181, 189, 198-199, 201-202, 212, 221, 244, A-34. Grazing impacts were also addressed in the cumulative watershed affects assessment for the project in the hydrology report (George, 2015; p. 59-60) and are included in the FEIS (see ERA, p. 209).

Concern# 18 - Close Allotments

3-6 - We think allotments should be cancelled if they cannot be run profitably and effectively. No subsidy of permittees should be allowed. They should pay damage restoration costs.

3-27 - We think allotments should be cancelled if they cannot be run profitably to all taxpayers and effectively. No subsidy of permittees should be allowed. They should pay damage restoration costs if they are the result of overgrazing, regardless of who causes it.

3-31 - We recommend closing that portion of the allotment north of Pilgrim Road for 5 years, with commensurate cattle reductions and enforcement.

46. Response

Permitting cattle grazing through range allotments is a Forest Service action taken to meet direction provided by the Multiple Use Act and direction in the Forest Service Handbook (FSH 2209.13, Chapter 90); grazing permit decisions are outside the scope of this project's decision framework. Grazing allotment permits are administered under the Allotment Management Plan and the Annual Operating Instructions. Separate NEPA is required to change or close allotments. Currently, permittees are not required to pay for restoration. There is Congressional intent to allow grazing on suitable lands when it is consistent with other multiple-use goals and objectives (Multiple Use-Sustained Yield Act of 1960, Forest and Rangeland Renewable Resource Planning Act of 1974, Federal Land Policy and Management Act of 1976, and National Forest Management Act of 1976). It is a Forest Service objective to contribute to economic and social well-being of people by providing opportunities for economic diversity and by promoting stable communities that depend on range resources for their livelihood (Forest Service Manual 2202.1) and it is Forest Service policy to make forage available to qualified livestock operators from lands suitable for grazing consistent with land management plans (Forest Service Manual 2203.1). Management of permitted livestock grazing is spelled out in a NEPA decision for each grazing proposal and then incorporated into an Allotment Management Plan (AMP).

Concern# 19 - Grazing Infrastructure

3-16 - Generally we think pipelines and fences should be removed due to costly upkeep and we object to subsidy.

3-28 - Generally we think all pipelines and fences should be removed or not begun due to costly upkeep and we object to subsidy.
47. Response

Permitting cattle grazing through range allotments is a Forest Service action taken to meet direction provided by the Multiple Use Act and direction in the Forest Service Handbook (FSH 2209.13, Chapter 90); grazing permit decisions are outside the scope of this project's decision framework. There are no grazing related pipelines or fences within the Elk Project area. If there were any pipelines and fences, removal of such would be handled through the permit administration process. (see also Response 46).

Concern# 76 - Monitoring, Historic Transects

3-13 - This is in the vicinity of C2, C5, C6, and C9 historical range transects. Will these sites be preserved during logging? Why or why not? When were they read last and what were the results? What is the range condition and trend? Grazing allotment condition?

3-13 - Does the result justify project activity in this range type? Range will be removed by the project.

48. Response

The Forest Service thanks you for your comment regarding historic range transects and what project effects might befall these transects. These transects have not been visited in many years so the current condition is not known. The Forest Service no longer uses the historical transects. Beginning in 2003, the Pacific Southwest Region of the U.S. Forest Service assumed all long-term range monitoring. The Region uses the rooted frequency vegetation sampling method for meadows (Weixelman, 2010) and the greenline vegetation sampling method for stream banks (Winward, 2000) to collect information on long-term rangeland health, ecological condition, and trend for key areas within grazing allotments. These methodologies have been developed and refined as part of an overall Regional rangeland monitoring program. The purpose of the USDA Forest Service Region 5 Range Monitoring Project was to establish permanent plots on key range sites across NFS lands in the Region in order to provide long-term monitoring of range condition. Each site is reread every five years. In addition, the project provides an ecological classification and quantitative condition scorecard for meadows. Region 5 has been using this method since 1999. Since the historic range transects have not been maintained in years, the status of these transects is unknown. There is no known value of re-establishing these transects. The Forest Plan requirements for range monitoring (Forest Plan 5-11) can be completed without the re-establishment of these transects.

Physical effects from this project may be soil disturbance due to mechanical equipment used to implement the project. This effect will be of short duration. It is expected that range resources will be improved by thinning and underburning as this will bring more sunlight to the ground, improving habitat for forage species.

Silviculture

Concern# 158 - Capability

13-141 - Watershed Level Late Successional Habitat Table Appendix H-4 shows a summary of the capability of NFS lands in the Ash Creek watershed. Capability is not the same as functioning habitat as required under the NWFP.

49. Response

Language in the Forest Plan (Forest Plan p. 4-63) is consistent with and identical to language in the NWFP which directs that “Landscape areas where little late-successional forest persists should be managed to retain late-successional patches. This standard and guideline will be applied in fifth field watersheds (20 to 200 square miles) in which federal forest lands are currently comprised of 15 percent or less late-successional forest. This assessment should include all allocations in the watershed. Within such an area, all remaining late-successional stands should be protected. Protection of these stands could be modified in the future, when other portions of the watershed have recovered to the point where they could replace the ecological roles of these stands.” (NWFP Attachment A, p. C-44).
DEIS Appendix H provides a late-successional old-growth analysis of the HUC 5 Ash Creek watershed (analogous to a fifth field watershed) where the Elk LSR project is located. For the purpose of the watershed level assessment, the late-successional forest definitions in this analysis are consistent with the definitions in the FEMAT report (FEMAT 1993) and those described in the DEIS (DEIS pp. B-16, H-28).

FEIS Table Appendix H-4 (DEIS Table Appendix I-4, p. H-28) displays watershed acres both by their capability of supporting late-successional forest/late-successional status and general age ranges, and by acres currently comprised of mature late-successional forest and older late-successional forest. The statement, “[c]apability is not the same as functioning habitat,” in the comment is correct, however FEIS Table Appendix H-4 shows both capable and functioning currently occupied late-successional/old-growth habitat. See also Response 80 on page I-84 (to Concern 119) regarding the applicability of and compliance with the “Provide for retention of old-growth fragments in watersheds where little remains” standard.

Concern# 139 - Concentrate on Young Trees
4-34 - C-13 of the NW Forest Plan requires that timber sales designed to reduce risk in the LSR land use allocation "should generally focus on young stands." This direction has been ignored in the Elk LSR timber sale that instead primarily focuses logging in mid-seral stands and includes no substantive protections for larger trees while significantly reducing current and future trees greater than 24" DBH in proposed logging units. Hence it is essential that public and the decision maker be informed via NEPA of the number and size of trees to be logged prior to a decision being made to implement the timber sale. This is particularly relevant for older trees >30"dbh. The DEIS fails estimate the number mature trees (20-30" dbh) and the number of "old growth" trees >30" dbh that would be logged from each unit. The most informative way of disclosing this data would be to report the pre-logging number of trees in these size classes and the post-logging number and size of trees in these size classes. We have previously reviewed modeled results of these data for other timber sales thus the data is available for NEPA purposes and the Forest Service is required to disclose for comment and analysis prior to issuing the decision to implement the project. The proposed action must demonstrate that this standard is being met for each unit logged.

50. Response
A preliminary cruise report in the project record dated 02-01-2016 (USDA-FS, 2016) provides an estimate of trees designated for removal. The preliminary cruise report indicates the overall average diameter of removal trees is 11.9 DBH. Trees 10 DBH and larger are generally considered sawtimber; the cruise report indicates the average removal tree diameter for trees 10 DBH and greater is 15.9 DBH (USDA-FS, 2016). This doesn't mean that larger trees wouldn't be removed in some locations such as in radial thinning around predominant pine trees and around some oak, this is more of the exception than the rule. Modeling shows retention of approximately 77-80% of trees over 24 inches DBH immediately following treatment (DEIS pg. 132). Within 20 years it's modeled to show growth to be back up to approximately 89-96% percent of current levels, while reducing the risk of continued widespread mortality of pine in the project area, including the desirable large overstory (predominant) trees that are considerably larger than 24 inches DBH.

Concern# 2 - Diameter Limit
4-7 - We believe that retaining large diameter trees and snags where they still exist would benefit the project in a number of ways. Large trees are a primary element of late successional habitat function, which this project seeks to retain. Retaining large trees in the project would greatly reduce the scientific and social controversy regarding the harvest prescriptions. Large trees provide disproportionate hydrological benefits to these watersheds. The crowns of such trees help moderate peak flow events via canopy cover. Large live and trees are the primary source of future large down wood, which also helps to filter and moderate water flow throughout the year. Also, please note that in the Thom Seider timber sale FEIS (page 343) your colleagues in both the Klamath National Forest and the Environmental Protection Agency acknowledge that the diameter of conifer trees acts as a "measure of resistance to fire." Hence the forest health and fire resiliency goals of the Elk LSR timber sale project may be best achieved by retaining such trees where they still exist in the watershed. That federal agency analysis contained in that FEIS may be viewed at: http://www.fs.fed.us/nepa/fs-usda-pop.php?project=16796
4-8 - We are perplexed by the agency's insistence on logging large trees within the Late Successional Reserve land use allocation. Many LSR projects in California (and throughout the range of the northern spotted owl)
have developed and implemented action alternatives that retain (rather than log) large-diameter trees. Hence it is reasonable to consider and develop such an action alternative.

4-9 - Large tree retention in LSR and riparian reserve land use allocations that serve as designated critical habitat for listed species is an acknowledged "key issue" for the project. See DEIS page 148. Yet every action alternative developed by the Forest Service would reduce the large tree component both now and in the future. Indeed, page 132 of the DEIS indicates that the Forest Service intends to remove 20%-23% of the existing large diameter trees in proposed logging units. In the short term "it is clear that thinning will reduce the number of trees per acre over 24" DBH from current levels." DEIS page 132. In the long term "modeling indicates that unthinned stands would have notably higher levels of trees greater than 24" DBH at year 20 than thinned stands." The project purpose and need, as well as the management intent for the LSR, would be inhibited in both the short and long term by the proposed extensive removal of the very habitat element that is supposed to be emphasized in the Reserve.

4-10 - The proposed removal of large trees/structural legacies will run counter to the management goals for dry forest LSR restoration. As noted on page 165 of the DEIS: In dry forest landscapes, retaining structural legacies (large trees that tend to be fire tolerant, snags and down wood created through stand development or disturbance events) is important to maintaining habitat and connectivity. These structural legacies serve valuable functions, including reproductive structure, cooler microclimates, pretty and forage base, or help maintain or improve connectivity.

51. Response

The Proposed Action and other Alternatives Considered in detail retain the majority of large diameter trees, while reducing densities to levels that promote long term survival them. As described on page 132 in the DEIS, proposed thinning in the natural stands would retain most (77% to 80% based on modeling projections) large diameter overstory trees. A representative scenario further clarifies where a large tree would be removed in one instance (to reduce density around a larger adjacent tree) but retained in another (kept where it is a larger overstory tree compared to neighboring trees). The criteria for tree selection for retention versus removal is an important consideration when discussing numbers and sizes of trees removed. For example, a 26-inch DBH white fir would be selected for removal if it is growing under a 40-inch ponderosa pine being radially released, but would be selected for retention where it is a healthy dominant overstory tree. Modeling was conducted to reflect tree selection criteria that would leave some trees in the smaller size classes, thin heaviest in the suppressed and intermediate sized trees, and thin some codominant trees where needed to reduce density and promote adjacent larger trees (DEIS page 132). The referenced text in comment 4-7 was found in the 2009 Thom Seider FEIS on pages 341 and 367. The Klamath National Forest's response to the EPA comment included: "Larger trees are thicker barked and thus are more fire resistant as noted. However, there are many other variable that influence fire behavior including stand structure, density, composition, aspect, slope, etc. To maintain forest health and resiliency, density is proposed to be reduced to below the zone of imminent mortality, which is an indicator of the healthy density of a stand. Size of trees to be removed and canopy cover retained would vary depending on the size and species of the tree [sic]. We agree with the Klamath's response above, and the Elk project is consistent with that response. Of additional interest is the Klamath's project did have an LSRA Activity Design Criteria that limits trees over 20 inches DBH except for the purpose of creating openings or providing other habitat structure and a few other reasons (Klamath National Forest's Forest-wide LSR Assessment p. 4-13). The Klamath National Forest response to the comment also provided strong rationale for removing larger trees elsewhere depending on site conditions to remove stress on larger trees. Unlike the Klamath National Forest, the Shasta-Trinity National Forest has no management direction to impose diameter limits in our LSRA (as corrected by Mahoric, 2009). While proposed thinning would remove some trees over 24 inches DBH, projected average stand overstory diameter increases by approximately 4 inches immediately after thinning (DEIS, Table 36). Thinning that creates an immediate increase in a stand's average diameter reflects it is a "thinning from below" where tree removal focuses on smaller size classes. Modeling projections of trees per acre under the No Action Alternative at year 20 do not reflect the ongoing density related mortality which has been directly observed in the field and whose occurrence is widely supported by research on density related mortality (Oliver, 1995; Otrosina, et al., 2007; Egan, et al., 2010; Snyder, 2012). As described on pages 144-145 in the DEIS: "Modeling results do not account for the insect and disease activity and mortality patterns that
have recently occurred and are ongoing. As noted elsewhere in this document, a complex of bark beetles and root disease, further exacerbated by several years of drought, have caused elevated mortality above endemic levels throughout much of the project area. There is a loss of large diameter trees not accounted for in the No Action modeling results. Reducing high stand densities including thinning a small percentage of larger diameter trees would provide conditions that promote the development of late successional habitat and survival of large predominate and dominate trees. As described on page 125 of the DEIS: "With increasing high density and competition for resources, tree growth slows, tree vigor declines and forest stands become increasingly at risk of large scale disturbance from events including insect outbreaks and high intensity fire (Kolb, et al., 1998; Agee, et al., 2005; Fettig, et al., 2007). Thinning reduces competition and frees up resources that support the vigor and resilience of the residual forest stand." While the proposed action retains most large diameter overstory trees, two alternatives were considered but dropped from detailed analysis that would limit harvest based on diameters. See the DEIS pages 119 (Alternative 6), and 120-121 (Alternative 8) for discussion of why these alternatives were not considered in detail. See also the Responses to Concerns 103 (comment 4-4) and 137 (Comment 4-13).

The commenter highlights the hydrologic benefits of large trees to watersheds. We recognize the importance that the science of large live trees shows for hydrology, as well as a suite of other processes and functions, and through our analysis of the current condition have found that to maintain the benefits the commenter highlights there is a need to increase stand health in the LSR and in Riparian Reserves. The prescription for each unit balances these needs to best meet these site specific and landscape scale objectives.

Concern# 103 - Diameter Limits and LSR, RR, and Critical Habitat

4-4 - The agency's refusal to consider an upper diameter limit for logging and its proposal to log throughout critical habitat, late successional and riparian reserves runs counter to the standards and intent of the Northwest Forest Plan.

52. Response

The Shasta-Trinity National Forest Late-Successional Reserve Assessment (LSRA as corrected by the October 18, 2009 Regional Ecosystem Office correspondence for ADC #4 and #5) explicitly notes that diameter limits are not prescribed (ADC #4 Stand Attributes "b" (p. 184) and ADC 5 "c" (p. 187). Per the NWFP, silvicultural systems proposed for Late-Successional Reserves have two principal objectives: (1) development of old-growth forest characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and (2) prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations. Small-scale disturbances by these agents are natural processes, and will be allowed to continue (NWFP ROD S&Gs, p. B-5). Additional management activities are allowed in LSRs east of the Cascades in Oregon and California (where the project is located) to reduce risks of large-scale disturbance (NWFP S&Gs, C-12-13). While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the Late-Successional Reserves from playing an effective role in the objectives for which they were established (NWFP ROD S&Gs, p. C-13). The project is responsive to these NWFP objectives treatments are designed to move the landscape toward the desired condition for the Elk Flat LSR as guided by the visions, goals, strategies and design criteria embodied in the NWFP, the Forest Plan, and the LSRA. The NWFP outlines standards and guidelines to follow in all land allocations on pages C-2 to C-6 and specifically in LSRs on pages C-9 to C-21, neither require diameter limits.

While no ubiquitous diameter limits are included in the project, the project's thinning prescriptions emphasize retention of important late successional characteristics including all predominant and most dominant trees; healthy large overstory dominant trees of all species; healthy pine of any size where pine is underrepresented; a component of healthy small understory and midstory trees; a component of heavily
damaged or diseased trees that provide habitat; and all hardwood trees as operationally feasible. Large
snags and down logs and multiple canopy layers (where conditions allow) will be retained consistent with
the project's design and resource protection measures, which were specifically tailored to meet the desired
future condition in the LSR, and based on LSRA guidance and best available science regarding species'
habitat requirements. Variable density thinning will retain a range of densities by including skips, gaps,
and thinning within a range of basal areas, promoting resilience and heterogeneity (DEIS H-20). Risk
reduction efforts were analyzed for the three criteria for potential treatments in older stands. The analysis
concluded that project activities will not prevent the Elk Flat LSR from playing an effective role for
which it was established. The proposed actions in the LSR will help accelerate development of late-
succesional characteristics, will contribute to increased connectivity and resilience of late-successional
habitat in the LSR, and will help reduce the risk of large scale habitat loss while maintaining important
current habitat areas, attributes, and functions (DEIS H-22). Also see DEIS page 179, and H-17 to H-18.
Also see the response 64 page I-71, DRAFT Wildlife Biological Assessment (pp. 4-6).

Per the Aquatic Conservation Strategy Objectives (ACSO) Under the NWFP (pp. B-9, 10) and Forest Plan
(4.53), all management activities must meet or not prevent attainment of the ACSO. Diameter limits are
not prescribed in the standards and guidelines. An evaluation of the project's response to the objectives of
the Aquatic Conservation Strategy from the NWFP and included in the Forest Plan is provided in the
DEIS pages H-13 to H-15. ACSO numbers 1, 3, 8, and 9 address stand or riparian health where the
objective is met through vegetation treatments involving tree thinning in the riparian reserves or larger
watershed. The analysis found that all action alternatives meet and do not prevent attainment of the ACS
objectives (DEIS H-13). The Final Critical Habitat Rule does not prescribe a diameter limit. It does
describe features that support NSO nesting/roosting including large overstory trees and large snags (p.
71905). The treatments are considered consistent with the ecological forestry principals discussed in the
Final Critical Habitat Rule where long-term NSO recovery will benefit, even if short-term impacts may
occur (DEIS p. 176). To ensure the treatments proposed in critical habitat are consistent with
recommendations for management described in the Final Rule, several field reviews were conducted with
the FWS and Forest Service personnel to the majority of natural stands designated as critical habitat, and
some of the older plantation units in critical habitat (see Appendix E that describes the consultation to
date). The specific treatments in unit 153 (oak release, radial thinning of pine, small gap creation), and
other units proposed for thinning and prescribed fire were reviewed by both agencies and deemed
consistent with management objectives within the East Cascades Province (p. 71907). As noted above, the
project retains important late successional components that will also provide for NSO, while overall
reducing the risk to large scale disturbance in the LSR. The project will not remove PCEs of NSO critical
habitat or result in a measurable change in the ECS-3 subunit's ability to provide the functions for which
it was designated (DEIS p. 179). See DEIS pp. 178-181, Draft Wildlife Biological Assessment p. 111.

Concern# 12 - Disease Effects

4-66 - Please consider the following findings from your colleagues in the Rogue River Siskiyou National Forest
contained in the 2012 Bybee timber sale EA indicating that proposed logging activities in the LSR may
increase the impacts of existing pathogens:  
A-15: Armillaria Root Disease "is often associated with trees
under stress or where human caused disturbance is evident."  
A-15: Annosus Root Disease "fungus can be
found fruiting in scuffed white fir and western hemlock stumps infection and mortality are much greater in
tree fir stands that have been entered more than once than in stands that have not been entered "  
A-16: 
Black Stain Root Disease is "associated with roadsides, skid trails, landings, [and] with trees on compacted
soils, recently cut thinning stumps and slash."  
A-17: Pine engravers are associated with logging slash and
windthrow material." The Elk LSR timber sale will result in all of the disease vectors identified above. The
timber sale will disturb forest structure and individual trees, will scuff leave trees and create stumps, will
facilitate multiple logging entries, will establish new roads, skid trails and landings, will compact soils and
will create logging slash. Individually and cumulatively these factors inhibit, rather than contribute to,
attainment of the project purpose and need concerning risk reduction.  
As stated at B-7 of the Elk LSR
DEIS "[f]logging can create tree scars, which become potential infection sites for disease, and insects can be
attracted to the wounds."

4-20 - A possible relationship between soil disturbance and black stain incidence has been reported. Disease
incidence appears to be higher adjacent to recently constructed roads and old railroad beds. Page 67. Yet
the Forest Service is proposing extensive road construction, landing construction, tractor yarding and machine piling.

13-15 - the overstory canopy. Insects, disease and abiotic factors create 1.5 to 5 snags per acre, which are generally scattered throughout the forest canopy. In this 3,400 acre LSR, a 100 acre opening could be a considerable habitat loss. Forest health problems are most common where one species dominates a stand. Black stain root disease is a problem in nearly pure pine stands on the east side of the LSR. As stated previously the current proportion of ponderosa pine in the LSR is 75%. This was never intended, should not have happened, and the FS is to blame for the continued disease outbreaks. Doing more of the same will not remedy the situation.

53. Response

Regional direction for the management of root disease is to prevent mortality and growth losses from exceeding levels which are economically, aesthetically and environmentally acceptable when measured against the multiple objectives and constraints of resource managers (FSH 3409.11, Ch. 60). While disturbance in some instances can lead to further root disease, research has found that the overall benefits of thinning, in promoting the survival and growth of residual trees, outweigh the effects of site disturbance. Findings from a 10-year study of black stain root disease on the adjacent Modoc and Lassen National Forests determined "The control plots had dramatically more mortality than any of the thinning treatments. This is significant because it illustrates the benefit of lowering stand density and therefore stress in mitigating disease impact. Excessive stand density coupled with high mortality rates from black stain root disease can greatly increase risk of catastrophic wildfire in unthinned stands." (Orotsina et al. 2007).

Prevention and suppression are two approaches resource managers use to reduce the occurrence and spread of root diseases. Prevention includes 1) stump treatment with a borate compound and 2) avoidance of cambial damage during operations. Suppression includes 1) favoring non-susceptible hosts, 2) reduction of root-to-root contact, and 3) regeneration of resistant species. As stated in the Elk DEIS, during implementation, land managers will use a borate compound on all operationally cut live conifers with a 14 inch or larger stump diameter (DEIS, p. 51), standard B-provision B6.32 Protection of Residual Trees is enforced during operations to prevent cambial damage and small group selections in infection sites will be planted with non-susceptible host species (DEIS, p. xii and p. 50).

Concern #10 – Insect and Disease Effects

4-63 - There is very little evidence that logging can control insects. Cronin (et al 1999) states: "Even more striking is the paucity of studies that have examined the consequences of human intervention on pest movement patterns. In fact, we know of no studies that have experimentally evaluated the effects of management strategies on the dispersal of insect pests in forest systems." As in the Elk project, logging is often recommended to control outbreaks of bark beetles but there is little direct evidence that this works. Much relies on the assumption that as tree vigor increases the trees are able to ward off infestation by insects. Some scientists have suggested caution in using thinning to control bark beetles as geographic and climactic variables may alter the effect. (Hindmarch and Reid 2001). Hindmarch and Reid (2001) found that thinned stands exhibited a higher attraction rate of mates by males of Ips pini, while females had longer egg galleries, more eggs per gallery and higher egg densities. Warmer temperatures in thinned stands also contributed to a higher reproduction rate. The number of males and females setting on logs was also higher in thinned stands. However, pine engravers in Arizona responded differently to thinning (see Villa-Castillo and Wagner 1996).

4-64 - There is even less evidence that we can control insects once an outbreak starts. Citing several sources Hughes and Drever (2001) assert that the weight of opinion seems to be that most control efforts to date have had little effect on the final size of outbreaks, although they may have slowed beetle progress and prolonged outbreaks in some cases. Bark beetles are always widespread and quite common. Even if an agency can control them in a stand of trees it is likely to have little impact on infestation on a landscape scale. According to Wilson and Celaya (1998), removal of infested trees may provide some protection to surrounding trees, but these insects [Western pine beetle] are very common, so removal of a few infested trees is not a guarantee of protection. Wickman (1990) detailed the effort to control the Mountain pine beetle (Dendroctonus ponderosae) at Crater Lake National Park from 1925 to 1934. Although he did not calculated how many trees in the areas were treated (cut down and then burned) in the nine year period, over 48,000 were treated in a three year period alone. The main lesson learned was that once a mountain pine beetle population erupts over a large area of susceptible forest type, and as long as environmental
conditions remain favorable, there really is no way to stop it until almost all the susceptible trees are either killed or removed by logging. Treating trees perhaps slows the progress of the outbreak, but the outcome is inevitable. (Pg 38) Wickman (1990) The report goes on to state "Perhaps the cold winter in 1932-33 helped, but most importantly, the depletion of susceptible trees ended the outbreak rather than the annual control efforts for 10 years." Wickman (1990) In 1984, lodgepole pine stands in central Oregon were once again infested with mountain pine beetle. By 1985 a severe outbreak covered thousands of acres and extended south nearly to the park boundary. In 1986, beetle-killed trees were found in the northern end of the park (Wickman 1990). In the end the control methods did not work. Although the Forest Service often asserts that the most effective means of reducing losses to the western pine beetle is by risk rating trees with subsequent removal of those that are high-risk. There is no evidence that this works to protect trees in a diverse forest. In some situations, removal of infested trees prior to emergence of brood is recommended in an attempt to protect surrounding trees. However, the overall effectiveness of this strategy is unproven (Wilson and Celaya 1998). Further, in most forest situations, it is not feasible to locate and remove all trees prior to emergence. (Wilson and Celaya 1998)

4-65 A recent report by the Xerces Society includes a summary of relevant studies on the importance of insects to forest function and the methods used to control forest "pest" insects, and a compilation of summaries of over 150 scientific papers and Forest Service documents. The report may be downloaded in .pdf format from http://www.xerces.org/Forest_Pest_Myths/Logging_to_Control_Insects.htm See Black, S.H. 2005. Logging to Control Insects: The Science and Myths Behind Managing Forest Insect "Pests." A Synthesis of Independently Reviewed Research. The Xerces Society for Invertebrate Conservation, Portland, OR. Key findings in the report include:  
- Native forest pests have been part of our forests for millennia and function as nutrient recyclers; agents of disturbance; members of food chains; and regulators of productivity, diversity, and density.  
- Fire suppression and logging have led to simplified forests that may increase the risk of insect outbreaks.  
- Forests with diverse tree species and age classes are less likely to develop large insect outbreaks.  
- There is no evidence that logging can control bark beetles or forest defoliators once an outbreak has started.  
- Although thinning has been touted as a long-term solution to controlling bark beetles, the evidence is mixed as to its effectiveness. The report also outlines general guidelines to follow when considering pest insects and forest management. "The findings are very clear," said Scott Hoffman Black, executive director of the Xerces Society for Invertebrate Conservation and author of the report. "A review of over three hundred papers on the subject reveals that logging is not the solution to forest insect outbreaks and in the long run could increase the likelihood of epidemics." While the Forest Service should examine, incorporate and respond to all of the relevant peer-reviewed citations regarding insects and disease contained in the Xerces Report, we hereby especially highlight four papers for your consideration.  
Summary: Forest insects and pathogens do not threaten forest resources unless changes in forest conditions facilitate population growth. Healthy trees in diverse forests are protected from potential pests by defensive compounds that kill or deter plant-feeding pests, and by the abundance of non-hosts that increase the distance between hosts and chemically hide host trees. Contrary to numerous assertions, old-growth forests are highly productive and remarkably resistant to potential pests.  
Summary: The authors identify major ecological considerations that should be incorporated into sound forest management policy and their potential impacts on current practice. There is no evidence to support the view that natural forests or reserves are more vulnerable to disturbances such as wildfire, windthrow, and pests than are intensively managed forests. Indeed, there is evidence natural systems may be more resistant in many cases. The spread of native and exotic pests and pathogens in many forest systems can be linked to the simplification and fragmentation of the forest. From an ecological standpoint, the strategy with the greatest probability of long-term success in protecting forests against pests and pathogens is one that encourages the maintenance of a diverse set of controls, such as occurs in nature.  
Summary: Disease and insect problems may be worse in managed stands than in natural stands. The authors suggest that old-growth forests have greater diversity of insect predators, which may in turn limit pest insect populations. They also suggest that damage by herbivorous insects could increase as the area of old-growth forests diminishes.  
Summary: The author compared arthropod community structure in replicate Douglas-fir and western hemlock canopies in intact old-growth stands; natural, mature stands; and regenerating plantations in western Oregon. Species diversity and abundance for several taxa, especially predators and detritivores, were significantly lower in plantations than older forests. Old-growth stands had less variability (tighter clustered) arthropod diversity
Elk LSR Enhancement Project

and abundance than partially harvested stands. The data suggest that Douglas-fir canopies may largely recover old-growth structure by 150 years. The author concludes that the recent conversion of large portions of old-growth and mature forests to young plantations (in Oregon’s Willamette National Forest) likely has reduced regional populations of many predator and detritivore species. Reduced predator diversity increases the probability that herbivores will escape regulation by predators, which could lead to a greater likelihood of pest outbreaks.

54. Response

The Forest is not claiming that logging will control outbreaks of bark beetles. The proposed treatments would reduce stand density and inter-tree competition as well as increase stand resiliency, thereby increasing trees resistance to insect attacks when they occur. In the case of black stain root disease in pine, treatments would create conditions less favorable to the disease and break up root-to-root contact between susceptible trees, thereby slowing or reducing spread of the disease (DEIS page 130; see Otrosina et al 2007; Snyder, 2012a). Proposed treatments would slow spread of heterobasidion disease in white fir and develop more resilient stand conditions by interplanting non-host species, treating cut stumps with Sporax® and underburning (DEIS page 130; see Schmitt, et al., 2000; Snyder, 2012a). The Forest Plan (pp. 4-79, 4-82, 4-86) describes density-related desired condition as forest stands managed at levels that maintain and enhance growth and yield to improve and protect forest health and vigor, recognizing the natural role of fire, insects and disease and other components that have a key role in the ecosystem (DEIS page 19). Several citations referenced by the commenter (Hughes and Drever 2001, Wickman 1990, Wilson and Celaya 1998) discuss outbreak control efforts not reflective of or applicable to the Elk Proposed Action. One study (Hindmarch and Reid 2001) researched the behavior of a different species of beetle (ips pini) in dead trees. They examined brooding galleries in dead trees as an indicator of effects of thinning on ips pini beetle reproduction. While their findings indicated increased beetle reproduction, they acknowledged other research (Villa-Castillo and Wagner 1996) found decreased beetle reproduction. In their conclusion they noted; “Because there are many differences between our study and previous ones, including beetle species, breeding preference for live or dead trees, and geography, it is difficult to reconcile the conflicting results.” (Hindmarch and Reid 2001). They further noted this study suggests caution in the use of thinning as a management tool for controlling bark beetles until the mechanism(s) for its effectiveness are better understood. The Proposed Action is consistent with many of the key findings described by the commenter from the summary report circulated by the Xerces Society “Insects and Roadless Forests: A Scientific Review of Causes, Consequences and Management Alternatives” by Black, S. H., D. Kulakowski, B.R. Noon, and D. DellaSala. 2010. National Center for Conservation Science & Policy, Ashland OR. A combination of factors, including past management practices such as the exclusion of frequent natural fire, have led to dense stand conditions at increasing risk of elevated density related mortality from insects and disease. Proposed activities would promote species, structural and age diversity within the stands, protect elements of late successional forest where they occur, and promote the development of late successional forest elsewhere. Statements the commenter references from the above summary report speaks to the heart of the desired conditions the Proposed Action is designed to help achieve, namely conditions where: “Healthy trees in diverse forests are protected from potential pests by defensive compounds that kill or deter plant-feeding pests, and by the abundance of non-hosts that increase the distance between hosts and chemically hide host trees.” (Schowater, T.D. 1990). The Forest recognizes that insects and disease are an important natural component of a functioning forest ecosystem and are not proposing logging as a means to control insect outbreaks but rather promote conditions that reduce the risk of future large scale outbreaks. The project is designed to increase resiliency of the treated stands to respond to natural disturbances so that large habitat losses are not sustained (USDA-FS, 1999).

Researchers began to recognize the importance of tree stocking control to reduce bark beetle activity in about 1941 (Eaton 1941 in (Oliver, 1995). Within the last several decades, a number of studies examined the relationships between tree thinning to reduce bark beetle activity and risk. Repeated observations were made showing a correlation between bark beetle activity and increasing stand densities in pine forests (Fettig, et al., 2007; Cochran, et al., 1995; Cochran, et al., 1999; Schmid, et al., 2005; Oliver, et al., 1997;
Fiddler, et al., 1989; Oliver, 1995). They considered a stand density index of 230 to be the zone of imminent bark beetle mortality based on research observations. The proposed thinning treatments retain a range of densities by including areas of heavy thinning or small openings (radial release, gaps, or group selections), unthinned patches (UTPs that are also referred to as skips), and thinning within a target basal area range elsewhere within the stands. Thinning would reduce stand densities consistent with scientific literature findings that support the use of thinning in ponderosa pine to lessen disease viability and spread (Kliejunas, 1992; Otrosina, et al., 2007; Woodruff, 2002).

Concern# 133 - Large Tree and Snag Retention

4-19 - In Late-Successional Reserves and Managed Late Successional Areas, late successional forest stands are to maintain health and diversity components through the use of prescribed fire and thinning from below. Patches of dead trees are scattered throughout the landscape. Page 66. In this project the Forest Service refused to consider a “thin from below” alternative that retained large trees and snags in the project area.

55. Response

The comment cites to page 66 of the 1995 McCloud Flats Ecosystem Analysis, which is a direct quotation from the Forest Plan for management area 2 (McCloud Flats) and the Desired Future Condition of Late-Successional Reserves and Managed Late Successional Areas (Forest Plan p. 4-81). This same description of the Desired Future Condition for LSRs/MLSAs is also in the Forest Plan for other management areas (pp. 4-85, 4-101, 4-115, 4-119, 4-122, etc.) and is not necessarily specific management direction.

The NWFP, Forest Plan, and 1999 LSRA provide management direction for silvicultural activities in LSRs and MLSAs (see EIS Chapter 1). The 1999 LSRA (Chapter 3) provides guidance for the desired condition in LSRs. This guidance was included in the project design for snags, down wood and the various Activity Design Criteria that are applicable to the project.

The Elk LSR project design and proposed actions are consistent with the Desired Future Condition described in the Forest Plan (p. 4-81) in that prescribed fire is proposed as an initial and recurring treatment throughout the LSR. The project treatments include variable density thinning, which includes thinning-from-below (to reduce stocking, inter-tree competition, and fuel ladders). This treatment also includes subtreatments such as radial thinning around legacy pine (to protect and maintain existing late-successional components); hardwood release (to increase oak and aspen, including rest and nest sites and prey base for fisher and NSO); small gap creation (to introduce fine-scale, within-stand heterogeneity of new species and age classes and reduce fuels); and large and small tree retention areas (unthinned patches and habitat clumps to maintain processes such as thermal refugia, prey base, cover, small and large trees, undisturbed debris, and large snags). These treatments are consistent with the management guidance for dry forest restoration treatments in the Revised Recovery Plan for the NSO, and for increasing resilience in late-successional, and other, forest stands (see Responses 118, 124 and 131 regarding treatment rationale and applicable research and literature).

Existing large snags (dead trees) will be retained, based on species composition and consistent with the Desired Condition in the LSRA (LSRA Tables 3-1 to 3-3). Individual large snags, and large (5 to 10-acre) groups of snags, will be retained (DEIS p. A-25). See EIS Chapter 2, Resource Protection Measure 40 for snag and down log retention measures (DEIS pp. 88-89). Retention of predominant trees, healthy dominant trees and dominant trees with late-successional characteristics (with the exception of meadow restoration and radial thinning around legacy pine, groups selections and hardwood release, where some dominant trees may be removed) contribute toward recruitment of future large snags on the landscape. The EIS Chapter 2 Description of Actions, Alternatives Considered in Detail, Resource Protection Measures and Monitoring and Appendix A (Silvicultural Prescriptions, General Marking Guidelines) provide details on treatments and rationale and measures that maintain and promote health (as well as disease) and diversity in the Elk Flat LSR.

See also Response 51 (to Concern 2) regarding retention of large trees and thinning from below; and Response 74 (to Concern 21), regarding snags.
Concern# 163 - Leave Tree Selection

13-118 - The DEIS defines a desirable tree as one exhibiting no signs of defect, damage or disease. Desirable trees should be preferred over acceptable trees. Desirable trees are not the primary component of LSR and late successional habitat. Acceptable trees may exhibit some minor defect, damage or disease but these characteristics are not excessive. The DEIS states desirable trees should be selected for leave over acceptable trees. The DEIS also speaks to retaining only predominant and dominant trees that meet desirable or acceptable tree criteria. This means all large diameter, old growth characteristic trees will be logged - the exact trees NSO prefer. This is a violation of the LSRA, NWFP and RRP. The project will not meet RA 10 and RA 32 using this prescription.

56. Response

The commenter is referring to a portion of the tree selection criteria for removal as part of the marking guidelines in appendix A (DEIS pg. A-23) which is preceded by the following: “Tree selection for thinning is a process of identifying those trees that are desirable for the habitat objectives, and removing the remaining trees to reduce competition for resources and reduce live ladder and canopy fuels. Trees to be retained would include healthy large overstory dominant trees of all species, healthy pine of any size where pine is underrepresented, a component of healthy small understory and midstory trees, a component of heavily damaged or diseased trees that provide habitat, and all hardwood trees as operationally feasible.” (DEIS pg. A-22) Taken within the context of the complete tree marking guidelines, the definitions the commenter references are designed to help timber markers prioritize trees for removal once all the trees desired for retention have been identified. Predominant trees are retained across all prescriptions (DEIS, page 48). In other words, large predominant trees are desirable for habitat objectives, and thinning within the remaining trees are to reduce competition and reduce the potential for high fire severity (DEIS, page A-22).

Marking guidelines are designed to help the decision process in the field for tree selection to achieve the resource objectives described in the project purpose and need and elsewhere within the DEIS. These objectives include [retain] attributes such as large trees and species and structural diversity (DEIS, page 47); develop and sustain late-successional habitat (DEIS, page 127); promote the health and survival of scarce, large, older trees (DEIS, page 129) and retain existing late successional characteristics (DEIS, page 129). This project has gone through USFWS consultation and has had the agencies involvement from the beginning of the project. The project has been reviewed by the Regional Ecosystem Office and found to be consistent with the NWFP and the LSRA; see the response to concern #146 for further discussion of the REO consistency review. See the response to concern # 57 for further discussion on timber marking.

Concern# 130 - LSR Consistency, Late-Successional/Old Growth

4-3 - In many fire-suppressed dry forest stands our organizations have supported Forest Service plantation thinning and understory thinning of encroaching white-fir. We also have supported Forest Service efforts to utilize prescribed fire in many instances. Unfortunately, the Shasta-Trinity National Forest in general, and the McCloud Ranger District in particular, are making it harder and harder for us to support Forest Service management activities in the Late Successional Reserve (LSR) system. Large tree removal, new road construction, group selection logging, riparian reserve logging, and machine piling are all activities that directly harm forest health and late-successional ecosystems. Simply put, the reserve land use allocations, and the Northwest Forest Plan, lose all meaning if native forest stands are logged in order to prevent, rather than facilitate, natural forest succession processes.

57. Response

As described in the Purpose and Need, the majority of the forested portion of the project area is departed from the natural fire regime (DEIS pg. 10), which in combination with historic logging practices has led to a shift in species composition and unsustainably high stand densities (DEIS pg. 21) Treatments would promote natural forest succession processes by developing stand conditions that more closely reflect those that occur under a frequent natural fire regime, as well as reintroducing fire on the landscape. Treatments were developed for the Elk LSR to promote forest resiliency, protect and develop late successional characteristics, reduce the risk of habitat loss to large scale disturbance, and promote hardwood
development. These objectives are supported by the analysis conducted and described in the DEIS. The project has been reviewed by the Regional Ecosystem Office and found to be consistent with the NWFP and the LSRA; see the response to concern #146 for further discussion of the REO consistency review. It is through developing the purpose and need of the Elk LSR treatments that management activities were developed to address management direction and objectives within the LRMP, LSRA and NWFP.

As one example, existing conditions within the Riparian Reserves (RR) currently do not promote riparian vegetation or hydrologic process and functions needed to maintain or improve Aquatic Conservation Strategy objectives. Hand piling within the equipment exclusion zones of the RR responds to the need to avoid sensitive areas with equipment. The lack of sunlight, needed by riparian vegetation to reproduce, is limiting riparian vegetation growth. Near stream shading by riparian vegetation is virtually absent within the RR. Please see Concern/Response #15 for a discussion on treatments, and effects from machine piling within the Riparian Reserve and on thinning and C/R #125 on shading..

Concern# 113 - LSR Consistency, Risk Reduction

4-5 - It appears that much of the large tree, machine piling and road construction proposed in the Elk LSR timber sale is based on the belief that management (logging) induced tree mortality in a Late Successional Reserve is ecologically preferable to tree mortality that is the result of natural processes. This premise is incorrect. We recognize that continuing Forest Service fire suppression, logging and road construction policies have altered the species and seral composition of some forest stands in the LSR, but we dispute that additional large tree-removal, road construction, machine piling will therefore aid forest health.

The authors of the Northwest Forest Plan accounted for large-scale disturbance in the design (and function) of the LSR system. As stated in Dr. Jerry Franklin's comments regarding the proposed Biscuit Fire Salvage timber sale within Late Successional Reserves on the Rogue River-Siskiyou National Forest:

The LSR network was designed to accommodate large, intense natural disturbances and allow for natural recovery processes. This is one reason that the FEMAT report and PNW Forest Plan provide for conservative direction with regards to salvage in LSRs and direct that activities should enhance or at least not interfere with natural recovery processes. Chapter and verse are cited in the text of these comments.

Salvage logging of large snags and down boles does not contribute to recovery of late- successional forest habitat; in fact, the only activity more antithetical to the recovery process would be removal of surviving green trees from burned sites. Large snags and logs of decay resistant species, such as Douglas-fir and cedars, are critical as early and late successional wildlife habitat as well as for sustaining key ecological processes associated with nutrient, hydrologic, and energy cycles.

Specifically, in the Elk LSR project Forest Service timber planners are proposing the removal of large snags and live conifers that "are critical as early and late successional wildlife as well as for sustaining key ecological processes associated with nutrient, hydrological, and energy cycles" in the Late Successional Reserve rather than recognizing that the LSR network "was designed to accommodate large, intense disturbances and allow for natural recovery processes."

The ecological differences between biologically rich stands that result from natural disturbance and stands that are subject to logging, skid trail establishment, machine piling and road construction are well known and pronounced:  
Eaaacomodarily-successional forest ecosystems that develop after stand-replacing or partial disturbances are diverse in species, processes, and structure. Post-disturbance ecosystems are also often rich in biological legacies, including surviving organisms and organically derived structures, such as woody debris. These legacies and post-disturbance plant communities provide resources that attract and sustain high species diversity, including numerous early-successional obligates, such as certain woodpeckers and anthropods. Early succession is the only period when tree canopies do not dominate the forest site, and so this stage can be characterized by high productivity of plant species (including herbs and shrubs), complex food webs, large nutrient fluxes, and high structural and spatial complexity. Different disturbances contrast markedly in terms of biological legacies, and this will influence the resultant physical and biological conditions, thus affecting successional pathways. Management activities, such as post-disturbance logging and dense tree planting, can reduce the richness within and the duration of early-successional ecosystems. Where maintenance of biodiversity is an objective, the importance and value of these natural early-successional ecosystems are underappreciated.  

The Forest Service proposal to log native forest stands, conduct group selection logging, establish skid trails, establish new log landings, construct new logging roads, and conduct machine piling largely ignores
the existing science regarding stand development processes including biological legacies and recovery periods in creating stand complexity and biodiversity.

Foresters use natural disturbances and stand development processes as models for silvicultural practices in broad conceptual ways. Incorporating an understanding of natural disturbance and stand development processes more fully into silvicultural practice is the basis for an ecological forestry approach. Such an approach must include 1) understanding the importance of biological legacies created by a tree regenerating disturbance and incorporating legacy management into harvesting prescriptions; 2) recognizing the role of stand development processes, particularly individual tree mortality, in generating structural and compositional heterogeneity in stands and implementing thinning prescriptions that enhance this heterogeneity; and 3) appreciating the role of recovery periods between disturbance events in the development of stand complexity. We label these concepts, when incorporated into a comprehensive silvicultural approach, the “three-legged stool” of ecological forestry. Our goal in this report is to review the scientific basis for the three-legged stool of ecological forestry to provide a conceptual foundation for its wide implementation. -Franklin et al, Natural Disturbance and Stand Development Principles for Ecological Forestry. USDA Forest Service Northern Research Station. General Technical Report NRS-19. 2007.

58. Response

NWFP Late-Successional Reserve standards and guidelines are designed to maintain late successional forest ecosystems and protect them from loss due to large-scale fire, insect and disease epidemics, and major human impacts. The intent is to maintain natural ecosystem processes such as gap dynamics, natural regeneration, pathogenic fungal activity, insect herbivory, and low-intensity fire. These standards and guidelines encourage the use of silvicultural practices to accelerate the development of overstocked young plantations into stands with late-successional and old-growth forest characteristics, and to reduce the risk to Late-Successional Reserves from severe impacts resulting from large-scale disturbances and unacceptable loss of habitat (NWFP p. B-1, C-11). See also NWFP B1-2, 4-5, 7.

The Forest Service recognizes that natural disturbance is an important process in late-successional reserves, but both human and natural processes have altered the disturbance regime in the Elk Flat LSR such that without action, further habitat loss will result from density-related mortality, root disease, insect attacks and predicted lethal fire effects. Without action, the ongoing stand-replacing events in the Elk Flat LSR are expected to continue, jeopardizing existing and future late-successional habitat (DEIS p. viii). This concept for stands east of the Cascades is common in recent science, such as the Revised Recovery Plan, Final Rule Critical Habitat, Churchill et. al 2013, Franklin et. al 2013).

The Elk project is designed to achieve management direction to enhance and protect the Elk LSR. Habitat loss, long term habitat persistence and current habitat trends were seriously considered by the interdisciplinary team in evaluating this project. The interdisciplinary team developed project actions to address the purpose and need to maximize the reduction in the risk of large scale habitat loss and other purpose and need elements while maintaining important current habitat areas, attributes, functions, refugia and biological legacies. This was done through a variety of methods, including retaining all predominant and most dominant trees; a component of healthy small understory and midstory trees; a component of heavily damaged or diseased trees that provide habitat; all hardwood trees as operationally feasible; large snags and down logs; and multiple canopy layers (where conditions allow). Variable density thinning will retain a range of densities by including skips, gaps, and thinning within a range of basal areas, promoting resilience and heterogeneity (DEIS H-20). Roost/rest clumps, UTPs, and specifically unthinned areas will also contribute to this as well as resource protection measures that call for mosaic burning.

See also Response to Concern 21 and 158 and Response 133 and 112 (trees, snags).

We don’t discount that early-successional habitat is diverse. The NWFP and the LSRA provide direction for reducing large-scale risk in LSR that was considered in project development. See also Response to Concern 38 (response 124) 96 (response 131). Regarding Swanson et. al 2011, the project is consistent with many of concepts such as retaining biological legacies, maintaining undisturbed areas of vegetation and soils, etc.
The DEIS (p. 6) notes that “Late-Successional Reserves (LSRs) were established in the Forest Plan and are intended to provide old-growth forest habitat, provide for populations of species that are associated with late-successional forests, and to help ensure that late-successional species diversity will be conserved. Management direction in LSRs is to protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late- successional and old-growth related species, including the northern spotted owl (NWFP, 1994 p. 8) (Forest Plan pp. 4-37 to 4-43) (LSRA, 1999 p. 1). LSRA p. 178 provides Objectives for treatment in LSRs on the Forest include protection from large-scale disturbance events (see also DEIS p. 7). The DEIS p. 10 cites the NWFP B-7 (pasted below) and LSRA p. 2.

Regarding Franklin et. al 2007, the project is consistent with the concepts to incorporate biological legacies into harvest prescriptions, utilize intermediate treatments that enhance heterogeneity, and allowing for appropriate recovery periods.

Concern# 171 - LSR, Desired Condition, Stand Density

13-14 - Denser stands should be intermixed with these desired ranges with 10-20% of the landscape area in conditions that are closer to 90-100% of normal. This will allow for areas of higher stocking levels, higher levels of mortality, undisturbed debris, and size differentiation. Numbers of trees per acre will vary depending on the size of the trees within individual stands. The Elk LSR project will not leave anywhere close to 210 -245 foot basal area in mixed conifer as shown in Table 3-2 above. The FS appears to be intentionally misrepresenting this figure to log more of the LSR at the expense of late successional species habitat.

13-14 - The DEIS states "the desired condition for density of late successional and old growth habitat stands on the McCloud Flats is 50 to 70% of normal basal area”. This is not true and is misrepresented. The actual language states on page 167 of the LSRA: Denser stands should be intermixed with these desired ranges with 10-20% of the landscape area in conditions that are closer to 90-100% of normal. This will allow for areas of higher stocking levels, higher levels of mortality, undisturbed debris, and size differentiation. Numbers of trees per acre will vary depending on the size of the trees within individual stands. Desired basal area for most of the late seral and old growth stands on south and west aspects, and the McCloud Flats will generally be in the range of 50-70% of normal (Dunning & Reineke, 1933) and should apply to stands generally in the range of 150 - 200 years. This is done in order to allow these stands to maintain desired characteristics for a longer time period without an imminent threat to high levels of mortality. (Personal discussion with Forest Pest Management Personnel). After the 200 year timeframe, basal area should not be as much of a concern in order to allow decadence and increased mortality processes to naturally occur. Table 3-2 summarizes these characteristics.

59. Response

The LSRA gives a general description of Late-successional forests as "those forest successional stages that include mature and old-growth age classes (NWFP). The structure and composition of these forests vary by forest type, site quality, and fire regime. Typically, such stands include live old-growth trees, standing dead trees (snags), and fallen trees or logs. . . . In pine dominated forest, stands under normal conditions are more open with relatively fewer snags and logs (LSRA, p. 1). Page 162 describes a generalized desired condition for the LSRs "is to promote and maintain late successional conditions in the maximum amounts sustainable through time. Differences in late successional forest structure and process exist between forest community types within the LSRs/MLSAs, and no single desired condition is appropriate for the entire landscape.” the LSRA page 164 notes that desired future condition will vary according to the primary vegetative species, site class, topography and other site factors. The descriptions are to be used to guide the development of the prescriptions, with development and maintenance of late-successional habitat as the ultimate objective of the treatment.

The LSRA passage referenced by the commenter (LSRA page 167) refers to the Douglas fir vegetative series (Douglas fir - tanoak and Douglas fir - white fir), which does not exist in the Elk Flat LSR. The LSRA provides desired condition specific to the McCloud Flats within the description of attributes for vegetative series for Mixed Conifer on pages 165 to 166. Consistent with the LSRA, the variable density thinning prescriptions for the Elk project vary based on stand and tree species composition with lower
basal areas and SDI targets prescribed for pine-dominated stands (80 to 140 sqft/ac; 220-230 SDI), and higher basal areas prescribed in mixed conifer/pine stands (125 to 175 sqft/ac/250+ SDI).

Stands 150, 152-2, 156, 168-2, 173 and 182 are dense forest stands not proposed for thinning and represent 10% of the total LSR acres. Inventory data indicates basal areas ranging approximately 254 – 292 square feet in these stands. These stand conditions are not projected to persist in the long term but provide desirable habitat for the near term. Underburning would remove some surface and smaller ladder fuels in these stands but not appreciably alter stand density.

In addition to these unthinned stands, the project's design includes unthinned patches within thinning stands, in accordance with LSRA direction (LSRA, pp. 185 and 188). Whether thinning treatment is occurring in a natural stand or plantation, the unthinned patches (UTPs) would be retained in units within LSR allocation. These UTPs retain variable conditions and stand elements that promote structural heterogeneity for wildlife and late-successional forest values. They vary in size and placement, but typically range between 10 to 12 percent of a unit. The UTPs are selected by identifying the best available NSO and fisher habitat elements within a unit. Snag retention areas would also comprise unthinned patches in units that have heavy mortality when other valuable features are not available to retain. See DEIS Appendix A (p. A-24-25) for more information on the unthinned patch designation and DEIS Table Appendix A-2 (p. A-6) for unit-specific unthinned patch acreage. Other design features also maintain late-successional habitat attributes including predominant trees, dominant trees with late-successional characteristics, healthy dominant trees, and habitat roosting and resting clumps in the thinned portions of stands (DEIS pp. 48-49 and pp. A-22-25). The unthinned patches, habitat clumps and large tree retention areas would not be factored into the overall basal area targets during marking. Based on this, it is assumed that post-project stand basal area in thinned portions of mixed conifer stands that support NSO habitat would range from 125-200+ sqft/ac (DEIS pp. 173-175, Draft BA, pp. 28, 79, 96, 98). In the pine-dominated natural stands proposed for thinning, where basal area targets are lower, unthinned patches would also remain on the landscape, though may be primarily composed of existing large snags (DEIS pp. 48). Roost and rest sites are of lower frequency in these areas, given the dominant species composition of ponderosa pine and more open canopy conditions in general.

Concern# 172 - LSR, Ponderosa Pine

13-132 - Alternative 1 has a flawed purpose and need including the primary P&N. The entire premise of the project is based on protecting ponderosa pine - a species that is 50% more than it should be under LSRA direction. The LSR is functioning as it should with mixed conifer taking over the pine and providing late successional habitat for species dependent on it. The project fails to meet the direction in the FOREST PLAN for LSRs and completely deviates from the LSRA for the Elk Flat LSR. The FS seems to have ignored the fact that LSRs were set aside under the NWFP for recovery of late successional species including the threatened NSO. These areas were never intended for commercial timber sales [ponderosa pine is favored by the timber industry] that basically gut the area for use by late successional species.

60. Response

The purpose of the project is not to protect ponderosa pine, but to reduce the risk of losing existing (and developing) mid-, early- and current late-successional habitat and increasing stand resilience (DEIS p. 9). An additional purpose and need is to accelerate development of late-successional habitat (DEIS p. 9). Specific to the LSRA, the Elk Flat LSR (RC-360) is described as a priority for treatment objective II, which is to promote the continued development of late-successional forest characteristics (USDA-FS 1999 p. 178). The Project is also designed to meet the other three LSRA treatment objectives; protecting existing late-successional habitat from threats (of habitat loss) that occur inside and outside LSRs, protecting mid and early-successional vegetation from loss to large-scale disturbance events, and promoting connectivity of late-successional habitat within LSRs (USDA-FS 1999 p. 175).

Late-successional reserves were established under the NWFP and are intended to provide old-growth forest habitat, provide for populations of species that are associated with late-successional forests, and to help ensure that late-successional species diversity will be conserved. The management objective within
LSRs is to "protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late-successional and old-growth related species, including the northern spotted owl" (USDA-FS and USDI-BLM 1994; Forest Plan pp. 4-37 to 4-43; LSRA p. 1).

The LSRA describes protection of LSRs to include reducing the risk of large-scale disturbance, including stand-replacing fire, insect and disease epidemics, and major human-caused impacts (USDA-FS 1999 p. 1). Both protection and enhancement can include application of silviculture and other treatments designed to reduce the risk of loss and/or accelerate development of late-successional stand characteristics (USDA-FS 1995 pp. 4-37 to 4-39; USDA-FS 1999 pp. 174-203). This direction was taken into detailed consideration during development of the project, along with Forest Plan goals that describe the network of LSRs are designated to provide for a viable population of northern spotted owls throughout their historic range (USDA-FS 1995 p. 3-27). The projects' treatments are intended to protect existing high quality NSO habitat, and are expected to increase suitable NSO habitat, and develop more resilient and more diverse NSO habitat over time, including within the one NSO core and home range in the project area (Draft BA pp. 93-102).

The Forest also expects the network of land allocations excluded from active management (e.g. wilderness, administratively withdrawn areas, wild and scenic rivers, others) to provide habitat to help maintain viable, well-distributed populations of federally listed or proposed and Forest Service sensitive species (USDA-FS 1995 p. 3-27). Where active management (including thinning) occurs in LSRs and Riparian Reserves, standards and guidelines and project design features for snags, logs, hardwoods, biodiversity and protection and enhancement of habitats also contribute toward this goal. Late-Successional Reserves or Riparian Reserves may be treated to reduce the risk of losing habitat, to enhance habitat, and to contribute to Aquatic Conservation Strategy objectives, but they do not regularly contribute to allowable sale quantity (DEIS p. 6; Draft BA p. 4).

The project's purpose is not to convert stands to ponderosa pine, but where ponderosa pine is the dominant species, create stand conditions that result in higher levels of resilience to withstand drought, disease and insect attacks (DEIS, pp. vii-xii). The variable density thinning prescriptions vary based on stand and tree species composition with lower basal areas where the ponderosa pine vegetation type occurs, and higher basal areas where the mixed conifer vegetation type occurs. Appendix A of the EIS outlines the proposed treatments, including radial thinning around legacy predominant sugar and ponderosa pine that are current late-successional habitat components which are also at risk (DEIS, p. A-25; preliminary silviculture report, p. 14). The project's design includes unthinned patches, in accordance with LSRA direction (LSRA pp. 185 and 188) and other design features that maintain late-successional habitat attributes on the landscape (EIS Chapter 2; Appendix A). In the higher quality habitats for northern spotted owl, northern goshawk and fisher, no mechanical thinning would occur and prescribed fire is expected to have a beneficial effect on these habitats, though may result in reduced prey abundance in the short term (one season to 3-5 years; DEIS p. 172; Draft BA pp. 72-73, 84-87, 90-92). The project's Draft and Final Biological Assessment (and Biological Evaluation) fully describe how thinning treatments would maintain, protect and enhance habitat for late-successional associated species in both the short term and long term.

The Elk Project is treating the stand types for the desired conditions that they can sustain, as directed by the LRMP, NWFP and LSRA. Late-successional forests are those forest successional stages that include mature and old-growth age classes (USDA-FS and USDI-BLM 1994b). The structure and composition of these forests vary by forest type, site quality, and fire regime. Typically, such stands include live old-growth trees, standing dead trees (snags), and fallen trees or logs. In Douglas-fir forest, other features include multiple canopy layers with smaller understory trees. In pine-dominated forest, stands under normal conditions are more open. In wet climates, on productive sites, these old-growth characteristics can begin to develop as early as 150 years. On dry sites, stands may be well over 180 years before these characteristics develop (LSRA, p. 1).
As described in all the management direction and guiding documents for the project area and LSRs (NWF, Forest Plan, LSRA), the project meets the objectives for managing the late-successional stand types found in the project while maintaining, protecting and promoting habitat critical for late-successional species.

Concern# 151 - LSR Species Diversity Compliance

13-99 - The Elk Flat project deviates from the LSRA direction completely. The FS has not provided a rationale for this deviation, other than to state it is seeking REO approval to decimate this LSR at the expense of late successional species.

13-99 - After reviewing the DEIS on pages 87-90 for Wildlife we checked the LSRA page numbers cited and found the proposal is not in compliance with LSRA direction. For example the LSRA states pp. 165-167: Attributes Specific to Vegetative Series (References: Beardsley and Warbington 1996; Old Growth in Northwestern California National Forests) Mixed Conifer The more structurally complex late seral stage conditions will occur on the north and east slopes within the mixed conifer zone. Conifer species should contain a mixture of Douglas fir, ponderosa pine, sugar pine, and incense cedar. Dominant hardwoods should be black oak and madrone. It is desirable to have multilayered stands scattered throughout the north and east facing aspects, especially on moist sites or lower on the slopes. On south and west aspects and the McCloud Flats sites will be dominated by conifers. Due to fire behavior some locations may have canopy closures averaging 25%, especially on the upper locations of steep slopes. Stands will generally be single layered with some hardwood present in the understory. Multilayered patches will be scattered, but stands will tend to be more single storiaged with mature to old growth characteristics. Ponderosa pine will be the dominant conifer species, intermixed with Douglas-fir, white fir, sugar pine, and incense cedar. Hardwood species will often consist of black oak, madrone, live oak, or aspen. On capable lands, there are on the average 12 trees per acre at least >30 inches in diameter, and 12 trees per acre between 20 inches and 28 inches diameter. The density of understory trees <20 inches diameter will be greatest on cooler north and east aspects. Overstory percent cover averages 49 percent. The average number of snags at least 20 inches in diameter is 2-4, per acre and 6-7, 20+ inch diameter down logs on north and east aspects and less on south and west aspects and the McCloud Flats. On the average there are three trees per acre with some form of decay. Douglas fir (Douglas fir - tanoak and Douglas fir - white fir): Most stands should be multilayered stands with conifers occupying the overstory and hardwoods/conifers occupying the understory, depending on associated vegetation series. Overstory conifer species should be dominated by Douglas fir and sugar pine in the Douglas fir - tanoak series. White fir should be an added component in the Douglas fir - white fir series. Dominant understory hardwoods should be tanoak, with minor amounts of pacific madrone and black oak. Dominant understory vegetation in the Douglas fir - white fir series should be white fir with a mixture of Douglas fir. It is desirable to have multilayered stands; on north and east aspects, especially on moist sites or lower on the slopes. On south and west aspects and the upper portions of some locations are more open with small patches of denser vegetation scattered. Overstory conifer species are dominated by Douglas fir, sugar pine, and white fir where applicable. Dominant understory hardwoods include tanoak, pacific madrone, live oak, and big leaf maple. On capable lands, there are on the average 13 trees per acre at least 30 inches diameter, and 12 trees per acre between 20 inches and 28 inches diameter. The density of lower crown class and understory trees <20 inches diameter will be greatest on cooler north and east facing aspects and on the lower portions of slopes adjacent to riparian areas. Overstory percent cover averages 75 percent. The average number of snags at least 20 inches in diameter is 2-3 per acre and 5-8, 20+ inch diameter down logs. Desired basal area for most of the late seral and old growth stands on north and east aspects will generally be in the range of 50-70% of normal (Dunning & Reineke, 1933) and should apply to stands generally in the range of 150 - 200 years. This is done in order to allow these stands to maintain desired characteristics for a longer time period without an imminent threat to high levels of mortality (personal discussion with Forest Pest Management Personnel). After the 200 year timeframe, basal area should not be a concern in order to allow decadence and increased mortality processes to naturally occur. Table 3-1 summarizes these conditions.

13-99 - Denser stands should be intermixed with these desired ranges with 10-20% of the landscape area in conditions that are closer to 90-100% of normal. This will allow for areas of higher stocking levels, higher levels of mortality, undisturbed debris, and size differentiation. Numbers of trees per acre will vary depending on the size of the trees within individual stands. Desired basal area for most of the late seral and old growth stands on south and west aspects, and the McCloud Flats will generally be in the range of 50-70% of normal (Dunning & Reineke, 1933) and should apply to stands generally in the range of 150 - 200 years. This is done in order to allow these stands to maintain desired characteristics for a longer time period without an imminent threat to high levels of mortality (personal discussion with Forest Pest Management Personnel). After the 200 year timeframe, basal area should not be as much of a concern in order to allow decadence and increased mortality processes to naturally occur Table 3-2 summarizes these characteristics.
61. Response

The LSRA gives a general description of late-successional forests as "those forest successional stages that include mature and old-growth age classes (NWFP). The structure and composition of these forests vary by forest type, site quality, and fire regime. Typically, such stands include live old-growth trees, standing dead trees (snags), and fallen trees or logs. . . . In pine dominated forest, stands under normal conditions are more open with relatively fewer snags and logs" (LSRA, p. 1). Page 162 of the LSRA also describes a generalized desired condition for the LSRs, "...to promote and maintain late successional conditions in the maximum amounts sustainable through time. Differences in late successional forest structure and process exist between forest community types within the LSRs/MLSAs, and no single desired condition is appropriate for the entire landscape." The LSRA (p. 164) notes that desired future condition will vary according to the primary vegetative species, site class, topography and other site factors. The descriptions are to be used to guide the development of the prescriptions, with development and maintenance of late-successional habitat as the ultimate objective of the treatment. See also Response 55 (to Concern 133). See also the LSR Compliance section in the EIS (Appendix H).

Stands 150, 152-2, 156, 168-2, 173 and 182 are dense forest stands not proposed for thinning and represent 10% of the total LSR acres. Inventory data indicates basal areas range approximately 254 – 292 square feet in these stands. These stand conditions are not projected to persist in the long term but provide desirable habitat for late-successional associated species (NSO, goshawk, fisher) for the near term. Underburning would remove some surface and smaller ladder fuels in these stands but not appreciably alter stand density (BA NSO effects section and BE NGO effects sections for underburning-only treatments). In addition to these unthinned stands, the project's design includes unthinned patches within thinning stands, in accordance with LSRA direction (LSRA, pp. 185 and 188). Whether thinning treatment is occurring in a natural stand or plantation, the unthinned patches (UTPs) would be retained in units within LSR allocation. These UTPs retain variable conditions and stand elements that promote structural heterogeneity for wildlife and late-successional forest values. They vary in size and placement, but typically range between 10 to 12 percent of a unit. The UTPs are selected by identifying the best available NSO and fisher habitat elements where they occur within a unit (e.g. in natural stands and older plantations, as these habitat elements are generally not present in younger plantations).

The project’s purpose and need reflects LSRA objectives and treatments are designed to be consistent with the pertinent Activity Design Criteria (ADC). This includes ADC 1 (Reforestation and revegetation), 4 (Thinning in early successional pole and mid-successional stands - Hazard Related), 7, 9 and 10 (Fuel Reduction, Hazard Reduction - Prescribed Burning and Manual and Mechanical Fuels Reduction) (LSRA pp 182-195) or Miscellaneous Activity 7 (Maintaining Hardwood Stands, forest openings, meadows, and glades) (LSRA pp. 205; DEIS pp. H-17 to H-22).

The Forest consulted with the FWS and the agencies have completed streamlined consultation since October 2011 (BA Appendix C). The project has been reviewed by the Regional Ecosystem Office who have found it to be consistent with the NWFP and the LSRA (Rubado 2016).

Concern# 122 - LSRA Consistency

While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the Late-Successional Reserves from playing an effective role in the objectives for which they were established. The Elk LSR project will prevent the LSR from playing an effective role in the objectives for which it was established and the FS has not demonstrated otherwise.

62. Response

Chapter 1 of the DEIS (DEIS pp. 1- 46) describes the ongoing risk of losing late-successional habitat and stand conditions, and the risks to NSO critical habitat in the project area. This is further described in the existing condition sections of the Preliminary silviculture report (Payne 2015), Forest Health Biological Evaluation (Snyder 2012) and the wildlife resource reports. The treatments are designed to move stands in
the Elk Flat LSR toward the desired conditions described in the Forest Plan and LSRA. Treatment effects, as well as effects of ‘no action’ are described in Chapter 3 of the EIS (DEIS pp. 123-251). The DEIS and analysis in the project record support the rationale for treatments in the LSR, identify and describe the methods to be utilized, and are consistent with applicable management direction. In ponderosa pine-dominated forests, thinning to stand densities that are below the limiting SDI shows a benefit to long term stand and forest resiliency (Payne 2015b). The treatments are variable, depending on stand conditions (see also Response 130 to Concern 176 regarding thinning in pine-dominated areas, and thinning in mixed-conifer areas).

The DEIS Chapter 3, Environmental Consequences summarizes the direct, indirect and cumulative effects of all alternatives considered in detail (DEIS pp. 123-251). DEIS Appendix H (pp. H-1 to H-30) describe and Forest Plan, National Forest Management Act and other compliance as it applies to the Elk LSR project.

The LSR Compliance section describes, “The project’s thinning and fuels treatment designs, areas delineated for no mechanical treatment and measures to maintain and protect important habitat components will contribute to: 1) continued function for late-successional associated species use occurring now or in the future, 2) increased diversity and resilience of existing and developing early and mid-successional habitat, and 3) reduced risk of loss and increased connectivity within and between stands” (DEIS p. H-22). These conclusions are based on supporting rationale in the project analysis, and the project activities will not prevent the Elk Flat LSR from playing an effective role for which it was established. This section has been updated in the FEIS, but the conclusion remains the same as the DEIS.

Concern# 144 - LSRA Consistency
13-31 - The FS has violated LSRA direction since it was written and now that it is in a condition not anticipated, rather than take a cautious approach to management, the FS wants to log the majority of the LSR in one fell swoop when dispersal, foraging, roosting and nesting habitat are at much lower rates than ever anticipated. The FS fails to provide any legitimate rationale for such a significant deviation from the LSRA. Simply because the forest has violated the LSRA in the past does not give it permission to continue doing so now. The FS could develop a proposal far less detrimental to the owl and other late successional species by following the direction in the LSRA cited above.

63. Response

The Elk LSR project is designed to move the landscape toward the desired condition for the Elk Flat LSR as guided by the visions, goals, strategies and design criteria embodied in the NWFP, the Forest Plan, and the 1999 LSRA (DEIS pp. 6, 9-27, B-24, H-17). This includes the protection and enhancement of conditions of late-successional and old-growth forest ecosystems. Treatments are designed to reduce the risk of losing habitat for late successional species, improve NSO habitat, increase conifer species diversity in plantation areas and natural stands, treat areas of black stain and Heterobasidion root disease, and reduce the risk of developing future extensive mortality areas (DEIS 47, 138, and 139). The ‘Ecological Principles for Management of Late-Successional Forests’ discussion in Section B of the NWFP Standards and Guidelines were assessed during project development (DEIS pp. B-24, H-18).

The project’s purpose and need reflects LSRA objectives and treatments are designed to be consistent with the pertinent Activity Design Criteria (ADC). The Forest found that the Elk LSR project meets the LSRA ADC and treatment standards for potential treatments and the objectives in the NWFP, and the intent of ADC #4 and ADC #7. REO consistency review (Myers, 2016) was requested for two proposed treatments that are consistent with the ‘Ecological Principles for Management of Late-Successional Forests under the NWFP’, but vary from specific requirements in the LSRA: Group selection treatments (openings) larger than ¼-acre and the Extensive Mortality Area treatment. Otherwise, all proposed actions are consistent with the general objectives from the LSRA, all of which fall under LSRA Activity Design Criteia (ADC) #1, #4, #5, #7, #9 and #10, or Miscellaneous Activity 7. The LSR Work Group met and discussed the proposed treatments and concurred that the treatment in the Elk Flat LSR meets the objectives and the Standards, and Guidelines for managing within LSRs. This conclusion is documented
in a letter of concurrence from the REO received (Rubado, 2016). The FEIS LSR consistency finding was clarified after the REO review concluded. (See FEIS starting page H-17).

Concern# 46 - LSRA Consistency, P&N

13-6 - The DEIS claims there are no specific objectives for the Elk Flat LSR in the LSRA. This is simply incorrect. Both the MFPEA include the Elk Flat LSRA as well as the LSRA itself. Below is information regarding the Elk Flat LSR including the habitat in the LSR at the time the LSRA was written treatment options, area recommended for treatment, among other things. The proposed action conflicts with virtually all of this direction. The STNF has mismanaged the Elk LSR since the inception of the LSRA and has not followed its guidance. It has created a situation that was never expected and now is attempting to continue the mismanagement. For example, as cited below, the LSRA states the Elk LSR should not be more than 25% ponderosa pine. It explains any more than this exacerbates black stain disease and annosus disease -two current problems in the LSR. The current proportion of ponderosa pine in the LSR is a whopping 75% with only 10% mixed conifer forest. The DEIS claims the mixed conifer is a problem yet that is what late successional species need and that is what largely existed in 1999 when the LSRA was written. Mixed conifer is not the problem, the ponderosa pine is and the FS intends to replant more ponderosa pine at 250 trees per acre creating more plantations that will develop more disease and require additional treatment within 20 years. This plan is a failure that will prevent late successional habitat preferred by late successional species from ever developing.

13-7 - the primary purpose of the project is risk reduction in early, mid and late successional habitat and cites to Objectives I and III of the LSRA pp. 174-179. A look at this section says nothing about risk reduction in late-successional habitat [the DEIS even concedes this with a footnote stating the LSRA means young stands and plantations up to 12.9" DBH]; Elk Flat is listed next to last of all LSRs as a priority for treatment; and then the LSRA recommends Objective II if the area is treated. Objective II is to promote the continued development of late successional habitat, not to log it. It will take well over 100 years for this LSR to achieve late successional habitat that can be used by species if the current proposal is implemented. That is not the direction intended in the LSRA and the project is not necessary as currently developed.

13-8 - The DEIS concedes "Many of the natural stands in the Elk Flat LSR contain elements of late successional habitat and provide stand structural conditions suitable as either reproductive or foraging habitat for NSO, goshawk or fisher habitat. These stands generally meet the Forest Plan classification elements of older late seral stands (4c in Table 5) except for stand age and canopy closure, which are required to exceed 70% to meet the Forest Plan classification." The reason for not meeting stand age and canopy closure is because "a portion of the project area, namely ponderosa pine cannot sustain over the long term at densities which provide canopy cover greater than 70%." As we have already documented there is too much ponderosa pine in the LSR currently. Simply because it can't achieve 70% canopy cover is no reason to log the LSR and bring the canopy cover down to 40%. This high value habitat should be conserved as RA 10 and RA 32 require. The ponderosa pine should be left to die out with the exception of the very large ponderosa pine that are a component of the overstory. The LSR has about 50% too much ponderosa pine because of too much logging and planting. It is absurd to log these natural stands that are currently providing good late successional habitat in order to create 'new' late successional pine habitat in 100 years through logging. This part of the project is completely arbitrary and capricious.

13-9 - The FS also claims "current stand conditions reflect an increase in a shade-tolerant understory and midstory, composed of primarily of white fir and incense cedar. This transition occurred because white fir and cedar are able to establish in a shaded understory environment and grow into the overstory over time." This is exactly what should be occurring in the LSR. The mixed conifer needs to overtake the ponderosa pine as directed in the desired condition in the LSRA. Pine may require sunlight and openings to successfully regenerate and does not survive well in a shaded understory environment, but there is about 50% too much ponderosa pine so the area is actually evolving in a positive manner that will only benefit late successional species if left alone. The FS should allow the under-represented mixed conifer to continue taking over the ponderosa pine. This will get the LSR back to more historic conditions in the natural range of variability.

64. Response

The overall comment supports the no action alternative. See also Responses 39, 40, 80 and 136 regarding the MFPEA. Some of the conditions referenced in the comment refer to the initial LSR assessment in 1995, and not the current 1999 Forest-wide LSRA.

The DEIS describes management direction for LSRs and the LSRA management objectives pertinent to the Elk Flat LSR. Specifically "Elk Flat LSR is described as a priority for treatment objective II, which is to promote the continued development of late-successional forests (LSRA, 1999 p. 178). The project is also designed to meet the other three treatment objectives (LSRA p. 175): I. Protect existing late-
successional habitat from threats (of habitat loss) that occur inside and outside LSRs. III. Protect mid and early-successional vegetation from loss to large-scale disturbance events. IV. Promote connectivity of late-successional habitat within LSRs” (DEIS p. 7).

Treatments are designed to maintain natural ecosystem processes such as gap-dynamics, natural regeneration, pathogenic fungal activity, insect herbivory, and low-intensity fire (NWFP pp. B-1; DEIS pp. 4-10).

While most of the natural stands in the project area are a Ponderosa Pine vegetation type (based on CWHR classification) and a few stands are a Mixed Conifer vegetation type, the DEIS describes, “field reviews show there is a variety of species classes, primarily due to lack of fire to reduce white fir and cedar regeneration. Field reviews also show there are older remnant (or predominant) Douglas fir, white fir, cedar and sugar and ponderosa pine trees (see [EIS] cover, Figure 6 p. 18). The ponderosa pine-dominated natural stands are primarily within the eastern and southeastern extent of the project area. It is also a stand component in other lower elevation portions of the project area in mixed-conifer pine, and white fir-pine stands. The SMC [Sierra Mixed Conifer] forest type increases where there is an increase in elevation; dominated by white fir, incense cedar, ponderosa and sugar pine, and higher incidences of Douglas fir and black oak” (DEIS p. 3).

As described in Response130 (to Concern 176), the Forest Service is not proposing to replace mixed conifer habitat with ponderosa pine. Where mixed conifer habitat (which can provide suitable foraging habitat depending on stand age, stocking and understory conditions) is thinned, residual basal areas would range from 125-175 sqft/acre or higher (DEIS pp. 173, 175, 178 and DEIS Appendix E pp. E-19, E-21, E-23 to E-24; Draft BA pp. 28, 76, 79, 96, 98; and Draft BA Appendix C pp. C-4, C-6, C-8 to C-9). This is well within the range of basal area conditions frequently used by foraging NSOs in the dry forest types (DEIS pp. 173, 175-176, 179, and H-21; Draft BA pp. 79-80, 112). The project's design and resource protection measures fully considered the recommendations in the Revised Recovery Plan for the NSO (specifically RA10 and RA32 as described in the Draft and Final BA).

The lacking disturbance in the project area from a low-intensity, frequent fire return interval is the result of fire suppression (DEIS p. 25). Effective fire suppression within the dry forested landscape of the California Cascades Province where the project is located has resulted in changes to forest structure, stand density and species composition, changing the fire regime from frequent low intensity surface fires, to infrequent, stand replacement fires (Agee, 1993). The stands have densified and shifted from more fire-adapted shade intolerant species such as ponderosa pine to a less fire adapted shade tolerant mix including white fir and incense cedar (DEIS p. 25). Large-scale, frequent, low-intensity fires have not occurred in the project area, resulting in an accumulation of surface and understory fuels and overstocked stands that are more susceptible to drought stress, insects and disease.

The 1999 LSRA describes the mixed conifer/ponderosa pine series as being comprised predominantly of fire-adapted conifers (i.e. ponderosa pine, Douglas fir, incense cedar, and sugar pine). Douglas fir being more prevalent on north slopes and riparian zones and ponderosa pine more prevalent on the south slopes. White fir is generally absent from stands in low to mid-elevation zone (below 4,000 Feet) (Taylor and Skinner, 1995). California black oak and canyon live oak are typical hardwood components. Historically, stands were more open than they are today, with fewer existing as dense and multi-storied. The relatively denser stands within the watersheds were most likely found on the lower one-half of the north facing slopes, in riparian areas, and areas of deep, productive soils. More open stands occurred on south facing and the upper one-half of north facing slopes (LSRA pp. 10-11).

The proposed treatments would retain and protect the existing, and promote future, late-successional stand characteristics and species composition reflective of those found in a frequent natural fire regime and consistent with natural site conditions and ecological processes (LSRA p. 162).

Concern# 146 – Silviculture, LSRA Consistency, REO Review
13-54 - The FS is submitting the Elk project to the REO for a consistency review which is required because the project is not consistent with the NWFP standards and guidelines. The REO should not approve the project but regardless of the REOs determination, it is important for the FS to acknowledge the following:

Standards and Guidelines  Also see Standards and Guidelines Common to all Land Allocations starting on page C-2 of these standards and guidelines. Objectives - Late-Successional Reserves are to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional And old-growth related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem. See additional information in the Ecological Principles for Management of Late-Successional Forests discussion in Section B of these standards and guidelines. Exceptions - Research Natural Areas and activities required by recovery plans for listed threatened and endangered species take precedence over Late-Successional Reserve standards and guidelines.

65. Response

The Elk LSR project is designed to move the landscape toward the desired condition for the Elk Flat LSR as guided by the visions, goals, strategies and design criteria embodied in the NWFP, the Forest Plan, and the 1999 LSRA (DEIS pp. 6, 9-27, B-24, H-17). This includes the protection and enhancement of conditions of late-successional and old-growth forest ecosystems.

The ‘Ecological Principles for Management of Late-Successional Forests’ discussion in Section B of the NWFP Standards and Guidelines were assessed during project development (DEIS pp. B-24, H-18).

The Forest found that the Elk LSR project meets the LSRA ADC and treatment standards or potential treatments and the objectives in the NWFP, and the intent of ADC #4 and ADC #7. REO consistency review (Myers, 2016) was requested for two proposed treatments that are consistent with the ‘Ecological Principles for Management of Late-Successional Forests under the NWFP’, but vary from specific requirements in the LSRA: Group selection treatments (openings) larger than ¼-acre and the Extensive Mortality Area treatment. Otherwise, all proposed actions are consistent with the general objectives from the LSRA, all of which fall under LSRA Activity Design Criteia (ADC) #1, #4, #5, #7, #9 and #10, or Miscellaneous Activity 7.

The LSR Work Group met and discussed the proposed treatments and concurred that the treatment in the Elk Flat LSR meets the objectives and the Standards, and Guidelines for managing within LSRs. This conclusion is documented in a letter of concurrence from the REO received (Rubado, 2016) The FEIS LSR consistency finding was clarified after the REO review concluded. (See FEIS starting page H-17)

Regarding species’ recovery plans, the principles and recommendations described under Recovery Actions 10 and 32 were utilized throughout project design and treatment development (DEIS pp. 9, 171, 175-176). The project is consistent with the applicable dry forest restoration principles from the Recovery Plan (DEIS pp. 175, 180).

Concern# 57 - Marking Supervision

13-107 - Under Silviculture and wildlife the DEIS states "14. The project silviculturist and wildlife biologist will coordinate with marking crew and inspect the marking to ensure that the unit specific prescriptions, marking guides and project design features are applied as described in order to maintain, improve or promote habitat structure and function." This is simply not true. I have been going to the Elk LSR annually since 2012 and the entire project has been marked since that time. The STNF always marks its projects well before a decision is made and we have continued to accuse the FS of biased decision-making because of it. Is the FS going to go back out and black out all the blue marks on the trees and remark? We have hundreds of photos of this project area documenting unit numbers and marked trees along with the flagging.

66. Response

The project and district silviculturist and the project wildlife biologist worked closely with the marking crew at the onset (see also Appendix C of the BA that discusses FWS reviews of marked stands; Final BA pp. C3, C7-C10). The silviculturists and biologist described the desired conditions, treatment and habitat objectives to help the marking crew “dial in” on nuances as they encountered varying species and stand conditions. After the initial start-up, the district silviculturist or other district personnel familiar with
Elk LSR Enhancement Project

forestry, LSR, and NSO/fisher habitat objectives were on site nearly every day, inspecting the mark to ensure objectives were met and to answer any questions that arose for the marking crew. The project silviculturist and wildlife biologist reviewed the marking for consistency with treatment and habitat objectives mark on several occasions, and some adjustments were noted, discussed with the marking crew and made.

While there was initial unit and project area boundary layout completed in 2012, DEIS Appendix B p. B-29 (response to comment 65) states, “the preliminary flagging (orange/blue), orange paint (draft unit boundaries) or tagging (yellow) that may have been observed in 2012 [in the Elk LSR project area] is used to assist resource specialists during the planning phase of most projects. It is not the final treatment boundary designation, but is a preliminary identification to help with development of different alternatives, resource protection measures, location of potential suitable landing locations, assessing logging systems, designating wildlife leave areas and identifying mortality areas. Unit boundaries and/prescriptions are also sometimes marked prior to a decision being made. This allows for a better visual representation of what is proposed with thinning and other treatments. It permits FS specialists and other agency staff (FWS, NOAA’s National Marine Fisheries Service, SHPO, Water Board), county personnel and landowners the opportunity to review what the proposed or draft treatments are and visualize what conditions would be like post-thinning or harvest. It is not possible to pre-mark areas of underburning, but the SMMU has several post-burning examples that the public is able to review. If changes result during the NEPA analysis and decision process for mechanical thinning operations, or no-treatment areas (unthinned patches are modified, additional timber is designated for retention or removal, exclusion of units, etc.), marking, and cruise data, changes are made prior to implementation to ensure consistency with whatever decision is made.”

The tree marking started on the Elk LSR project (in the plantations) in November 2013, and was incrementally continued through November 2014. Additional reviews and adjustments to the completed mark were made in April-August 2015, and October 2015 (BA Appendix C p. C9). The final marking inspection from November 2014 is included in the project record (USDA-FS, 2014d), and BA Appendix C describes the marking updates made after November 2014.

Concern# 87 - Plantations, Existing

13-22 - At the time the LSRA was written there were 894 acres of clearcuts/plantations - 25% of LSR. The DEIS claims 25% of LSR is plantations now but that is only if there weren't other sales since 1991. The cumulative effects table in Appendix F suggest there may be more plantations in the Elk LSR than the DEIS discloses.

67. Response

The alternative 1 treatment map and aerial imagery map (DEIS, Appendix D-2, D-8) display all treatment units including all plantations within the LSR and all plantations are listed in tables A-1 and A-2 (DEIS Appendix A). The cumulative effects table (DEIS, Appendix F), lists acres of plantation timber stand improvement under existing NEPA documents however much of that work is incorporated into the proposed action and as such are a subset of the total plantations within the LSR. There are approximately 855 acres of plantations currently within the Elk LSR as reflected in the alternative 1 treatment map in appendix D and unit information tables in appendix A (DEIS Appendices D and A). The Forest Activity records (FACTS) indicate the youngest plantations were planted in 1993. The LSRA was published in 1999 indicating these plantations would have been included in the assessment. Discrepancies in total plantation acres between the DEIS and LSRA (855 acres versus 894 acres) is attributed to improved accuracy of mapping with the use of GIS software and geospatial linking of FACTS records to GIS polygons.

Concern# 154 - Ponderosa Pine

13-117 - As the LSRA direction, FWS, and Irwin all state NSO avoid ponderosa pine especially in plantations. There is 50% too much ponderosa pine in the LSR. The FS developed a project to save the pine and forego the NSO.
68. Response

The primary purpose of the project is not to protect ponderosa pine, but to reduce the risk of losing existing (and developing) mid, early and current late-successional habitat and increasing stand resilience (DEIS p. 9). An additional purpose and need is to accelerate development of late-successional habitat (DEIS p. 9). Specific to the LSRA, the Elk Flat LSR (RC-360) is described as a priority for treatment objective II, which is to promote the continued development of late-successional forest characteristics (LSRA p. 178). The Project is also designed to meet LSRA treatment objectives I, III, and IV namely; protecting existing late-successional habitat from threats (of habitat loss) that occur inside and outside LSRs, protecting mid and early-successional vegetation from loss to large-scale disturbance events, and promoting connectivity of late-successional habitat within LSRs (USDA-FS 1999 p. 175).

The project’s purpose is not to convert stands to ponderosa pine, but where ponderosa pine is the dominant species, create stand conditions that result in higher levels of resilience to withstand drought, disease and insect attacks (DEIS, pp. vii-xii). The variable density thinning prescriptions vary based on stand and tree species composition with lower basal areas where the ponderosa pine vegetation type occurs, and higher basal areas where the mixed conifer vegetation type occurs. The projects’ treatments are intended to protect existing high quality NSO habitat, and are expected to increase suitable NSO habitat, and develop more resilient and more diverse NSO habitat over time, including within the one NSO core and home range in the project area (Draft BA pp. 93-102).

Regarding “There is 50% too much ponderosa pine in the LSR.” it is presumed the commenter is referring to DEIS p. 3, ‘…75 percent of the 3,519 acre project area is classified as Ponderosa pine (Pinus ponderosa) forest” and a statement in the McCloud Flats WA, Appendix A (p. 101) regarding criteria for developing appropriate treatments that states, “Establish and maintain a balance of conifer species to improve diversity and reduce susceptibility to insects and disease….Ponderosa pine should ideally make up 25 percent of the stand.” The project utilized the 2011 Edson WA and 2012 Mt. Shasta WA, Forest Plan and other direction, the LSRA and best available science. A certified silviculturist worked with the wildlife biologist and the FWS regarding stand density, vegetative and late successional associated species sustainability, composition, etc.

The project’s Draft and Final Biological Assessment (and Biological Evaluation) fully describe how thinning treatments would maintain, protect and enhance habitat for late-successional associated species in both the short term and long term. The Elk Project is treating the stand types for the desired conditions that they can sustain, as directed by the LRMP, NWFP and LSRA. Late-successional forests are those forest successional stages that include mature and old-growth age classes (USDA-FS and USDI-BLM 1994b). The structure and composition of these forests vary by forest type, site quality, and fire regime.

Concern# 152 - Ponderosa Pine and Mixed Conifer

13-115 - Appendix A includes information on each unit proposed in the Elk project. We are opposed to all natural thinning units with a high density of ponderosa pine, unless all pines less than 18” DBH are removed. This is the vast majority of the project. The mixed conifer forest is trying to shade out the pine and it should be allowed to do so. We are fine with leaving the ponderosa pine that is over 18” DBH that is part of the mixed conifer forest and overstory trees.

69. Response

The commenter’s recommendation to only thin out pine and remove all pines less than 18” DBH would not meet the purpose and need very similar to how Alternative 8 does not meet the purpose and need. Under Alternative 8, all conifer species less than 20” DBH are thinned. Following the commenter’s recommendation, higher densities compared to Alternative 8 would be retained as only pine less than 18” would be thinned. Alternative 8 would only reduce stand densities to desirable levels in roughly one third of natural stands in the LSR. Since most trees in the smaller size classes are shade tolerant species that have encroached as a result of long-term fire suppression, such as white fir and incense cedar (DEIS p. 145), only removing pine less than 18” DBH would leave considerably higher densities than those
modeled under alternative 8. High basal area retention modeled under Alternative 8 did not meet stand health objectives; leaving even higher stand densities as the commenter suggests, would also not meet project objectives.

Radial thin around large predominant pine would not occur, increasing the risk of losing desirable late successional stand characteristics to density related mortality. Under Alternative 8, roughly two thirds of the natural stands remained at densities above the threshold for imminent mortality in pine (DEIS p. 121), and more stands would be at risk following the commenter’s suggestion, which would retain more trees.

Infection centers of black stain and heterobasidion root disease would not be effectively treated under this recommendation. Infected host trees would not be removed (18” or larger infected pine, other infected species) and stand conditions would not be sufficiently changed to discourage spread of disease (i.e. breaking up root-to-root contact, increasing sunlight to the forest floor) (DEIS p. 121). Similar to Alternative 8, hardwoods, which are mostly within the LSR natural stands, would remain overtopped and continue to decline as a stand component. Oak would be more impacted following the commenter’s recommendation since all trees of all sizes other than pine would be retained, thereby continuing to over shade the oak.

The majority of the forested project area is departed from a natural fire regime and is at risk of large-scale undesirable disturbance due to existing fuel loading from the ongoing mortality that has occurred from high stand densities and associated stress from insects, disease and drought conditions. By leaving stands at high densities, the risk of further loss of desirable habitat features and conditions will continue due to a combination of continued density related mortality, root disease, insect attacks and predicted lethal fire effects. These losses have, and would continue to result in a further loss and decline of late-successional habitat and a failure to maintain or meet Forest Plan direction and LSRA objectives for the LSR. To allow the pine to get shaded out and die as suggested by the commenter would not meet the projects purpose and need and would result in increased fuel loading and the potential for more severe fire behavior.

See also Responses # 130 and #141 for further discussion of dry forest LSR restoration and associated management direction and goals under the NWFP, LSRA and LRMP.

Concern# 89 - Reforestation Proposed Action

6-7 - there needs to be an emphasis on mixing species, natural to the area, when creating "plantations", and there needs to be required follow-up to thin and maintain these "plantations" (I define a plantation in this case is any replanting, either after harvest or fire) - expensive, but people that use the wood should be expected to pay the cost to help maintain healthy forests.

70. Response

In areas proposed for reforestation, a mix of native species would be planted, such as ponderosa pine, Douglas fir, sugar pine, incense cedar and black oak (DEIS page A-33). Plantations would be monitored for the need to control competing vegetation; hand or mechanical cutting of vegetation would be implemented within the first one to five years depending on monitoring results (DEIS page 51). Funding for reforestation efforts other than per current Agency policy is beyond the scope of this document.

Concern# 138 - Retention of Large Trees

4-25 - Youngest stands have the highest priority for silvicultural treatment. Page 101. The project contains no substantive protections for old and larger trees in the LSR.

71. Response

Thinning prescriptions are designed to reduce the risk of losing habitat for late successional species, promote conifer species diversity in plantations and natural stands, reduce the risk of developing future extensive mortality areas and retaining large diameter trees (DEIS p. 47, 138, and 139). Thinning will contribute to desirable wildlife tree characteristics by providing conditions such as fuller crowns, larger boles and branches, and retaining larger trees with desirable habitat characteristics that may contribute to larger snags and down wood (DEIS p. H-20). Thinning treatments are designed to retain the majority of
large diameter trees, while reducing stand densities to levels that promote long term survival of them. As described on page 132 in the DEIS, proposed thinning in the natural stands would retain most (77% to 80% based on modeling projections) large diameter overstory trees.

Concern# 79 - Salvage Adaptive Management

4-73 - The DEIS (at pages 58-60) indicates that the Forest Service may or may not authorize up to 811 acres of salvage logging (that could include regeneration-style logging) of pine stands in the LSR. No attempt is made to analyze or disclose the impacts of salvage logging within these stands. Indeed, the public and decision maker are left to guess as to whether the logging will actually occur or not. The purpose of NEPA is to inform the public and decision maker of the environmental consequences of agency actions before they are conducted and to foster informed decision making.

72. Response

Regeneration harvest as described by the commenter is not prescribed or analyzed in the DEIS, as it is not proposed. Regeneration harvest describes the cutting of a stand or portion of a stand of green (living) trees for the purpose of starting a new forest rotation. In contrast, salvage is implemented when mortality has recently occurred or is eminent, resulting from a natural disturbance. As a component of adaptive management salvage logging may be conducted to remove recently dead and dying trees in excess of desired snag retention levels to remove sources of undesirable fuels accumulation.

The DEIS analyzed for a scenario of further spread of mortality reflective of the elevated mortality that has occurred over the last few years. The principle of adaptive management is to plan for and respond to changing conditions that may occur during implementation of a project and is defined as: “(adaptive management) promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Adaptive management identifies in advance precisely how, when, and why adaptive management plans will be altered” (DEIS p. 257). Salvage of dead and dying trees is proposed to address increases in undesirable fuels that may develop as a consequence of expected ongoing elevated insect activity and density related mortality.

 Concern# 14 - Size Classes and Tree Selection

4-11 - at B9 and B10 of the DEIS the Forest Service states: We recognize the importance of large trees on the landscape for a variety of reasons including fire resiliency, various species habitat needs (including northern spotted owl, northern goshawk, fisher and pacific marten and stand structural legacies) particularly in Late Successional Reserves. Yet rather than retain large trees for the management benefits that are acknowledged above, the Elk Project contains no substantive protections whatsoever for large trees within the LSR. Indeed, while over 20% of the large trees will be logged, the DEIS fails to disclose or quantify the location or number of large trees >24” DBH to be removed from the LSR. The conclusions presented in the DEIS are not supported by any data or numbers at all. Instead, an undisclosed number of large trees will be removed from undisclosed locations within LSR logging units.

4-12 - At B-10 the DEIS indicates that large tree removal may "primarily" focus on white-fir encroachment. The term "primarily" fails to quantify impacts or inform the reader. Does primarily mean 51%? How many large pines will be removed? Our observations of the recent Pilgrim and Mayflower timber sales in the SMMU indicated that large fire-resilient pines are generally targeted for removal throughout the District.

13-21 - What is the current composition of trees in the Elk LSR now? How many 200 foot trees exist and what are their DBH? Are any of these trees proposed for logging? We request the same information for 175 foot trees and 150 to 175 foot trees.

73. Response

Page B-9 the DEIS states, “While there is no prescribed upper diameter limit for the project, or within specific treatment units, the largest, oldest trees (predominant and dominant) and those that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops would be retained as long as they are not a safety hazard.” [That was clarified in the FEIS to note that some dominants may be removed in the radial release, groups selection and hardwood prescription elements.][The paragraph continues, “All predominant trees would be retained, regardless of their current
health/condition when marking. We recognize the importance of large trees on the landscape for a variety of reasons including fire resiliency, various species' habitat needs (including NSO, northern goshawk, fisher and Pacific marten) and stand structural legacies, particularly in LSR" (DEIS p. B-9). On page 64 of the silviculture report predominant trees (aka remnant or legacy tree) are defined as trees that remain from a previous management activity or catastrophic event and are significantly older and generally larger than the surrounding vegetation. (Remnant) trees do not form a canopy layer and are usually isolated individuals or small clumps (USDA-FS, 2010). Dominant trees are described as that component of a (forest) community, typically a species, exerting the greatest influence on its character because of its life form or great abundance or an individual or species of the upper layer of the canopy (Society of American Foresters, 2008). Most commonly used in this analysis as a tree whose crown extends above the crowns of the tree's immediate neighbors and receiving full sunlight from above and complete to partial sunlight from the sides (Payne, 2015b, p. 63). A preliminary cruise report in the project record dated 02-01-2016 (USDA-FS, 2016) provides an estimate of trees designated for removal. The preliminary cruise report indicates the overall average diameter of removal trees is 11.9 inches DBH. Trees 10 inches DBH and larger are generally considered sawtimber; the cruise report indicates the average removal tree diameter for trees 10 inches DBH and greater is 15.9 inches DBH (USDA-FS, 2016). Larger trees, that fall into the dominant category, may be removed in some locations such as in radial thinning around larger retained predominant pine, around some oak (leaving Douglas-fir, sugar pine and incense cedar 24 inches and larger) and in the meadow enhancement unit 402, however this is more of the exception than the rule. Modeling shows retention of approximately 77-80% of trees over 24 inches DBH immediately following treatment (DEIS, 132). Within 20 years it is modeled to show growth to be back up to approximately 89-96% percent of current levels, while reducing the risk of continued widespread mortality of pine in the project area, including the desirable large overstory (dominant) trees that are considerably larger than 24 inches DBH. On page A-22 of the DEIS the Tree Selection Criteria for Thinning " Conifers states "trees to be retained would include healthy large overstory dominant trees of all species, healthy pine of any size where pine is underrepresented, a component of healthy small understory and midstory trees, a component of heavily damaged or diseased trees that provide habitat and all hardwood trees as operationally feasible" (DEIS, A-22). Trees to be removed would primarily be smaller midstory intermediate or suppressed trees, though some co-dominant trees would also be removed; primarily the shade tolerant white fir that has grown up through the understory over the last several decades because of fire suppression and stand succession (DEIS, A-23). "Primarily" in this context of the discussion means, "for the most part" or "mainly." The preliminary cruise report, (USDA-FS, 2016), shows the estimated percentage by species of trees planned for removal in natural stands (not plantations) by volume as follows: WF-48%, PP - 33%, IC-17%, SP-2%. Inventory data for the project (USDA-FS, 2007) shows the data for trees of which measurements were taken. The largest diameter tree measured was a ponderosa pine with a diameter of 50 inches and height of 152 feet, the tallest tree measured was a ponderosa pine with a diameter of 40.7 inches and a height of 175 feet. Trees less than 4 inches DBH were counted but not measured; the smallest tree measured was an incense cedar 4.1 inches in diameter and 18 feet tall. Inventory data was used to help describe and determine forest stand composition, density and overall health. While the 2007 inventory data does show that these were the largest, tallest (and smallest) trees measured, the inventory does not occur on every acre of every stand. Based on field reviews and habitat typing completed after the 2007 Common Stand Exams, there are other larger predominant (remnant) trees in the project area, notably in stands 150, 156 and 168-2 where no thinning will occur. Legacy trees would not be thinned or removed under the project's design criteria, but would be subject to low-intensity prescribed fire and the resource protection measures associated with that treatment. Also see response to Concern #2 and #137 pertaining to large tree retention.

Concern# 21 - Snags and Downed Wood

4-32 - Large numbers of mature trees and snags will be removed from proposed logging units. All of these trees would have died and created snags and down wood for wildlife. What is the reduction in large snag/down wood supply over time (beginning with this logging project)? Since many of these trees are over 100 years old, the reduced snag supply may persist for at least several hundred years.
4-33 - Snags are an essential element of forest health, forest structure, and late-successional habitat. Thomas et al. (1990) and the Fish and Wildlife Service (1990) defined Spotted Owl (old-growth) habitat as including "numerous large snags." Similarly, the Shasta-Trinity National Forest FOREST PLAN directs the agency to "protect and enhance late-successional characteristics" in LSRs. Large snags are a key late-successional characteristic. Hence snags should be retained as essential habitat elements in a Late Successional Reserve. The FOREST PLAN also encourages the agency to use prescribed fire and thinning from below, focus on younger stands, and accelerate development of late-successional characteristics in the LSR. None of these objectives will be furthered by reducing large snag habitat on over 1,500 acres of the LSR.

4-16 - Distribution of snags and deadwood is spotty because large areas of plantations have almost no deadwood or snags. This reduces the average below forest minimums. Page 22. Yet the project calls for removing large trees that would become snags and reducing large trees per acre as well as felling snags for OSHA purposes and to facilitate yarning, road construction and landing establishment.

13-101 - Regarding large snags 20" DBH the DEIS states post thin ranges 2.0 to 3.5 snags/acre and 20 years later 0.3 to 3.6 snags per acre - less than post project. Both post thin and 20 years out don't comply with LSR direction as cited in Table 3.2 of the LSRA.

13-19 - The FS proposes to remove all snags in the Hazard Reduction component. It includes 8 units plus anywhere else it is determined. This will only exacerbate the loss of snags and as we document below the project will not meet snag direction in the LSRA as proposed. Large tree snags can stand for 10 to 50 years and provide valuable habitat to late successional species.

74. Response

The Forest recognizes the importance of snags (and logs) and green trees for future snag replacements on the landscape for a variety of reasons. As acknowledged in the desired conditions for snags and down logs in Chapter 1 of the DEIS (pp. 6, 17-18, 20, 22, 24, 26, 28, 126, 211), they are ecologically valuable stand structural components and legacies and for structure and composition of late-successional and old-growth forest ecosystems. As such snags and down logs were an important consideration in project design.

Desired Condition - Snag and down log requirements and desired condition are described in the DEIS (pp. 17-18, 28. As described on pages 17-18 of the DEIS, the desired number of snags should vary based on vegetation type with the average number of snags at 3 to 7 per acre of at least 20 inches in diameter. Tables 3-1 and 304 of the LSRA are used to describe the desired condition for snags by vegetation type. Averages per acre are considered over the landscape or treatment [project] area. The number of snags greater than 20 inches DBH projected 20 years after implementation is a public issue indicator for Issue #1 (DEIS p. 45). Also see DEIS footnote 109, p. B-20 and 110, B-23. Down logs are defined as at least five per acre for Matrix as described in the Forest Plan Appendix O. For LSR the desired logs per acre is 6 to 10 by vegetation type. The FEIS was clarified on page 18 to describe the LSR existing condition for logs to be consistent with RPM 40e.

Existing Condition - The existing condition for snags and down wood is described on pages 21-22, 27-28, 133 of the DEIS. The likely current condition is 10 or more snags per acre, which meets and exceeds the Forest Plan and LSRA standards, and down logs exceeding desired conditions. Desired logs are at least 20 inches in diameter and 10 feet long, representing a range of decomposition classes. Logs in decomposition classes 3 through 5 should be protected from burning and mechanical disturbance.

Proposed Action - Unthinned patches will incorporate snag and down log retention areas and Habitat Roost/Rest clumps will include snags as available (DEIS p. 48-49, A-24-25, A-31, A-39). Plantation units may or may not contain the desired level of snags. Snag densities are generally low in plantations because of the younger ages and higher vigor of the trees. Thinning prescriptions were developed with snag objectives as part of the desired condition. Plantation thinning retains dying trees when needed to meet snag retention (DEIS p. 49). Overstory trees that will make desirable future snags will be retained in the natural thinning units (DEIS p. 49, A-26).

Snags will be felled if needed for safety throughout the project. Snags would be retained where they are not an operational safety risk and in unthinned patches (DEIS p. 133). The 87-acre Hazard Reduction zone identifies areas (in addition to the Extensive Mortality Area) where this is highly likely to occur. The FEIS has been corrected to note that the Hazard Reduction Treatment does not fall ALL snags but it is an area where many snags will need to be felled for safety. Also see DEIS pages B-12, B-19. In the extensive
mortality area prescribed fire would be used to reduce heavy fuels, which is expected to produce a 70-80 percent reduction in snags and trees. Unthinned patches of snags and trees have been designated on the area periphery (Project-Level Management Indicator Assemblage Report p. 39, DEIS B-19).

Resource protection measures designed to protect snags and logs include numbers 11 (DEIS p. 83), 26, 27 (DEIS p. 87); 40a-f, 41, 42 (DEIS p. 88-89).

Effects - Snag levels are expected to decrease immediately after thinning treatments in order to provide for human safety during operations; However, remain at required levels to meet the LSRA standards (DEIS p. 133). While modeling projects show a decrease in snags over 20 inches over time, page 133 of the DEIS notes that modeling projections underestimate future mortality. In unthinned patches and portions of the project area that are not mechanically treated, mortality is also expected to continue in these dense, higher quality habitat stands over the long term, and contribute to snag and down log recruitment (Project-Level Management Indicator Assemblage Report p. 40). The project will retain the largest oldest trees (predominants and dominants) that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops as long as they are not a safety hazard. All predominant trees will be retained, regardless of their current health/condition when marking (DEIS A-23, B-9). These and other trees in treated stands will serve as future replacement snags. Also see DEIS p. B-17.

Conclusions - Snag densities will meet and exceed the LSRA standards with snag levels retained post project, as well as the expected snag recruitment within the unthinned patches, and the natural mortality levels across the project. (See DEIS pp. 133. See also DEIS H-23, H-24 for effects to snag and down log assemblage habitat). Treatments will not remove important structural components for late-successional habitat including large snags and down wood unless necessary for operational safety (DEIS p. 172).

The long-term snag reduction would be the most pronounced in the extensive mortality area, as described in the preliminary BE (pp. 37-40) and the project-level cavity nesting bird report. The effect on overall late-successional snag habitat quality would be long term, as it would take 60-100 years to develop trees (and snags) of similar size classes.

While existing snag density and down log levels would be reduced in some treated stands (due to being knocked over or burned), all stands that contain snag and down log assemblage would continue to provide this habitat for species associated with the assemblage (Project-Level Management Indicator Assemblage Report pp. 38-39). The project will retain existing snags in mechanical thinning units: 1) At levels that exceed or meet the Forest Plan standards and guidelines for LSR; 2) At the recommended levels by vegetation community in the Forest-wide LSRA, for matrix lands in the Elk Flat meadow and surrounding stands, and 3) At levels that support cavity-nesting birds at 100 percent of their potential population levels (Project-Level Management Indicator Assemblage Report p. 39).

While it is clear that thinning will reduce per acre tree numbers from current levels, it is important to consider the relevance and context of current stand densities, and the risk they pose for large-scale disturbance (DEIS p. 132). Treatments would create stand conditions where mortality is more likely to occur consistent with endemic (nonepisodic) conditions (DEIS p. 129). Hence the current high rate of tree mortality/snag creation will slow. The modeled average snags per acre over 20 inches DBH in thinning units pre- and post-thinning (DEIS Table 37) may be underestimated in light of ongoing mortality from pine beetle (which will likely persist until beetle populations decline and tree vigor improves), and that the thinning modeling is limited (does not reflect the unique tree selection and current snag retention that are in the marking guidelines and likely underestimates snags) (DEIS p. 133).

The fire and fuels existing condition discusses down wood, and the potential impacts of excessive amounts starting on page 27 of the DEIS. Down log retention requirements are included in the project design features.

Down logs will continue to exist on the landscape within the project area for years to come and meet requirements (see p. 223 of DEIS). As snags fall, they become down logs. As multiple prescribed fire
entries occur, along with wildfires managed to meet multiple objectives, additional snags will be created and eventually will fall, creating down logs.

Concern# 83 - Thinning Recommendations

6-3 - the thinning as stated can be variable but should tend toward the thinner side, (if I understand the SDI component) then less than 180

75. Response

The thinning prescriptions were developed to help achieve the purpose and need by reducing excessive stand densities and promoting forest resilience. Thinning within the ponderosa pine vegetation type is aimed to shift densities to levels below the zone of imminent mortality, which is about 63% of the limiting SDI, or an SDI of 230. Research has shown density related mortality is reduced when the SDI is below 230 in ponderosa pine stands (Oliver, 1995). Higher stand densities (i.e. basal area) are retained when thinning in areas of mixed conifer where the vegetation type can support slightly higher densities and still be resilient. While treatments are aimed at reducing density-related mortality they are also designed to promote and retain habitat reflective of the naturally occurring vegetation communities. These and other considerations within the context of management direction and analysis of existing and desired conditions as described in the purpose and need (DEIS p. 9-38) went into developing target basal area ranges for thinning in the natural stands and older plantations.

Concern# 104 - Thinning, Salvage Only Suggestion

6-6 - any commercial cutting within the project area should be only for thinning of trees or the removal of dead/infected (beetle and root) trees

76. Response

Alternative 1 is the Modified Proposed Action and the Agency Preferred Alternative- In this Alternative, Forest restoration treatments include; variable density thinning from below, with site-specific prescription elements, reforestation and adaptive management strategies. (2,190 acres of thinning with 313 acres of reforestation consisting of interplanting and planting group selections and natural mortality areas). Site specific prescription elements (or subtreatments) include group selections, radial thinning, aspen release and restoration, oak release, and adaptive management salvage (Preliminary ROD pg. 5). These tree thinning activities including the prescription elements, are planned to meet the purpose and need for treatment as described in the DEIS ( pg. 9). The proposed thinning would reduce inter-tree competition and free up resources that support the vigor and resilience of the residual forest stand. Stand resilience is defined as the capacity to persist through disturbance, adapt to shifting environmental conditions, and maintain basic ecosystem structure and function over time (DEIS pp. 125-126). Alternative 5, dropped from consideration in detail, does eliminate the Elk Flat meadow unit, and thus conifer removal for meadow enhancement purposes.

Concern# 105 - Thinning, Species Diversity

6-4 - the thinning should be done permitting the maximum variety of tree species, especially hard woods

77. Response

The Elk LSR project is designed to move the landscape toward the desired condition for the Elk Flat LSR as guided by the visions, goals, strategies and design criteria embodied in the NWFP, the Forest Plan, and the 1999 LSRA (DEIS pp. 6, 9-27, B-24, H-17). This includes the protection and enhancement of conditions of late-successional and old-growth forest ecosystems. Treatments are designed to reduce the risk of losing habitat for late successional species, improve NSO habitat, increase conifer species diversity in plantation areas and natural stands, treat areas of black stain and Heterobasidion root disease, and reduce the risk of developing future extensive mortality areas (DEIS 47, 138, and 139). The ‘Ecological Principles for Management of Late-Successional Forests’ discussion in Section B of the NWFP Standards and Guidelines were assessed during project development (DEIS pp. B-24, H-18).
Proposed treatments reduce stand density, break up fuel continuity, promote the healthy growth of residual trees, and promote species and structural diversity. Variable density thinning will retain a range of densities by including skips, gaps, and thinning within a range of basal areas, promoting resilience and heterogeneity (DEIS H-20) Black oak that are in decline throughout the project area, due to competition of encroaching conifer, will be radially released improving growth and vigor and long-term survivability, by improving the availability of resources, particularly sunlight and growing space (DEIS, page 134). Aspen will be released by thinning out most conifers within 50 feet of aspen trees or sprouts, with no planned replanting of conifer within those areas. Aspen will be monitored to determine the effectiveness of all the treatments. Further description of oak and aspen treatments are provided in appendix A (DEIS pp. A-26, A-27, A-34).

Where planting or interplanting occurs a mix of species will be planted (DEIS p. A-33). A mix of natural regeneration and interplanting of group selections within pine plantations will promote a mix of species including pine, as well as development of structural diversity and ingrowth of understory grasses, forbs and shrubs (Payne, 2015b). The species mix is anticipated to be a mix of tree species desired to promote diversity or when certain species are not expected to establish naturally. These may include ponderosa pine, sugar pine, Douglas-fir, incense cedar and hardwoods such as black oak.

Concern# 123 - Tree Selection, LSR Consistency

13-120 - Unacceptable trees are those exhibiting damage, insect attack, defect or disease. These trees should not be left according to the DEIS. LSRs and late successional habitat are made up of these types of trees along with snags, downed logs and woody debris. The LSR is not matrix lands and should not be managed as such.

78. Response

The purpose of the project is to reduce the risk of losing existing (and developing) mid, early and current late-successional habitat and increasing stand resilience (DEIS p. 9). An additional purpose and need is to accelerate development of late-successional habitat (DEIS p. 9). Specific to the LSRA, the Elk Flat LSR (RC-360) is described as a priority for treatment objective II, which is to promote the continued development of late-successional forest characteristics (USDA-FS 1999 p. 178). The Project is also designed to meet the other three LSRA treatment objectives; protecting existing late-successional habitat from threats (of habitat loss) that occur inside and outside LSRs, protecting mid and early-successional vegetation from loss to large-scale disturbance events, and promoting connectivity of late-successional habitat within LSRs (USDA-FS 1999 p. 175).

The commenter is referring to a portion of the tree selection criteria for removal as part of the marking guidelines in appendix A (DEIS p. A-23) which is preceded by the following “Tree selection for thinning is a process of identifying those trees that are desirable for the habitat objectives, and removing the remaining trees to reduce competition for resources and reduce live ladder and canopy fuels. Trees to be retained would include healthy large overstory dominant trees of all species, healthy pine of any size where pine is underrepresented, a component of healthy small understory and midstory trees, a component of heavily damaged or diseased trees that provide habitat, and all hardwood trees as operationally feasible.” (DEIS p. A-22) Taken within the context of the complete tree marking guidelines, the definitions the commenter references are designed to help timber markers prioritize trees for removal once all the trees desired for retention have been identified. Predominant trees are retained across all prescriptions (DEIS, page 48). In other words, large predominant trees are desirable for habitat objectives, and thinning within the remaining trees are to reduce competition and reduce the potential for high fire severity (DEIS p. A-22).

Thinning will contribute to desirable wildlife tree characteristics by providing conditions such as fuller crowns, larger boles and branches, and promote larger trees with cavities that may contribute to larger snags and down wood (DEISp. H-20). A component of heavily damaged or diseased trees will be retained
in order to provide habitat (DEIS p. A-22). Snags would be retained in all action alternatives except where hazard abatement is needed for human safety considerations. An estimate of 20 percent reduction was used to reflect snags removed for hazard abatement, but given the intent to retain snags as feasible, a higher proportion may be retained (DEIS p. xvi).

**Concern# 44 - Vegetation Diversity Compliance, LS**

13-126 - Currently there are only 97 acres of old growth habitat representing 0% of the watershed. The NWFP requires 15% per watershed so the FS is violating the NWFP. Logging approximately 400 acres of 100 to 120 years old in the Elk project makes no sense considering these trees are on their way to old growth status.

13-127 - We also refer the FS to Table Appendix H-2 Seral Stage Diversity. It only shows 21% large tree 4b, 4c, >40% canopy closure in the watershed and some of these acres will be logged in the project. There is only 1% 4a, large tree, and 40% canopy cover.

13-39 - The FOREST PLAN Standards and Guidelines require maintenance of at least five percent of each timber type/seral stage (4-14). The FEIS must document how this standard is being met in the FEIS. We don't possibly see how it can be met considering the admission there is no old growth habitat.

**79. Response**

The Northwest Forest Plan directs that landscape areas where little late-successional forest persists should be managed to retain late-successional patches. This standard and guideline is applied in fifth field watersheds (20 to 200 square miles) in which federal forest lands are currently comprised of 15 percent or less late-successional forest. An assessment should include all allocations in the watershed. Within such an area, all remaining late-successional stands should be protected. Protection of these stands could be modified in the future, when other portions of the watershed have recovered to the point where they could replace the ecological roles of these stands.) (NWFP Attachment A, page C-44). Appendix H in the DEIS provides a late successional old growth analysis of the HUC 5 Ash Creek watershed (analogous to a fifth field watershed) where the Elk project is located. The 97 acres of old growth identified in the assessment and referenced by the commenter occur outside of the Elk project area (but within the Ash Creek watershed). Proposed treatments in the Elk LSR, including thinning, are designed to protect, retain and develop future late successional forest characteristics within the LSR The projects' treatments are intended to protect existing high quality NSO habitat, and are expected to increase suitable NSO habitat, and develop more resilient and more diverse NSO habitat over time, including within the one NSO core and home range in the project area (Draft BA pp. 93-102)

The commenter expresses specific concern with seral stages as described in the LRMP (USDA-FS 1995 p. 4-15) and how the project will maintain the seral stages described in the LRMP. Table H-2 in Appendix H (DEIS p. H-26) shows the current seral stage distribution in the project area. This table shows that the current seral stage distribution across 79,205 acres, or the fifth field Ash Creek Watershed. Proportionally, the greatest distribution of all vegetation types is in size 3-medium tree, with approximately 56% (46,525 acres) in this category. The remaining 44 percent is shown to be equally divided early seral and late seral stages; with 22% being large tree (size 4) and the other 22% grass, forb, shrub, seedling or sapling. The existing condition is skewed with the bulk of the existing seral stages at the watershed scale in the medium tree (size 3).

Appendix H, Table H-3 (DEIS p. H-27) shows a summary of silviculture treatments and effects to seral stage, with approximately 47 acres treated under Alternative 1 changing from seral stage 3 a/b to seral stage 4 a/b. Standard and Guide 2-e (LRMP, page 4-14) specifically states to "provide for and maintain at least five percent of each timber type/seral stage combination shown in (LRMP) Table 4-3. The entire area in each timber type should be used for this calculation. Both suitable and unsuitable timber types are to be used in this calculation." The commenter suggests that the "FEIS must document how this standard is being met in the FEIS. We don't possibly see how it can be met considering the admission that there is no old growth habitat." The project analysis and DEIS do show that the habitat proportions suggested in LRMP Table 4-3 are not achievable because it doesn't exist at the Ash Creek watershed scale prior to treatment (Appendix H, Table H-2). The Standard and Guide 2-e states that we are to "provide for and
maintain;” the S&G continues to state that the values in Table 4-3 are not intended to apply to the project scale, rather the recommended percentages are intended to apply to the entire area in each timber type.

See also Response to Concern #96 and Response to Concern #95 regarding protection of high-quality NSO habitat and treatment of mature forests.

Concern # 119 - Vegetation Diversity, LSOG-Mature

13-38 - Since 2004 (the last update of the MFEA), the STNF has planned and logged the Edson, Powder, Trout Creek, Mud Flow, Pilgrim, Algoma, Harris, Porcupine, and other sales in the McCloud Flats. Now Elk LSR is planned which are the leave strips left from the Pilgrim sale allegedly left to provide habitat for NSO. The Pilgrim project isn’t even complete and already the leave strips are proposed for logging. This means the mitigation in the Pilgrim project was violated. In all of these sales either designated critical habitat or LSRIMLSA were logged taking the mature forest in natural stands and leaving the smaller trees as well as planting ponderosa pine that has created thousands of acres of plantations not used by NSO or late-successional species. Is the FS meeting the 15% retention of late successional old growth required by the NWFP in the Edson Watershed and/or the Mt. Shasta Watershed? Please include those figures in the FEIS and breakout habitat 80 to 120 years old: 121 years to 179 years; and 180 years and older for each watershed. It’s clear the forest has failed to follow the management direction in the MFEA in favor of unsustainable logging that has resulted in loss of species, habitat and an increase in disease.

80. Response

The comment states that the Elk LSR is “leave strips left from the Pilgrim sale” [referring to the Pilgrim Vegetation Management Project]. However, the entirety of the Elk Flat LSR and the Elk LSR project area is outside of the Pilgrim Vegetation Management Project area; with the exception of unit 401 in the southeastern portion of the project area, which is on matrix lands and is being analyzed for underburning under the Elk LSR project. Please refer to the Elk LSR project area map: Figure Appendix D-1 (DEIS, p. D-2). Documents for the completed Pilgrim Vegetation Management Project, including a proposed action map, can be found online at: http://www.fs.usda.gov/projects/stnf/landmanagement/projects. A records search (NEPA review, BA review, Biological Opinion review for the Pilgrim Vegetation Management Project) was unable to verify that any of the Elk Flat LSR or the Elk LSR project area was set aside for mitigation habitat by the Pilgrim project.

The 1995 McCloud Flats Ecosystem Analysis or MFEA, which has been superseded by the Edson Watershed Analyses in the project area and best available science on NSO dispersal and habitat use, does describe “dispersal corridors” (MFEA USDA-FS 1995 pp. 61-62). A review of these 1995 mapped areas and the Elk Flat LSR project area also shows the Elk Flat LSR outside the dispersal corridors (though it does provide suitable and dispersal habitat for NSO). Review also shows that some of the mapped corridors are in line with the NSO habitat typing done for the project in the NSO action area (see Map 4 of the Draft and Final BA). Conversely, there are areas mapped in the MFEA that do not support NSO dispersal (e.g. the meadow at Elk Flat, areas along the Pilgrim Creek Road/FA13 Road that are ponderosa pine-dominated).

The eight projects referenced in the comment did not remove mature forest in natural stands and leave small trees (refer to these project’s planning, NEPA and decision documents that describe the treatments, which were primarily thinning-from-below to reduce stand densities, plantation thinning, and in some projects, areas of regeneration and sanitation treatment in dead or dying ponderosa pine. Dead and dying ponderosa pine does not provide suitable or dispersal habitat function for NSOs; see Appendix D of the Final BA for a description of dispersal and suitable NSO habitat on the Shasta-McCloud Management Unit). The Forest Plan (p. 4.63) is consistent with, and identical to, language in the NWFP which directs the following within Matrix land allocation, “Landscape areas where little late-successional forest persists should be managed to retain late-successional patches. This standard and guideline will be applied in fifth field watersheds (20 to 200 square miles) in which federal forest lands are currently comprised of 15 percent or less late-successional forest. This assessment should include all allocations in the watershed. Within such an area, all remaining late-successional stands should be protected. Protection of these stands
could be modified in the future, when other portions of the watershed have recovered to the point where they could replace the ecological roles of these stands.” (NWFP Attachment A, p. C-44).

While very little of the Elk LSR project area is in Matrix, Appendix H in the DEIS provides a late-successional old-growth analysis of the HUC 5 Ash Creek watershed (this is analogous to a fifth field watershed) where the Elk LSR project area is located. For the purpose of this watershed level assessment, the late-successional forest definitions that are used are consistent with the definitions in the FEMAT report (FEMAT 1993) and described in the DEIS (DEIS pp. B-16, H-28). Late-successional forest status was assigned to two subsets by correlating the CalVeg forest typing. Within the Ash Creek watershed, 97 acres (less than 0.2% of the watershed) are identified as older late-successional or old-growth forest (greater than 150 years old); these acres do not fall within the project area. Approximately 53% of the Ash Creek watershed is classified as mature late-successional forest (generally 80-150 years old); well above the 15 percent level prescribed in the Forest Plan and NWFP (the assessment includes all current 3N, 3G, and 4N, 4G stands as late-successional).

DEIS Table 5 (p. 19) that displays the project area acres by seral stage as defined in the Forest Plan has been updated in the FEIS. Approximately 47% of the project area is defined as seral stage 4, which roughly corresponds to a late-successional classification (Forest Plan p. 4.15). Seral stage 4 stands in the project area are somewhat atypical in that they are comprised of both mid- and late-successional stands averaging generally between 60-100 years. While stands within the Elk Flat LSR do not meet the criteria for old-growth forest, the proposed actions are designed to help accelerate development of late-successional characteristics, contribute to increased connectivity and resilience of late-successional habitat, and help reduce the risk of large scale habitat loss while maintaining important current habitat areas, attributes, and functions (DEIS p. H-22).

Thinning treatments would reduce canopy cover sufficient to warrant a change in the “density classification” for some stands (DEIS pp. H-27, H-29). For example, radial thinning around predominant, legacy pine would reduce canopy cover in 0.25 to 0.30 acre areas, and would create more variable density in these areas, but would not change the stand’s seral stage class. This treatment is intended to protect this existing late-successional habitat. Given the limited removal of overstory conifer, and retention of predominant and most dominant conifers (meadow enhancement, radial thinning around pine, aspen and oak release are the exception as some dominant trees would be removed to meet the purpose and need for these treatment areas), the successional or seral stage classification in the stands would not be changed. The 2-acre or less group selections (within six older plantations and two natural stands) also would not cause a change in seral stage at the stand level (DEIS p. H-27). The ongoing and recent pine mortality from overstocking, root disease and insects in the project area is reverting stands and portions of stands to seral stage 1; this is not consistent with the management direction for LSRs (Forest Plan Chapter 4, 1999 LSRA). While the larger mortality pockets and the group selection areas would be reforested, this is also to introduce a range of species within the monotypic plantations and reduce the potential for root disease to spread. Overall, for Alternatives 1, 2 and 3, the percent of capable land occupied by forest types that meet the criteria of late-successional forest will remain at approximately 53 percent in the Ash Creek watershed (DEIS p. H-30), which is well above the 15% minimum requirement in the Forest Plan and NWFP.

Concern# 114 - Vegetation Diversity, Old Growth

13-34 - The focus area contains 21% mature and old growth forest which exceeds the standard of 15% late successional forest stands. This includes all 4N, 4G, and 3G stands over 80 years old, and half the stands types as M3N in 1975. However, nearly all of this (M3N) is early mature forest. Most late-successional stands are 80-110 years old and not spotted owl nesting habitat. The focus area has about one percent 4cOlder types (old growth), of which 90% are in LSR, MLSA, or riparian reserve. Almost all of the 4c older stands exceeding 100 acres are occupied by spotted owls and/or goshawks. Indicating competition for a shortage of nesting habitat. The DEIS fails to explain what happened to the 21% mature and old growth forest stated in the MFEA. The DEIS states there is no old growth at all in the Elk LSR and only 97 acres in the watershed.
81. Response

The commenter’s description of conditions within the focus area stems from the McCloud Flats Ecosystem Assessment (MFEA) in 1995, which has been superseded by assessments produced in the 1999 Forest-wide LSRA. The Edson and Mount Shasta Watershed Analyses are more current. See Responses 39, 40, 80 and 136 regarding the MFEA and its relation to the LSRA and the more current Watershed Assessments. Mature and older forest stands described in the McCloud Flats Ecological Assessment were assessed at the McCloud focus area (the planning watershed), not at the LSR scale, so the numbers are not representative of the LSR. While several projects may have included regeneration with green tree retention or other prescriptions that resulted in plantations since 1995, the BAs for projects since that time describe no effect to nesting/roosting habitat. This was usually because nesting roosting habitat was avoided or the stands were suffering from root disease and bark beetle mortality. Similarly, late successional/old growth habitat was generally not treated or had died.

Table 5 of the DEIS (pages 19-20) describes the seral stages within the Project area and how these differ in some instances from the Timber Type/Seral Stages found on page 4-15 of the Forest Plan (Table 4-3); the project area has highly productive sites where trees grow large trees in a relatively short period of time, resulting in younger large diameter trees. Of the 198 trees measured for age, species and diameter, no trees were >200 years old. On average, a 20” DBH tree is 65 years old, a 40” DBH tree is 110 years old and a 50” DBH tree is 180 years old. Also, predominant trees (i.e. the largest oldest ones) are to be retained throughout the project are unless they’re dead or pose a risk to human safety (e.g. next to existing roads).

Concern# 143 - Baseline Conditions

13-28 - Reference conditions continued - The acreage of young pine stands was a fraction of the current acreage. Spotted owl occupancy of this area depended on fire frequency and intensity. Land now in private ownership in the 4,300 to 5,500foot elevation band north and west of the LSR were likely to support spotted owls, or provide good dispersal corridors. The percentage of dispersal habitat within the LSR was equal or lower than what now exists. The vast acreage currently in 80 to 100 year old stands was much lower than the current acreage. The typical forested area consisted of uneven aged ponderosa pine. Douglas-fir and incense cedar, with an old growth understory. The number of large down Logs was much higher, but the tonnage of fuels under 10 inches DBH was lower. The crown canopy density needed for spotted owl habitat is higher than the typical conditions before settlement, but is probably within the range of natural variation.

Criteria for Developing Appropriate Treatments    1. Emphasize long-term development of late-successional forest. Stand treatments which temporarily reduce crown closure below 70% to increase diameter growth, fire resistance and species diversity are more important here than in currently occupied LSRs. 2. Through underburning and thinning, maintain a balance between stands with an open understory, which are more suitable for use by female spotted owls, and dense stand, which are more suitable for use by male spotted owls. 3. Establish and maintain a balance of conifer species to improve diversity and reduce susceptibility to insects and disease. Douglas-fir and sugar pine are not common in the LSR, but make the best nest trees. The species, should be encouraged and released where the11 occur. Ponderosa pine should ideally make up 25% of the stand. More than this risks blackstain outbreaks in the pine. Less increases the risk of large-scale white fir mortality. To the extent possible, establish and maintain hardwood species. 6. Assist in the development of a large-diameter overstory canopy suitable for nesting and roosting habitat of northern spotted owls. 7. Youngest stands have the highest priority for silvicultural treatment. a. Precommercial thinning opportunities in younger plantation. b. Precommercial or biomass thinning opportunities in older plantations. c. Biomass and commercial thinning opportunities in stands with quadratic mean DBH less than 21 inches. 8. No silvicultural activities are needed in old growth stands currently suitable for nesting habitat. Younger mature stands with average DBH of dominant and codominant greater than 21 inches, and largest dominant trees greater than 35 inches DBH, are very low priority (or silvicultural treatment. Fuels reduction activities are appropriate near roads. 9. Reduce road density. Eight miles of potential road closures have been identified. 11. No silvicultural activities should be undertaken in current or recently active goshawk nesting territories, of 200 acres. 12. No timber harvest activities are needed in the Ash Creek riparian reserve. Possible silvicultural activities include precommercial thinning and hand piling for wood rat habitat, planting of willow cuttings, and limited underburning. 13. No activities are currently planned in Elk Flat. The three options are to plant the area with ponderosa pine, do nothing, or cut and burn the encroaching pine. The Elk LSR project is not based on the aforementioned criteria in the LSRA.

82. Response
The criteria for developing appropriate treatments shared by the commenter were an excerpt from the McCloud Flats Ecosystem Analysis (September 1995, edited November 2004). These criteria were considered when developing the Elk LSR project, along with specific direction from the LRMP, NWFP and LSRA, recommendations from the Edson Watershed Analysis (2011) and Mount Shasta Watershed Analysis (2012) (and best available science). As the proposal and analysis in the EIS shows, the project is consistent with all or portions of many of the concepts described in the criteria above (e.g. 1, 2, 3, [4, 5], 6, 7, 8, 9, 11). Management direction and the project’s purpose and need are described on DEIS pages 4-38.

The LSRA has numerous activity criteria that are described as part of the assessment. The Background section of the DEIS (page 1) does state that "there are no specific objectives for the Elk Flat LSR in the LSRA; however, the project is consistent with the general objectives from the LSRA." Additionally, the DEIS is consist with the other guiding management direction that applies to the Elk project area. "An additional project consistency review with the Region Ecosystem Office (REO), will be required for proposed treatments, as stated in the NEFP Record of Decision (ROD) on pages C-12,13 and 26 (page 1)." Chapter 1 of the DEIS identifies the relationship of the Elk LSR project to relevant guiding management direction including the Forest Plan, and how the LSRA relates to the Forest Plan; the DEIS further describes the other designations within the project area that are outside of the Forest Plan, these designations include Wildland-Urban Interface (WUI) and Northern Spotted Owl Critical Habitat (page 6 through 9). These items are used to frame the Purpose and Need for Action for the DEIS, which is fully described in the DEIS in Chapter 1. Chapter 2 of the DEIS "Alternatives, Including the Proposed Action" describes the alternatives that were developed as a result of both internal and public review of the proposed action as part of public scoping. The DEIS does follow the LSRA recommendations as they apply to Elk Flat LSR-RC360. This is documented in the project record, as well as stated in the DEIS.

Socio-Economics

Concern# 61 - Mushroom Gathering

8-2 - These mushrooms in our area generate a significant amount of money to you and the surrounding towns which I will talk about later. The income generated is yearly. A very conservative estimate would be 50-100 cars per day on Pilgrim Creek Road going mushroom hunting x 2 people per car X Gas $25 X Food $20 = $2000-$4000 a day being spent locally in McCloud, Mt Shasta, Weed and Dunsmuir.

8-7 - Very few locals have benefited from the loggers working on the project in the McCloud Flats area. When the project is done they are gone. More people have benefited from the McCloud mushroom festival. The festival is a big event every year and much money is spent and made. During the mushroom the Mccloud Chevron, Reginato’s Market, Floyd’s frosty and the adjoining trailer parks and resorts highly benefit. People from out of the area including Bruno and the boys rent rooms from a lot of the local families. The amount of money spent in the local communities is significant and returns yearly for the entire mushroom season.

83. Response

We recognize that mushrooms are important to people in the local area and that mushroom hunting contributes to the local economy. The DEIS acknowledged that the local community of McCloud has limited services in general, but assumes that some residents may work for local timber harvesting companies and/or processing facilities. However, the DEIS (page 244) and Socio-Economics Report (Glubczynski 2015, page 8) note that uses of the McCloud Flats by the community include use of forest products such as mushrooms, including boletes, morels, and chanterelles. In response to this comment, information on the economics of mushroom collection was enhanced in the FEIS (see FEIS in the Community Use sections starting p. 253 and 255). Changes in boletus habitat, was weighed seriously against the need for restoring meadow habitat in Elk Flat. In response to comments received during scoping regarding mushrooms, the Forest did adopt measures into the Modified Proposed Action (Alternative 1), for some further protections for ectomycorrhizal mushroom habitat (such as boletus) through modified UTP placement, forested and large tree refugia, soil and organic matter protection in Elk Flat (DEIS pp. 117-118).

Concern# 25 - Support for Project
1-2 - These projects also create good paying jobs for many local families.

5-4 - any further reduction in the project runs counter to the need to maintain industry infrastructure to accomplish the non-timber objectives the Forest Service wants to achieve through improving the growth of residual trees to maintain and restore the health the resiliency of the forest. The current industry infrastructure is very important to helping you implement your projects and achieve wildlife habitat improvement and watershed restoration. This needs to be a consideration when assessing economics and project design. As project after project shrinks in size and volume during the NEPA analysis it cumulatively, has a major impact on the ability to maintain adequate infrastructure to accomplish your land management activities, including in this case enhancing the resiliency of the LSR to benefit late successional species.

84. Response

The project was designed to meet the purpose and need, but with local economic contributions in mind (to speak to the public issues identified in the Forest Plan) in considering implementation logistics.

The Socio-Economic report for the Elk Project (Glubczynski 2015) presents demographic information on employment and income in the project region (Siskiyou County) on pages 6-8, and the DEIS (page 243) summarizes this employment and income information. Based on an assumption that local contractors will be participating in project implementation (timber sale purchases, contracted services such as tree planting, road activities, etc.), jobs and income will be generated directly from implementing the project, as well as indirectly from the contractor expenditures on supporting materials and services, and from increased household expenditures by affected industries and employees. The Forest Plan Chapter 2, Public Issues (page 2.3), identifies the issue of providing activities and outputs that maintain community stability, primarily economic stability.

All three action alternatives will contribute to employment and maintaining the existing forest industry infrastructure. There is a 5 to 14 percent reduction in volume and value when Alternative 2 and 3 is compared to Alternative 1 (DEIS p. 78). Only the no-action alternative would not contribute to the forestry infrastructure or employment through harvesting activities or providing raw materials for processing. The Preliminary Record of Decision selects Alternative 1 as Decision.

Soils

Concern# 185 - Coarse Woody Debris and Soil Biota

4-74 - Coarse Woody Material - Coarse woody material densities should support the natural range of biota for the site. Snags and down logs build soil and provide habitat for a variety of organisms critical to ecosystem recovery after natural disturbance. The adaptive management direction of the NFP encourages site-specific research and planning for CWM retention.

85. Response

While the project does not occur in an Adaptive Management area, coarse woody material will be retained in the project at naturally occurring levels for the forest types in support of the natural range of biota for the site. Existing condition data has been collected and resource protection measures and the project design will assure retention of adequate coarse woody debris. Response 74 starting page I-79 provides more detailed information on snag and down log retention.

The forest service used the terms coarse woody material and large woody material interchangeably in this document and they are defined on page 257 of the DEIS, to include woody material over 4 inches in diameter. CWD was defined in the NWFP Standards and Guidelines as “Usually refers to pieces at least 20 inches in diameter.” The Forest plan in Appendix O, (O-1) states Large woody material, when occurring in forested areas, is at least 5 logs per acre in contact with the soil surface. Desired logs are about 20 inches in diameter, about 10 feet long and represent the range of decomposition classes defined in exhibit 2, section 2.4 I. Attempt to protect logs in decomposition classes 3 through 5 from burning and mechanical disturbance. Do not count stumps as large woody material. The LSRA desired future conditions for logs of different species composition were used to determine the RPMs for downed logs in
The DEIS, Chapter 2 page 89, but the minimum amount needed is 6 logs per acre with preference up to 10, while also maintaining the largest, embedded, and decomposing logs.

The soil monitoring that takes place before treatments using the National Soil Disturbance Monitoring Protocol (NSDMP) (Page-Dumroese, et. al. 2009) counts the number of logs that are occurring out on the ground before any treatments are done. This allows for tons per acre and number of logs per acre of large woody material on the ground to be calculated, pre-treatment, per unit. The same process would be followed for post monitoring as well. The data that has been collected in The Elk Enhancement project specific to Coarse Woody Material is found in Appendix C of the Soils report listed under Down Woody Debris (Rust et al., 2015, pg.47). Down Woody Debris was used as an interchangeable term here for Coarse Woody Material since this data was collected by a TEAMS soil scientist.

The Soil Report also discusses Large Woody Debris throughout the report and the changes and responses to the soils and large woody debris with all proposed treatments (Rust, Courtney, 2016; Soils Report page 3, 5, 6, 7, 14, 15, 31, 32, and 33). The forest recognizes that soil organic matter provides a carbon and energy source for soil microbes (soil Biota) and provides nutrients needed for plant growth. Soil biota and nutrient cycling are a function assessed by evaluating the vegetative community composition, litter, duff, coarse woody material, and root distribution. These indicators are directly related to soil organic matter, which is essential in sustaining long-term soil productivity and were assessed for this project. Also see Response 13 page1-23 for additional information of CWD data collection completed for the fire and fuels analysis.

The project is designed to be consistent with Forest Service Manual 2500 (FSM 2500) that provides the following guidance: "Maintain organic matter in kinds and amounts sufficient to prevent significant nutrient cycle deficits, and to avoid detrimental physical and biological soil conditions. (Forest Service Manual 2500 - Watershed and Air Management Chpt 2550 - soil management pg 8-9 effective date Nov 23, 2010) Soil organic matter (dark topsoil layer) in the upper 12 inches of soil is at least 85 percent of the total soil organic matter (SOM) found under undisturbed or natural conditions. (Displacement standard- Forest Service Manual 2500 - Watershed and Air Management Chpt 2550 - soil management pg 8-9 effective date Nov 23, 2010) Fine organic matter occurs on at least 50 percent of the area; this includes duff, litter, and woody material Forest Service Manual 2500 - Watershed and Air Management Chpt 2550 - soil management pg 8-9 effective date Nov 23, 2010) Large woody material, when occurring in the forested area, is at least 5 logs per acre in contact with the soil surface; and represents the total range of decomposition (preferably in decay class 3-4). Adjust the number of logs/acre to account for ecological type potential. (soil biology standard- Forest Service Manual 2500 - Watershed and Air Management Chpt 2550 - soil management pg 8-9 effective date Nov 23, 2010)."

Concern# 82 - Existing Condition Information

4-41 - Soil integrity is a key issue for this timber sale. Please address soil chemistry, productivity, hydrology, and biological integrity on a site-specific (i.e., unit-by-unit) basis. The DEIS does not contain field reconnaissance data and soil maps.

86. Response

The level of soil information requested by the commenter is normally not incorporated into the DEIS (or FEIS) document, it is included in the soil specialist report for the project. In addition, soil mapping and related soil survey data is publicly available at the NRCS website: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm (verified 3/11/2016).

The Forest Plan states what soil values are to be assessed, and what thresholds separate acceptable from detrimental disturbance. For example, soil chemistry is addressed by seeing if we have enough duff and litter cover (>50% area) for nutrient cycling, as one measure; if we do have enough, soil chemistry may be assumed to be intact. Other measures address soil physical, biological, and chemistry components. If all of these metrics are acceptable then soil productivity is assumed to be maintained.
All treatment units are expected to comply with Forest Plan requirements post-project. Soil resource protection measures are developed for the individual project (or unit if necessary) to minimize soil disturbance, or mitigate it where it is unavoidable and too large in aerial extent to comply with Forest Plan requirements. Complying with Forest Plan requirements is assumed to maintain soil integrity and productivity. Sale administration staff will be on-site during the project to ensure all Resource Protection Measures (DEIS RPM 14 p. 84, Best Management Practices (starting DEIS p. C-4), and Standard Operating Procedures (DEIS p. C-1) and Forest Plan and Soil Quality Standards are met. 

Site specific reconnaissance is for the purpose of verifying mapped soil types, documenting current condition of soils as affected by past management activities (in units having past management entry), and developing expectations for effects of proposed project activities on the specific soils, including developing specific resource protection or mitigation measures where applicable. Soil chemistry, productivity, hydrology, and biological integrity are addressed in the soil specialist report, notably in terms of soil values, indicators, and thresholds contained in the Forest Plan soil quality standards (Appendix O).

All of the proposed project units were visited, with at least an ocular walk-through to verify soil type and visually assess existing soil disturbance conditions. Units having similar soils and management history were stratified, and representative units were selected for different treatment prescription types (thinning of mature stands, plantation thinning, mortality areas, hazard reduction, meadow enhancement, under burning) for more intensive reconnaissance involving soil disturbance transects and more detailed data collection. 32 of the 58 units were surveyed with disturbance monitoring transects, within intermediate thin, interplant, meadow enhancement, plantation thin, and plantation thin-interplant activity types. Units that were identified as near or over threshold were resampled to insure data was correct. In the remaining units that had ocular walk-throughs, if much disturbance was noted (>10% area) they were revisited with transects done for good measure. Data from these transects is in the soil specialist report (Appendix C).

Having data, soil scientists also assessed several soil risk ratings and soil condition factors in the form a "soil resiliency index" that also reflects susceptibility or vulnerability of different soils to certain kinds of disturbance impacts. This assessment also addresses soil chemistry, productivity, hydrology, and biological integrity concerns. See the soil resiliency rating tables in Appendix B of the soil specialist report. Soil resiliency is rated as moderate to high, and soils are expected to have high rates of natural recovery, as detailed in the soils report. The manner in which soil quality - soil health - soil integrity concerns are analyzed by the Forest may seem awkward and indirect to the general public. However, the Forest Plan requirements set forth in the standards and guidelines, soil quality standards (Appendix O), as well as WO and Region 5 directives, determine how the soil scientist goes about assessing and protecting soil productivity: what is measured, why, and what thresholds to use to determine if detrimental disturbance exists, either currently from past management or expected post-project.

Concern# 16 - Machine Piling Effects

4-40 - As noted on page 211 of the DEIS the Forest Plan calls for retaining at least 90% of the total soil porosity found under undisturbed or natural conditions. Many acres in the project area already fail to meet this standard due to past Forest Service actions. Hence the agency may not incrementally add to existing soil compaction in logging units. Page 215 of the DEIS acknowledges that: Skid trails are the longest lasting detrimental disturbance, where many machines travel over the same route and compact the soil. Available water hold capacity is compromised as well by compaction since less water infiltrates to be held for plan growth on many soil types. Yet tractor yarding and machine piling are proposed both in meadow "restoration" units and in forest stands in which soils are already compacted. Indeed, page 215 of the DEIS indicates that the Forest Service is aware that approximately 15% of the project area is currently "highly disturbed as topsoil [is] displaced or [as] skid trails." The project cannot legally exacerbate this condition. Units 162, 164, 166 and 206 already exceed Forest Plan soil quality standard thresholds.

4-44 - Please note that recently your colleagues in the Six Rivers National Forest recently concluded: "Machine piling/burn piles would increase ground disturbance and soil displacement when the machine turns." -Little Doe and Low Gulch Timber Sale DEIS p 110. In response to a request from the timber industry (AFRC) to allow machine piling in federal logging units the Medford District BLM responded as follows: Comment 4: We asked that BLM provide some flexibility in how fuels would be treated by focusing on the desired goals.
The BLM has restricted fuels treatments to handpiling and burning. Contractors could use light weight equipment to treat fuels without detrimentally compacting soils. Response: The commenter has not provided details on methodology or supporting science that would support the claim that machine piling could be done without detrimentally compacting soils in excess of RMP standards for percent area compacted by current activities. Resource management plans call for limiting compaction in harvested areas in order to minimize soil productivity losses. Therefore, no additional use of mechanical equipment for fuels reduction was proposed, as ground-based logging would compact up to 12 percent of the harvest units. This is particularly important in the Cottonwood planning area as the majority of soils contain high rock content. It was identified that ripping the soils in this area would bring rocks and cobbles to the surface. The priority was given to minimizing the soil area compacted instead of trying to mitigate the effects. Additionally, the harvest prescription resulting in relatively few trees per acre being cut minimizes the slash, and consequently, also reduces the need for mechanical fuel treatment. Medford BLM Cottonwood Project EA Appendix A, Response to Comments. Page 3-2. Shasta Trinity National Forest timber planners refuse to acknowledge the significant (and avoidable) impacts of tractor piling. Indeed, the recent statements above by Forest Service and BLM timber planners are simply ignored in the Elk LSR DEIS. While the DEIS ignores the findings of other federal timber planners, it nevertheless erroneously cites (at DEIS 120) two SMMU machine piling soils reports to support the contention that additional soil damage from machine piling in this project area will not violate Forest Plan standards and guidelines. In fact page 1 of the April 2015 Report acknowledges that during recent machine piling on the District "when soils were moist, compaction levels on fine-textured soils were exceeded over the 15% ST-FOREST PLAN aerial extent." The same page indicates that porosity standards were not met because "post-timber harvest compaction had a 10.8% decrease in porosity" such that 20% of the area "is at the ST-FOREST PLAN compaction threshold." The attempt at page 5 of the Report to claim that new machine piling compaction in previously compacted logging units is not "cumulative" to soil resources due to a "different footprint" ignores the clear requirements and language of the FOREST PLAN.

4-45 - At B-7 the Forest Service responds to public scoping concerns regarding cumulative soil impacts from tractor yarding by indicating that "where possible" skidding will be limited to existing skid trails, no attempt is made to disclose or limit the location of machine piling within logging units. Indeed, on previously machine piled logging units in the District machine piling occurred on virtually every acre. Photos submitted to the Administrative Record for this project establish that contrary to Forest Service contentions at B-26 treated areas did not maintain duff levels in logging units on the District that were machine piled.

4-48 - We further encourage the agency to examine the soil compaction monitoring reports from 1985 through 1997 on the Payette National Forest. While the Payette contains different ecotypes and soil types than those in the Trout Creek project area, the monitoring reports clearly show long-lasting and significant soil damage from tractor piling activities. Similar monitoring in the Idaho Panhandle (Jerry Niehoff) and the Kootenai National Forest (Lou Kuennen) demonstrate significant impacts to soils. We also encourage the agency to review the findings of Geppert, R.R., Lorenz, C.W., and Larson, A.G., 1984. Cumulative Effects of Forest Practices on the Environment: A State of the Knowledge. Wash. For. Practices Board Proj. No. 0130, Dept. of Natural Resources, Olympia, Wash.

4-50 - Page 217 of the DEIS indicates that 703 acres proposed for machine piling currently meet soil quality standards. Hence the Forest Service intends to compound soil violations on at least 241 acres and perhaps up to 758 acres depending on whether it conducts 944 or 1,461 acres of machine piling. Please note that the decision maker and the public cannot actually know how much machine piling will be authorized by the Record of Decision since the agency has refused to quantify the exact amount and location of the proposed piling.

87. Response

Since machine piling can occur on up to 1,461 acres, those are the acres authorized for Machine Piling by a Decision on the project. It is estimated that 944 acres will actually be piled based on need, but up to 1,461 acres will be approved for machine piling. The acres and unit numbers of each unit to be piled are provided in Table Appendix A-3 on page A-31 of the DEIS and FEIS. The machine piling units are displayed on the Alternative Fuels maps in Appendix D of both the DEIS and FEIS.

The areas that are over threshold for compaction will be subsoiled to alleviate the compacted areas, including Units 162, 164, 166 and 206 that already exceed Forest Plan soil quality standard thresholds, to bring those areas back into compliance (DEIS p. 56, 84). Please see RPM 14 (DEIS p. 84) and Appendix C for Resource Protection Measures. BMPs and SOPs in place so soils are not logged while wet, to reduce compaction impacts and to overall protect the soil resource as best as possible; see Appendix C, pg C-1 # 6 and Practice 2.24 of the DEIS.
The Six Rivers DEIS referenced does not state if such ground disturbance was expected to be detrimental or not, which is a critical distinction. The BLM response notes minimal slash, so hand piling was obviously feasible; it also noted high rock content of soils, which limits feasibility of subsoiling as a mitigation. This is not the case with soils of the Elk project. Machine piling is to be done only where needed within piling units, the extent of which can not be entirely anticipated beforehand. That is, whole tree yarding is used to greatly reduce activity fuels in the majority of a unit, but there is still breakage and understory fuels that need to be dealt with by piling. Hand piling was considered instead of machine piling to reduce disturbance, but was ruled out due to the quantity and size of the material (See DEIS p. 119, Alternative 7), it would not be practical to do by hand.

It is acknowledged that machine piling may cause soil disturbance and compaction (DEIS p. 209, 218), in large part depending on how the practice is conducted; it is thus very important to distinguish "disturbance" and "compaction" as detrimental or not, as defined by Forest Plan soil quality standards.

The Shasta-Trinity soil scientists have worked extensively with operators to achieve favorable end results for soils, i.e. using smaller (low psi) equipment, which must be equipped with brush rakes, and emphasizing leaving the duff layer. Forest monitoring found the overall effects of machine piling on the soil were minimal due to clean piles that lacked displaced soil (Rust, 2013); also see the soil specialist report. Soil Scientists on the District and Forest level are monitoring ongoing projects for machine piling in timber sales and continue to collect soil compaction data and machine piling effects on the soils for the Shasta- Trinity NF. As monitoring reports have noted, and commenters repeated, compaction has been seen as a problem on fine-textured soils when operated in wet conditions; soils of the Elk project are coarse-textured and will not be operated when wet, and monitoring has shown this will produce acceptable levels of compaction (not detrimental).

With machine piling, duff removal may occur in an effort to get units "too clean" of all fuels, which is not necessary for fuels or desired for soils; soil scientists have been working with sale administration staff in recent years to improve this, and end results have been in compliance with Forest Plan standards (>50% cover of duff and litter). Regarding skid trail compaction, skid trails are approved by the Sale Administrator and follow spacing guidelines that are in the contract to the purchaser. (See Appendix C, pg C-2 #14, C-3 #15, and C-4 Practice 1.10 Tractor Skidding Design Appendix C of the DEIS). The intent here is to limit skid trails to less than 15% area to stay within Forest Plan compliance, and subsoil landings and proximate skid trails, where compaction is more likely to be at detrimental levels. Where landings and skid trails are re-used, the subsoiling will also mitigate the residual past compaction, reducing overall and cumulative compaction on a unit basis. Our Forest Plan Chpt. 4 says Dedicate no more than 15 percent of the land harvested by even-aged systems and no more than 20 percent of the land harvested by uneven- aged systems to non-productive purposes such as roads, trails, landings, etc (pg 4.25). Sale administration staff are tasked to ensure this is the result on the ground, in compliance with the Forest Plan.

The soil compaction monitoring reports suggested by the commenter [Geppert, R.R., Lorenz, C.W., and Larson, A.G., 1984. Cumulative Effects of Forest Practices on the Environment: A State of the Knowledge. Wash. For. Practices Board Proj. No. 0130, Dept. of Natural Resources, Olympia, Wash.; Idaho Panhandle (Jerry Niehoff); Kootenai National Forest (Lou Kuennen); Payette NF reports] is not relevant since they are geographically distant, and involve very different bioregions, climates, ecotypes, soil types, and topography (i.e. steeper slopes than in the Elk project area). Local knowledge and monitoring data is sufficient to predict compaction effects from operations as practiced on the Shasta-Trinity NF. Most relevant is table 6 in the Soils Specialist Report (pg 18) showing monitoring results of many timber sales on the Shasta-Trinity, several of which have similar soils as the Elk project. This monitoring concludes that across all soil types current mechanical harvesting operations decrease porosity on skid-trails by only 1 to 3% from pre-harvest levels, due to modern equipment (lower psi), effective BMPs, operating when soils are dry, use of existing skid-trails, and site specific mitigations. Total disturbance increased an average of 12 to 15% using conventional harvest methods, but this disturbance was not detrimental and is thus acceptable per Forest Plan standards.
The end result of both footprints of logging skid trails and machine piling activities were analyzed as part of the same proposed action, that is, they are connected actions in designated units (See DEIS 209). Cumulative effects refers to this project in combination with past and reasonably foreseeable future actions. It has been disclosed that machine piling will add disturbance atop the logging footprint; however compaction from piling, using smaller equipment, is not expected to be at detrimental levels, so controlling where and to what extent it occurs spatially is not of great concern for soils. Historically, topsoil displacement was of much more concern with machine piling than compaction, which the proper use of brush rakes with piling has largely eliminated in the last decade or two. (also see DEIS 212, 213 discussion of Cumulative Effects bounding and approach).

Concern# 20 - Road Impacts to Soils and Other Resources

4-53 - We are extremely concerned about construction of additional logging roads in the planning area. Please note that while the new road construction may described as either "temporary" or "permanent" that all road construction results in long-term impacts to soil health and productivity. Further, once trees are removed from the roadway, they cannot be put back. Please note that the joint BLM and USFS Biscuit Fire Recovery Project DEIS found that "Creation of temporary logging roads is an irreversible commitment of the soil resource, as such areas rarely regain their former productivity." We bring to your attention the following findings in the USFS Rogue River-Siskiyou National Forest 2012 Bybee Timber Sale Environmental Assessment: Construction of temporary roads (and their associated landings) detrimentally compacts soils and contributes to erosion by allowing water to run overland rather than naturally infiltrating at the point of raindrop impact. Roads are an example of detrimental soil compaction with adverse indirect impacts on water movement pathways. Properly designed and constructed roads (including temporary roads) require structures for channeling this now-redirected water flow to desired locations. Temporary roads and landings are expected to have an irretrievable reduction in soil productivity since they are bladed (soil is mixed and displaced) and compacted. Once rehabilitated, the hydrologic function of the soil profile may be re-established, but the soil profile in relation to organics and nutrient cycling is modified to a degree that may take many decades to return to the productive state of the undisturbed forest soils adjacent to it. Landings also, with their likely deep compaction, and soil mixing from construction and recurrent disturbance, are expected to cause an irretrievable decrease in soil productivity. http://www.fs.fed.us/nepa/fs-usda-pop.php?project=33406

4-71 - The DEIS lacks analysis or disclosure of the significant impacts of new road construction in this LSR. While 2.9 miles of new "temporary" road construction is proposed, the site-specific impacts to soils, forest connectivity and stand structure are ignored. Please note that page 221 of the DEIS acknowledges that decommissioning of roads after they have been built "cannot restore the roadbed to natural conditions [and rather] rehabilitation efforts initiate a long term recovery process." The timing and efficacy of this process is not disclosed or analyzed. Instead the Forest Service incorrectly assumes that the impacts of new roads and landings simply disappear after the project is completed.

4-29 - While every proposed action alternative in the DEIS calls for new "temporary" road construction and none of the action alternatives call for a reduction in Forest Service system roads, the DEIS fails to quantify or disclose the site-specific impacts of its proposals to construct roads and landings. How many trees will be removed to facilitate these actions? What will be the site-specific impacts to soils? Rather than analyze and disclose the impacts of new road construction, at page 221 the DEIS simply discounts the impacts of new road and landing construction that the agency claims "will have a short-term impact to the soil resource." This claim is not credible. During the scoping process for this LSR timber sale our organization submitted several literature attachments and referenced peer-reviewed publications establishing the long-term impacts of so-called "temporary" road construction. Indeed, on page 221 of the DEIS the Forest Service acknowledges that road decommissioning "cannot restore the roadbed to natural conditions [and rather] rehabilitation efforts initiate a long term recovery process." Hence the conclusion in the next paragraph that impacts to soils from road and landing construction are "short term" and need not be analyzed or disclosed by the agency is in error.

88. Response

We acknowledge the findings from the joint BLM-USFS Biscuit Fire Recovery Project DEIS, and the USFS Rogue River-Siskiyou National Forest. The Biscuit Fire area contains soils of a different geologic terrane from the Elk LSR project area; many of which are shallow with thin A-horizons, and occur on steep topography, where temporary roads usually involve full-bench blading of soils. Temporary roads in that type of topography, if they are not constructed with proper drainage and decommissioned appropriately, can potentially result in permanent impacts to soils, water quality and other resources. The
comment points to similar concerns that were expressed in the Bybee EA regarding blading the roadbed, followed by compaction. The estimated 2.9 miles of temporary roads proposed under the Elk LSR project would occur on flat terrain, requiring minimal blading and therefore minimal soil displacement or mixing (DEIS p. A-44). The primary impact to soils from temporary roads would be compaction, which could be detrimental compaction. Compaction will be mitigated in large part by subsoiling to de-compact and improve soil hydrologic function when the new (and existing) temporary roads are decommissioned.

Under the Elk LSR project, temporary road construction is not at all similar to permanent road construction. Permanent road construction typically involves engineered-specifications and includes extensive earth movement to establish cut and fill slopes, potential removal of all vegetation (including root-wads) along wider disturbance areas that allow for shoulders, and surfacing for public use and safety. Temporary roads generally require minimal blading of native surface and are narrow (estimated to be no wider than 14 feet (see below and Response 153, p. I-171).

The Forest does concur that some temporary roads (and landings) can have long-term impacts to the soil resource, but not to the same degree or with the same consequences for long-term soil productivity loss as with permanent roads.

The DEIS and soils report asserts that "new temporary roads and landings will have a short-term impact to the soil resource" and also states that "The creation of the temporary roads and land[ing]s will slow infiltration rates and could slow water flow patterns." These are the only two sentences in the paragraph. It is clear that the short-term impact refers to soil hydrologic function. The preceding paragraph acknowledges and discloses that decommissioning temporary roads will improve hydrologic function, but other aspects of soil quality recovery will be a "long-term recovery process." Actual impacts to soil productivity is site- and soil-specific, and should not be generalized. The Forest also concurs that temporary roads, after decommissioning, may not meet Forest Plan soil quality standards. Thus the only issue becomes whether or not the temporary road, in combination with other detrimental soil impacts, exceeds the 15-20% of the activity area allowed for in the Forest Plan (Chapter 4, pg. 4.25).

Forest Plan standards and guidelines allow for 15-20% of a unit for non-productive purposes (skid-trails, landings, temporary roads). The project-level soils data shows the extent of skid-trails and old roads are less than 15% area, and are in compliance with the Forest Plan (see Soils Report Appendix C, p. 47). Units 162, 164, 166, and 206 were over the Soil Quality Standards thresholds, and therefore the project design includes mitigation measures to alleviate compaction and bring those areas back into compliance (see DEIS Chapter 2, p. 56, RPM No. 14 at p. 84 and DEIS Appendix C). The timber sale contract specifications would include language that requires all temporary roads and landings to be decommissioned at the completion of work. Closure work may include mulching, outsloping, water barring, scarifying, removal of berms, and road barrier construction (see DEIS Appendix C, p. C-6-Practice 2.26, also see DEIS p. 56). During use and prior to decommissioning, the new temporary roads (and existing authorized routes that are used) will have BMPs and drainage features installed to control runoff and prevent impacts to water quality. These BMPs and standard operating procedures are expected to prevent any significant adverse erosion or sediment movement off-site during use; helping to conserve soil resources during the temporary use period.

Recovery rates of soils were addressed in the soils report using the "soil resiliency index" (see soil specialist report, Table 2 at p. 6; Table 3 at p. 10; Table 8 at p. 19; and Appendix B). The soils in the Elk LSR project area have overall good resilience and fast recovery rates. The Germany soils have a high resiliency rating and the Shasta soils have a moderate resiliency rating. A high soil resiliency index rating means the soil can withstand many destabilizing impacts without decreasing its inherent productivity, while a moderate index rating means some of the soil properties are more sensitive to destabilizing impacts. On moderate-rated soils, these potential impacts need to be addressed through soil protection measures that avoid or mitigate adverse impacts.

The analysis in the project-level wildlife reports addresses new temporary road construction and connectivity, including new landing construction (see also Response 160). In terms of impacts to forest
stand structure from construction of temporary roads, we assume the comment refers to late-successional habitat structure. As described in RPM No. 16 (DEIS p. 84), new temporary roads would be kept to a minimum and would be routed through non-late-successional or low quality late-successional habitat where possible. The new temporary roads do not consist of the typical cut/fill, paving or surfacing, and wide shoulders and vegetation clearance typically associated with new permanent road construction and they are estimated to be 14 feet or less in width. This is less than the typical leave tree spacing when thinning (Preliminary Wildlife BE pp. 35-36; Draft MIA report p. 15; Draft BA pp. 24, 122). The same project design features for thinning also apply to temporary road construction in that no predominant, healthy dominant, or dominant trees with late-successional characteristics would be removed, unless they are a safety hazard. This has been clarified in the Road Actions section of Appendix A in the FEIS.

The Forest generally concurs that long-term impacts of temporary roads (and landings) can occur to the soil resource. These impacts are all dependent on the soil type, where and how the road is constructed, and if, when and how it is decommissioned. The more blading that occurs deeper into the soil profile, the more impactful the road can be in terms of impairing productivity; resulting in a longer recovery time. Without decommissioning actions that include subsoiling (outsloping, dipping, revegetation, etc.) soil productivity is generally impaired over the long-term. With subsoiling, soil hydrologic function can be largely remediated in the short-term, and long-term soil productivity is largely or wholly retrievable, depending on soil type resiliency and site-specific factors. The Elk LSR project area soils are resilient, and long-term productivity is not expected to be irretrievably impaired.

Concern# 29 - Timber Harvest Impacts, NFMA Consistency

4-42 - The Forest Service may only yard timber if the activity will be "carried out in a manner consistent with the protection of soil." 16 USC §1604(g)(3)(F)(v); 36 CFR §219.27(c)(6). Management plans and projects must "insure that timber will be harvested from National Forest System lands only where-soil, slope, or other watershed conditions will not be irreversibly damaged." 16 USC § 1604(g)(3)(E)(i). By enacting this section, Congress intended that the Forest Service "provide empirical guarantees that timber harvesting will not damage soils, water conditions, and fish habitats." Please note that ground-based logging causes higher incidences of root damage and scarring of residual trees (compared to skyline systems). Soil loss with respect to method of harvest is directly related to the amount of soil disturbed and pared by harvest activity, especially the density of skid trails and roads required to access the timber. Megahan (1981) found tractor logging on granitics to result in 28 percent of the soil disturbed, ground cables with 23 percent, suspended cables with five percent and helicopter logging with two percent. Similarly, Swanston and Dyrness (1973) found tractor yarding in granitics to result in 35.1 percent bare soil, hi-lead in 14.8 percent and skyline in 12.8 percent. In a Trinity County study on mixed soil types, skid trails averaged four to eight percent (6-12 km/sq.km) for clearcut areas (Scott et al., 1980).


4-24 - Minimize soil disturbance during thinning operations. Page 88. Thinning operations include extensive whole tree yarding, landing establishment, road construction, tractor yarding and machine piling.

13-128 - The current level of detrimental disturbance is 9% for the project area. Anticipated new disturbance averages 9% as well. This total 18% which is over the FOREST PLAN standard of 15%. The FS states that not all new disturbance will exceed thresholds for detrimental soil disturbance but Appendix C of the Soils Report appears to disagree with this prediction. See also Table 62. The DEIS concedes there would be a "short-term" loss of soil productivity on areas dedicated to landings (up to approximately 5.8 acres) for Alt. -.

89. Response

BMP's and SOPs will be used to protect the soil resources, along with resource protection measures (RPMs); these can be found in Appendix C of the DEIS. Site specific Resource Protection Measures Common to all Action Alternatives are listed in Chapter 2 starting on pg. 81 of the DEIS. These are intended to minimize soil disturbance to the extent practicable, and further to mitigate detrimental compaction where it is expected to be an unavoidable result of activities. The Forest acknowledges the studies by Megahan (1981) and Swanston and Dyrness (1973). Despite there being no granitic soils in this project (see the Soil Specialists Report for soil types, pg. 10), the Forest readily concedes the point that ground-based logging systems produce more soil disturbance than other systems.
Logging systems are considered early in project development. Cable (skyline) yarding is typically done on slopes above 40% and Elk is a relatively flat project area with slopes below 40%. If cable yarding was the system employed on this project, the number of landings needed for the project would be increased based on the limitations of cable lengths. Ground based skidding distances can reach out up to 1,320 feet and bring trees back into the landings, while a cable system reaches 500 to 1,000 feet, and that is on steep ground with the proper deflection and lift to fully suspend logs. On flat ground there would have to be towers and intermediate supports in order to get the proper lift; those supports would need to attach to the largest and healthiest trees available, harming them to some extent. Also in a thinning operation there would be lateral lines bringing trees into the mainline and then to the landing. This action tends to be less controlled and leads to more damage to residual trees at the turns than what a ground-based harvester can achieve. Erecting a cable system on relatively flat ground is also time consuming and expensive to set up, and entails safety concerns with people working around intermediate supports. Helicopter yarding is not economically feasible for the size and quantity of trees being extracted. With all of this said, it was determined early on that a ground based system is the most feasible for the Elk project.

Mechanical and staged falling operations, along with a designated skid trail system, contract provisions that limit tree damage (e.g. B6.32 Protection of Residual Trees), and onsite sale administration of the contract all help to address and minimize residual stand damage (tree scarring). The physical environment of roots will be compacted in Project RPMs also help to minimize disturbance of soil and other resources values. Skidding and landing use will be restricted to existing skid trails and landings where possible. Adhering to BMPs will minimize erosion, compaction and subsequent root damage. The sale administrators work with operators to minimize disturbance and damage.

No clear cutting will occur in the Elk project and Scott et. al. is not directly relevant. The current level of detrimental disturbance is 9% for the project area. New anticipated disturbance is estimated to be about 9% as well, not all of which will be detrimental, and not all of which is additive as "new" compaction to the extent old skid trails are re-used. Subsoiling of landings and proximate skid trails will occur as part of project implementation, to bring currently-compacted units back into Forest Plan compliance, and assure that all units would result at or below Forest Plan standards (Soils Report pg. 4). Also, where landings and skid trails are re-used, the subsoiling will reduce overall and cumulative compaction, mitigating some of the persistent past detrimental compaction of the first 9% (current pre-project). The Forest Plan Chpt. 4 states “Dedicate no more than 15 percent of the land harvested by even-aged systems and no more than 20 percent of the land harvested by uneven-aged systems to non-productive purposes such as roads, trails, landings, etc. Sale administration staff will be onsite to assure compliance with this on the ground.”

Transporation

Concern# 74 - Road Density

13-23 - Roads - the LSR contains 5 miles of arterial and collector roads and 10 miles of local roads. Total road density is 3.2 miles per section. The DEIS states there are 18.64 miles of existing roads and an open road density of 2.72 miles per square mile. How can this possibly be based on the numbers above?

90. Response

The DEIS uses current data based on the existing condition. The reference document (McCloud Flats Ecosystem analysis, 1995) does not account for implementation actions that have been completed since 1995. The DEIS uses the most current available data and quantifies the data based on the project area, which includes LSR and matrix land allocations. A discussion of road densities, including methods of quantifying road densities is included in the transportation analysis (DEIS, p.228). The transportation analysis also includes two different measures for road density: the Total FTS road density as 3.39 miles per square mile and the Open FTS road density as 2.72 miles per square mile (DEIS, p.230). The DEIS uses the most current available data and quantifies the data based on the project area which includes LSR and matrix land allocation, whereas the McCloud Flats Ecosystem Analysis is only referring to LSR.
DEIS also provides Total and Open road densities, two different measures to analyze the effects of project actions.

Concern# 129- Add UA Routes, Mushroom Access

7-3 The areas of concern are the closing of the road at the top of the Elk Flat that runs East West (41n52). Your last logging here destroyed all of my spots that were close to the highway. I would like you to consider leaving these roads open for mushroom season only and change the ways the area is being logged and thinned as to not destroy the mushroom beds.

91. Response

See 92, p. I-97 below.

Concern# 27 - Close FTS Roads

4-22 - Four priority areas have been identified for road closures. They are in the Elk Flat LSR Page 86. The project calls for closing no Forest Service system roads in the LSR.

4-26 - Reduce road density. Page 102. No reductions of Forest Service system roads is proposed or contemplated. Only existing user created routes are under consideration for decommissioning.

4-28 - Please note that the DEIS indicates that the Forest Service is proposing: (1) Temporary road construction; (2) Landing construction; (3) Gap creation logging; (4) Ground-based yarding activities and (5) Machine Piling; all of which will increase (rather than decrease) the hydrological and terrestrial impacts of the equivalent roaded acres in the planning area. We urge the Forest Service to propose and implement a vegetation management project that implements the ACS of the Northwest Forest Plan and the findings and recommendations of the Watershed Analysis by: * Avoiding and deferring new road construction; * Minimizing new landing construction; and * Decommissioning unneeded system roads in addition to user-created routes. This reasonable alternative has been implemented in numerous LSR projects throughout the Northwest Forest Plan. The Forest Service refusal to develop and consider such an alternative is arbitrary and capricious.

92. Response

The Elk LSR project is guided by direction in the NWFP, the Forest Plan, the LSRA, the STNF motorized Travel Management decision as described in the DEIS. System roads needs have been evaluated. Concerns regarding road closure and densities are citing the 1995 McCloud Flats Ecosystem Analysis, several newer analyses have also been completed that also inform the project, including the Forest Travel Analysis (STNF Travel Analysis Report, 2015), the Mount Shasta Watershed Analysis (Mount Shasta WA, 2012), the Edson Watershed Analysis (Edson WA, 2011) and the Elk Travel Analysis (Elk Travel Analysis Process, 2015). In addition, the need for action was determined by comparing existing conditions with the desired condition relative to the resource. Existing conditions, causal mechanisms and needs for action in relation to the Forest Plan desired conditions were identified in Step 5 of the Edson WA and Chapter 5 of the Mount Shasta WA. The 2015 STNF Travel Analysis provided recommendations for road actions and those recommendation were incorporated in the project road actions that result in the proposed changes in road densities.

Concern# 26 - Public Road Access

8-5 - Using the map D-4, I would like to show two Roads that we would like to keep open for mushroom hunting only in the months of April 15 to July 15. Road one goes out to the Island Road and Road two goes into the last untouched king Bolete patches left in the area. This is what we are trying to save. The same thing was done to the roads at Medicine Lake years ago and it still works.

8-9 - Road two to goes into the heart of the biggest mushroom concentration left in Elk Flat. This does not include the area that was ruined by the last thinning project. This road is vital to the young and old alike who pick here. Most cannot walk the distance from Pilgrim Creek Road.

8-18 - I would ask again that if you would let people access the two roads for mushroom hunting only from April 15 to July 15. This would help a lot of the older and younger people. I understand that the long rifles or going to get their spot left alone. I have no problem with that as we see and talk with them during our outings. They are friendly and when they leave the area it is the same as they got there. They are respectful of our area.

9-1 - It has been brought to our attention by know specialist Philip Fachini, you are planning on closing existing temp roads in the Elk Flat area. Ourselves and fellow mushroom hunters in our late 70’s & 80’s will find it
Elk LSR Enhancement Project

93. Response

This also responds to Concern# 129 above.

Alternative 11, considered but not in detailed analysis, was developed in the FEIS (see p. 126) to address this suggested alternative of adding these routes to the FTS, and managing them with seasonal closures. The access routes of concern are unauthorized routes and their use by motorized vehicle is considered cross county travel and prohibited under the Forest's Motorized Travel Management (MTM) Record of Decision (ROD) (USDA Forest Service, 2010). Public Comments are an integral part of transportation management and they provide valuable information when considering changes to the Forest transportation system (FTS). Unauthorized routes in the project area were initially screened by the interdisciplinary team to determine potential additions to the FTS, and routes with unacceptable resource risks were excluded from further consideration. Seasonal closures on FTS roads, can be a practical mitigation measure where the potential risk is seasonal, but it was determined that adding these routes to the FTS presented unacceptable resource risks and would not meet the purpose and needs of the project. Road actions for decommissioning unauthorized routes within Elk Flat units 401 and 402 (recontouring) meet the Purpose and Need related to hydrology by restoring hydrologic function to approximately 8.1 acres of riparian reserve stream channel and floodplain (DEIS Table 11, p. 64). Manmade features such as old landings and unauthorized routes, restrict flooding and concentrate energy on floodplains and meadows (DEIS p. 203).

The Forest wishes to thank the commenter for requesting clarification on this subject and has further clarified that Along Ash Creek (DEIS p. 203) [and within Elk Flat], (clarification added to FEIS) these remnant features impede and confine flooding. FEIS, 203). Further, starting on FEIS page 212 addressing the need to show the additional incremental benefit from decommissioning, the following statement was added to the bullet list of incremental positive watershed effects from treatment will: restore infiltration within the project from decommissioning and unauthorized routes.

Concern# 73 - Temporary Roads, Road Opening

13-24 - We are opposed to opening maintenance level 2 roads for the life of the project and for using unauthorized routes as temporary roads. How will the FS stop illegal ATV use during the life of the project? If log trucks use unauthorized routes it will only make them more difficult to close. The FS is continually promising to close temp roads but it rarely happens. We request the FEIS list all temp roads and unauthorized routes and provide an estimated time for closure as well as the costs to close them. Where will these funds come from?

94. Response

Transportation management during project implementation is critical to implementing the project effectively, efficiently and with the least amount of impact. Roads currently closed (maintenance Level 1), to be opened for the project, are considered to be in storage, reserved for future uses, such as implementing management projects (DEIS, A-44). Unauthorized routes and temporary roads may have the appearance of remaining open, or rarely closed, especially in an area that has already been treated, but project operations may still be active. After project operations are complete and temporary roads are decommissioned, their locations may still be apparent as they revegetate. Chapter 2 in the DEIS further discusses temporary roads, unauthorized routes, their use and when they will be decommissioned (DEIS, p. 55). Additional details and a list of routes are included in appendix A (DEIS, A-40). Temporary roads, their construction, use and decommissioning are also a contract purchaser item and addressed in Appendix C under BMP 2.26-obliterating or decommissioning of temporary roads. Temporary roads and unauthorized routes are not designated for vehicle travel on the Forest Motor Vehicle Use Map (MVUM) but may appear to be an open road. Without a barrier, these routes can be used unintentionally by uninformed drivers and OHV users. Unauthorized route use and physically preventing access to these
routes is discussed in the transportation analysis (DEIS, p.227, p.235). Law enforcement issues are beyond the scope of this project.

Wildlife

Concern# 150 - Barred Owl Protocols

13-96 - Recovery Action 24: Establish protocols to detect barred owls and document barred owl site status and reproduction. Protocols to detect barred owls and document important population information, including pair status and reproduction, provide vital data needed to help manage barred owls to reduce their threat to spotted owls. A subgroup of the Barred Owl Work Group was formed in 2008 to develop a barred owl-specific survey protocol. The subgroup developed a draft protocol in 2009 with the purpose of providing a high likelihood of determining barred owl presence for research studies. During the 2009 field season, the draft protocol was tested in several areas with the objectives of determining barred owl detection rates and the survey effort needed to adequately detect barred owls. These data have been analyzed allowing the subgroup to refine the protocol based on the field tests. CC Comment: We are unaware of the STNF establishing any kind of survey protocol to document barred owls; where they exist on the landscape; or their reproduction. The 2012 survey protocol was established to help identify barred owls but the STNF rarely uses it.

95. Response

See also Response 108. Page I-113. The commenter has included the full text of Recovery Action 24 from the 2011 Revised Recovery Plan. The FWS developed the current survey protocol (February 2, 2011; with a revision on January 9, 2012) and the SMMU has been using this protocol (and will continue to use it) to survey the NSO action area and project area for the Elk LSR project since 2012 (DEIS pp. 159, 165; Draft BA pp. 22, 27, 41-42, 45-47, Table 10; and Final BA Appendix D). As described in the Recovery Plan at p. III-62, coordination among all agencies and non-governmental organizations that can contribute to research on ecological interactions between spotted owls and barred owls is needed to: prioritize research topics, maximize funding opportunities, minimize redundancies, increase efficiency, identify potential, management strategies, and communicate with decision-makers; and the US Fish and Wildlife Service is the primary agent to oversee implementation of any strategy for the management of barred owls.

The 2012 survey protocol was developed by the US Fish and Wildlife Service and it is currently in place to help identify barred owl presence on the landscape and within specific project areas. It is not the responsibility of the Forest Service, nor is it advisable by the US Fish and Wildlife Service, to establish new survey protocols that would differ in design from what was established by the primary agent overseeing implementation of the strategy for barred owl management. The survey protocol is designed to provide consistency in survey methods and estimate the likelihood that an individual may be detected (mathematical calculation based the number of times a particular area was surveyed using specific survey method). Deviations in the protocol, as defined in the 2012 survey protocol, can reduce the likelihood of detection of an individual in a particular area when occupied. However, the protocol also describes that “some areas local conditions (particularly when supported by appropriate data) may warrant deviations from this protocol. These deviations may occur through mutual cooperation between the landowner or their representative and the appropriate regulatory agency” (USDI-FWS 2012 p. 5). The Forest has developed a survey strategy for the Elk LSR project that follows the survey methods described in the 2012 survey protocol – see the BA pages described above for the full survey history for the project, and survey history for the Shasta-McCloud Management Unit (Final BA Appendix D).

The project includes design features specific to barred owl detection and NSO surveys (DEIS Chapter 2, Wildlife measures 33 to 36 – DEIS pp. 87-88). In addition, the following monitoring measure is incorporated into the project’s design: Stands will be surveyed / monitored for NSO prior to and for the full extent of project implementation utilizing a variety of methods. Similar monitoring may be performed after implementation to evaluate effects of the project on any territories or home ranges that may become reoccupied (ST-215) or newly occupied in the project area (DEIS p. 92, measure 16; Draft BA p.33).
NSO and barred owl presence in the action area and project area was thoroughly considered for the effects analysis, as described in the DEIS and BA. Appendix E of the DEIS, which is the ‘Threatened and Endangered Species Consultation Record’ describes the extensive joint efforts of the project biologists and FWS biologists to establish the presence of both NSO and barred owls in the action area. For example, pp. 165-166 of the DEIS describe in extensive detail the consideration of barred owl presence in portions of the project area where a historic NSO activity center was located. NSO survey records and activity center stand searches (USDA-FS 1989-2011) and more recent 2012-2015 6-visit and spot check protocol surveys and stand searches (in accordance with the January 2012 Revised Survey Protocol; USDI-FWS 2012), helped to inform the project design and analysis (Draft BA p.22).

Concern# 23 - Bat Habitat Improvement
3-15 - You also have a cave in the NW corner of the sale. air blast out of it is rather cold. It would be nice to open it up so bats can get in better. There's something big back in there. At any rate, keep the tractors off of it.
3-22 - Check with me and Liz Wolfe, Shasta Grotto if you find any caves in the area. We don't have any registered caves in the project area, but several in the vicinity. Some have bats. The sensitive pallid bat is a notable local user of large pine shagbark snags and is located in the flats. Townsend's big-ear bat was found in larger lava tube caves.

**Concern Statement:** The Forest Service should modify existing caves for bats and protect them during project implementation.

96. Response
Thank you for the comment and information. The project area has been reviewed and there is no evidence of caves, as defined under the Federal Cave Resources Protection Act of 1988 (FCRPA), in the northwest corner or other portion of the project area. The Forest Service is not permitted to disclose locations. There are standard operating procedures and protections in place however, for new discoveries that would protect caves, should they be discovered, during project implementation (Forest Plan p. 4.62). Potential bat use sites, including lava tubes in the vicinity of Elk Flat, were inspected in summer 2014 and no evidence of bat use was observed (Prelim. BE, p. 17).

The FCRPA also prohibits Federal Agency's from sharing information under the Freedom of Information Act (FOIA) concerning specific locations of significant caves in order to ensure protection of the resource (see 16 U.S.C. § 4304(a) for more information). In addition, this project is not proposing any modifications to caves. Effects to Forest Service sensitive bat species from the proposed actions are discussed in detail in the Preliminary BE beginning on p. 75. This includes the fringed myotis, pallid bat, and Townsend's big-eared bat. An effect determination of "May affect individuals, but is not likely to trend towards federal listing or loss of viability" was reached for all action alternatives for each sensitive bat species considered (Prelim. BE, pp. 88-89).

Concern# 30- General Wildlife Concerns
3-33 - We find the benefit to goshawks, spotted owls, marten, fisher, flammulated owl, screech owl, Cooper hawks, pileated woodpecker, and TES species is incomplete. These were recorded in previous NEPA input. Since the 1990s, these species continue to decline and NEPA and biology has thus been inadequate. We see no mention of marten or other owls, pileated woodpecker, etc. occurring in previous input.
3-1 - The intent of this DEIS is not adequately described besides the intent of timbering. What is the benefit to goshawks, spotted owls, marten, fisher, flammulated owl, screech owl, Cooper hawks, pileated woodpecker, and TES species? These were recorded in previous NEPA input. Since the 1990s, these species continue to decline and your NEPA and biology has thus been inadequate. I see no mention of marten or other owls, etc.

97. Response
The Management Direction and Purpose and Need sections of the Environmental Impact Statement fully describe the project’s purpose or intent (DEIS, pp. 1-38 and Final EIS). The purpose of the project is to protect and enhance the Elk Flat LSR, as well as restore the meadow at Elk Flat and other riparian areas in Ash and Swamp Creek. This includes protecting and enhancing suitable, dispersal and critical habitat
for the listed northern spotted owl and Forest Service sensitive species associated with late-successional habitat, and known to use or occur in the project area, including the northern goshawk, fisher and Pacific marten.

The Forest Service is directed to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” per the National Forest Management Act (NFMA). The maintenance and/or improvement of wildlife habitats and their diversity is addressed in Forest Service Standards and Guidelines, and provisions included in prescriptions VI (Wildlife Habitat Management) and VII (Late-Successional Reserves and Threatened, Endangered, and Selected Sensitive Species) were developed specifically for wildlife (Forest Plan p. 2.1, Forest plan ROD p. 22).

The wildlife section in Chapter 3 of the DEIS describes TES species that are known to occupy or occur in the project area, or have critical habitat in the project area, including the federally listed NSO (suitable and critical habitat present) and Forest-sensitive species (northern goshawk, fisher, and Pacific marten; DEIS, pp. 168-186). A complete account of the direct, indirect and cumulative effects to federally listed species, including the northern spotted owl and gray wolf, is in the project's Biological Assessment (Draft and Final BA). Effects to forest-sensitive species, including northern goshawk, Pacific marten, fisher, three bat species, the Shasta Hesperian snail, and the western bumble bee are assessed in the project's preliminary Biological Evaluation (Prelim. and Final BE). The NFMA (Forest Plan) compliance section of the DEIS (Appendix H) addresses management indicator assemblages and their representative species, migratory birds and survey and manage species. The management indicator assemblage and migratory bird analyses address effects relative to habitats that are important to flammulated owl, western screech owl, Cooper’s hawk, and the pileated woodpecker.

While the Cooper's hawk, western screech owl and pileated woodpecker are not federally listed, or designated as Forest Service sensitive species on the SMMU, the effects analysis for similar species (northern goshawk is an accipiter, like the Cooper’s hawk; and western screech owl is similar to the flammulated owl) can be applied to these species. The analysis found that there may be short-term effects (disturbance to individuals, habitat), but long-term benefits in terms of increasing habitat resilience and habitat development.

Effects to flammulated owls, white-headed and black-backed woodpecker and several other bird species of conservation concern in the Great Basin Bird Conservation Region (BCR-9) are addressed in the project-level migratory and cavity-nesting bird reports (project record; see also the DEIS at pp. H-9 to H-10). Reports that are part of the project record are available to the public upon request. Effects determinations and discussion for other species are addressed in the project-level Management Indicator Assemblage Report and Survey and Manage Report (project record; see also the DEIS at pp. H-22 to H-25).

Several treatment design features, resource protection measures and limited operating periods during critical breeding periods were developed for the project. These are intended to enhance unique habitats, trees, shrubs, and riparian areas, as well as protect listed and sensitive wildlife species and migratory birds during their critical breeding periods (see DEIS at pp. 81-90 and Chapter 2 Resource Protection Measures in the DEIS and FEIS).

The analysis that the Forest is required to complete under the National Forest Management Act, as well as the Endangered Species Act and NWFP Survey and Manage program is complete.

Concern# 183 - General Comment, new Alternative

8-6 - The Island road as we call it is a very active wildlife area. Ash Creek and the dead trees are there along with the bigger trees. I cannot name all the wildlife there but one of our most favorite is the wild turkeys that show up in the spring. The mushroom season starts about the time as the turkeys roost in the pines. The children love to see and hear the turkeys. I have identified some of the area but we could use a little bit more for this reason alone. Even the turkeys don't like being out in the open. I would hope whoever from the US
FS checks on the birds and other small animals takes the time to look and listen and see how many of them flourish in the area.

98. Response

See also the responses 2 to 6 (pp. I-16 to I-20) on the meadow at Elk Flat and mushroom collection. The point counts and other survey and field work conducted for this project has detected/observed turkeys in many portions of the project area. This includes the meadow area referenced by the commenter, as well as the younger plantation areas. Thank you for the comment and interest in the project.

Concern# 63 - Goshawk and Landbird Protections

4-38 - Please develop and implement seasonal operational restrictions to avoid project impacts while land birds are nesting in the project area. It appears that the limited operating periods for burning in Elk Flat Meadow and for logging in the Ash Creek riparian reserve contemplated on page 90 of the DEIS are discretionary. Hence the public and the decision maker cannot know if they will in fact be implemented. The "resource protection measures" relied upon at B-40 of the DEIS are not binding and may not occur during project implementation.

3-5 - We recorded about 18 goshawk nests, one spotted own nest, and one pileated woodpecker nest in the project area. What protections will they be given and will the area meet USFWS habitat requirements when finished with logging?

4-27 - No silvicultural activities should be undertaken in current or recently active goshawk nesting territories. Page 102. It is unclear if this recommendation was carried forward in the DEIS.

13-137 - 200 acre buffers around nests has not been applied in the Elk LSR project.

99. Response

See Response 100 and 151 (to Concern 9 and Concern 68) regarding the known goshawk nests, territories and nest protections for the project area; Response 97 (to Concern 30) regarding the pileated woodpecker; and Response 107 (Concern 6) regarding the MOU between the FS and the FWS on migratory birds.

According to Forest records, there is one known NGO nest in the project area, effects to which have been analyzed in the preliminary Biological Evaluation (DEIS p. 107; Prelim. BE pp. 6, 26-54). This nest has a 200-acre territory buffer, and 289 acres (inclusive of the territory, past nest sites, and areas of observed use) will have no mechanical treatment, new temporary roads, or new landings (Prelim. BE, pp 27, 29). There is one known NSO nest in the project area, which was analyzed in the Draft and Final Biological Assessment (DEIS pp. 169-171, 175; Draft BA pp. 67-68, 93-102; Final BA). Based on survey and stand search data, the ST-215 NSO activity center or AC has not been occupied by a verified territorial or reproductive NSO pair since 1990, or a verified resident single NSO since 2003 (Draft BA p. 46; Final BA). The USFWS does not establish habitat requirements/acreages for any species they administer. Rather, they provide recommendations and guidance for private land owners and federal land management agencies.

The 2009 ‘Regulatory and scientific basis for USFWS guidelines for evaluation of take for northern spotted owls on private timberlands in California’s Northern Interior Region’ does describe habitat levels at which NSO productivity and survivorship may be reduced (when the combined amount of suitable NRF habitat in a core falls below 400 acres; USDI-FWS 2009; Final BA p. D21 ). The Draft and Final BA discuss existing conditions in the ST-215 home range and core, including conditions on private lands (see tables 33-39 and discussion in the Final BA Appendix D (pp. D20 to D24). As described in the Final BA “With respect to the levels of suitable habitat that better support survivorship and productivity, the ST-215 home range is below the recommended levels of habitat at both spatial scales (37% suitable in the total home range; 69% in the core but with N/R habitat at half the recommended amount in the core). The larger proportion of suitable habitat on NFS lands at both core and home range scales, and the management direction for the Elk Flat LSR (contrasted with the past and ongoing private lands management) affords an opportunity to affect structural and compositional changes in habitat to increase its resilience and long term suitability” (Final BA p. D22). Page 73 of the Final BA also describes that “Barring any additional largescale disturbance event(s), it is expected that the [ST-215] core would contain about 405 acres of suitable habitat on NFS lands 20 years after the initial thinning treatments are
implemented." Combined with the existing suitable habitat on private lands in the core (29 ac and assuming it remains suitable), there would be about 434 acres suitable habitat in the core over the long term. For the home range, the Final BA (p. 76) describes that “While there would be an immediate reduction in foraging habitat and dispersal habitat availability on three percent of these available habitats in the home range (in the short term due to downgrading 46 acres of foraging and 9 acres of dispersal), over the long term, the treatments result in higher levels of suitable and dispersal habitat due to larger, more resilient trees and increased heterogeneity within and between stands. There would be about 200 acres of N/R habitat in the home range within 15-20 years. About 286 acres of the total thinned, older plantations in the home range would be functioning as lower quality foraging (6 as dispersal), resulting in about 889 acres of foraging habitat in the home range, and 1,089 acres of suitable habitat on NFS lands in the home range (1,539 total suitable acres or 45% of the home range, assuming private land operations do not remove or downgrade foraging habitat in western or northern extents of the home range and barring any short term stochastic natural events that remove or downgrade habitat).” Given the current home range and core conditions, NSO occupancy data and approximately 59% of the home range currently in private ownership managed for industrial timber production, the importance of enhancing and protecting NSO habitat on NFS lands is increased, and treatments were developed using recommendations from Recovery Action 10 (DEIS p. 177; Final BA pp. 69-72). The EIS and Final (and Draft) BA also describe the more likely function of the Elk Flat LSR and ST-215 ‘home range and core’ as important for dispersing juveniles, subadults of non-territorial NSOs (DEIS p. H-21; Final BA pp. 71-72, 84).

The resource protection measures for all wildlife species and habitat within the project area are listed and described in Chapter 2 of the DEIS, including protection measures for riparian-obligate migratory bird species (DEIS pp. 87-90). Limited operating periods for all species are not discretionary, and those for riparian-obligate species will be implemented if the LOPs for other species are not already preventing burning during the primary nesting season (DEIS p. 90).

The project's design, RPMs and LOPs are in accordance with management direction in the Forest Plan, the 2008 MOU for Migratory Birds and the recommendations from the FWS regarding treatment prioritization for NSO cores and home ranges described under Recovery Action 10.

Concern# 9 - Goshawk Effects Analysis

4-31 - The DEIS fails to fully address the impacts of the proposed logging and road construction on Goshawks. A peer-reviewed survey of Goshawk habitat use suggests that current management of the bird's habitat may be inadequate to provide for its persistence in viable populations. Greenwald et al, A review of northern goshawk habitat selection in the home range and implications for forest management in the western United States. Wildlife Society Bulletin 2005, 33(1): 120-129.

4-18 - Goshawks populations are in a similar situation to the spotted owls, limited by lack of habitat and harassed by human activity. Page 62. The project will log Goshawk habitat and downgrade 98 acres of suitable habitat.

4-23 - Continue nesting and occupancy surveys for goshawks. Coordinate monitoring with Klamath NF. Page 87. No quantitative wildlife data is presented in the DEIS.

13-136 - Northern goshawk 893 acres degraded; 98 acres downgraded; another 608 acres thinned; may affect determination. FS claims it is "improving" 1,921 acres over 20 years.

13-37 - The following is from the MFEA: Goshawk populations are in a similar situation to the spotted owls, limited by lack of habitat and harassed by human activity. ... The focus area may support up to eight nesting pairs under ideal conditions. The basic FOREST PLAN direction for goshawks is to provide for goshawk viability through LSRs, MLSRs, riparian reserves and withdrawn lands. However, the monitoring plan (FOREST PLAN 5-17) provides that further evaluation and/or corrective action would be required if monitoring shows a significant decline in occupancy or reproduction, or failure to designate goshawk territories prior to implementing major habitat modification projects. Another reference, on page 4-66 (FOREST PLAN), says to provide additional habitat for goshawks in prescription 6. The FEIS for the FOREST PLAN states that "all alternatives will consider goshawks during development of watershed analysis (landscape analysis). The Elk LSR project does not follow this direction for goshawk.

100. Response
The analysis of the predicted effects to northern goshawk (NGO) and its habitat, as well as survey history, is summarized in the DEIS (pp. 168-177, 179-186), and fully described in the preliminary Biological Evaluation (Prelim. BE pp. 26-54). Direct, indirect and cumulative effects to NGO and its habitat are analyzed for all alternatives considered in detail, including no action. The analysis includes effects from prescribed fire, mechanical thinning and fuels treatments, and connected actions such as landings, temporary roads, and transportation management activities (Prelim. BE pp. 26-54).

The one NGO territory in the project area, ST-205, has been active since 1985 as verified through annual surveys of the territory (Prelim. BE pp. 6, 27). Surveys have been conducted as per Forest Plan guidance (Forest Plan p. 5.17), using the survey protocol in Northern Goshawk Inventory and Monitoring Technical Guide (Woodbridge and Hargis 2006). This nest and its territory will be protected through project design features and LOPs (Prelim. BE p. 26). This is in accordance with the Forest Plan management direction for NGOs (Forest Plan pp. 3.27, 4.30, 4.44).

While 98 acres of NGO foraging habitat will be downgraded through project actions (Prelim. BE pp. 30, 41), no mechanical treatment will occur in the ST-205 territory area (~289 acres), and limited operating periods are in place to provide further protections to active territories and riparian reserves (pp. 26-27; Table 17). Additionally, 608 acres of capable habitat will be improved by thinning in plantations (DEIS p. 174; Prelim. BE pp. 33, 41). Habitat improvements on approximately 1,997 acres of NGO habitat in the Elk Flat LSR will be realized over the short and long term through reduction of overstocking and resistance to high-severity wildfire (Prelim. BE pp. 33, 41 – note that this figure was reported as 1,921 acres in the DEIS p. 175 and other places, and has been corrected in the FEIS). This represents both protection and improvement of NGO habitat over the 20-year timeframe in ~65 percent of the LSR (Prelim. BE p. 46). No part of the project area is designated as management prescription VI (wildlife habitat management; DEIS p. 4).

The Greenwald et al. 2005 study referenced in the comment was reviewed in 2012 for another project where NGO habitat would be affected, and was re-reviewed for the Elk LSR project. The studies presented in it were found to be generally consistent with other literature cited in the Elk LSR Project BE for NGO nesting and foraging habitat conditions in northern California (Prelim BE pp. 27-54). There are “wide differences among geographic regions and scientific studies in understanding its habitat requirements” (USDI-FWS 1998). Greenwald et al. 2005 does not mention or analyze NGO viability and the quote from the paper’s abstract is that the “habitat selection patterns suggest current goshawk management plans in the western United States may be inadequate.” While the Forest is not purporting to utilize the Management Recommendations set forth by Reynolds et al. 1992 (discussed in the Greenwald et al. 2005 paper) for the Elk LSR project, the Forest has incorporated portions of Reynolds’ research into describing suitable habitat for NGO (Prelim. BE pp. 27, 31). The conclusions in Greenwald et al. 2005 also derive from a misunderstanding of desired habitat conditions described in Reynolds’ ‘Management Recommendations for the Northern Goshawk’, a poor understanding of the ecological factors limiting goshawk populations, a failure to understand goshawk forest habitat as a dynamic ecosystem, incomplete reviews of the referenced literature, and inclusion of studies with limited samples of goshawks (Reynolds et al. 1992). The Greenwald et al. 2005 paper also only reviewed two studies completed in California (Hargis et al. 1994; Austin 1993). These results did show that NGO selected [ponderosa pine] stands with >52 cm (19” DBH) trees and higher canopy closures (34 to >40%). In northern California, nests are generally constructed in the largest trees of dense, mature stands with high canopy closure (60-88%) and an open understory (Hargis et al. 1994). Based on sampling throughout northern California, nest trees averaged 24-30 inches (CDFG 2008) and on this Forest, Saunders (1982) found mean diameter of nest trees to be 29 inches (Final BE Appendix C).

The Elk LSR project does not propose to increase prey abundance with treatments at the expense of reducing NGO habitat and structure, however that may be an indirect effect in areas that are not currently providing high quality NGO foraging habitat where canopy cover is more reduced, allowing for early seral vegetation increases (Prelim BE p. 41). The project includes design features to: 1) not mechanically treat within the ST-205 nest stand and territory; 2) retain all predominant trees, all dominant trees with
late-successional characteristics, and all healthy dominant trees (with exception of radial thinning around oak and legacy pine on 27 acres and 71 acres of NGO habitat (Prelim. BE p. 31) and meadow enhancement that does not provide NGO habitat). These design features would maintain existing nest-site suitability and trees for NGO, contribute to prey species and foraging habitat, and provide for future large diameter snags and down wood (Prelim. BE pp. 26-57). After implementation, the resiliency and functionality of NGO habitat (and that of the other late-successional associated species addressed in the BE and BA) would be maintained and improved on the most acres while reducing the risk of further late-successional habitat loss from drought, disease, insects or wildfire effects (Prelim. BE p. 41; DEIS p. 109).

Concern# 52 - Gray Wolf, Limited Operating Period

13-123 - The project states there are no known den or rendezvous sites within project area at this time. The action area for this species is 5 miles. Wolves easily range 30 miles in a day so this action area is arbitrary. Regarding LOPs, how was the one mile determined for "rendezvous" sites? Wolves can travel over 30 miles per day easily and the Shasta Pack likely use the Elk project area.

13-124 - Under monitoring the DEIS refers to "rendezvous habitats." Please define this term in the FEIS.

101. Response

The term "rendezvous site" is defined in the project's Draft Biological Assessment (Draft BA, p. 55). Justification and information regarding the selection of the gray wolf action area size and necessary buffers for noise disturbance are also presented in the Draft BA (Draft BA, pp. 19, 32, 47, 120, 126). In short, the 5-mile buffer on proposed activities was selected as it encompasses the average territory size, includes managed private timberlands that may influence wolf source habitat and use in and outside the project area, and it represents a reasonable distance that wolves should be able to hear and potentially respond to a disturbance or other activity given the range of hearing from 6 miles in forested conditions to 10 miles in open (Draft BA, p. 19). Accepted distances and time periods for LOPs were discussed with USFWS (DEIS, Appendix E, p. E26). A definition of "rendezvous habitats" has been added to the glossary in the FEIS.

Concern# 53 - Habitat Impacts, Late-Successional

4-6 - Please note that page 20 of the Elk LSR DEIS acknowledges that: Many of the natural stands in the Elk Flat LSR contain elements of late-successional habitat and provide stand structural conditions suitable as either reproductive or foraging habitat for northern spotted owl, northern goshawk or fisher habitat. Yet the proposed LSR logging units are located primarily within these native forest stands that currently contain the habitat elements that the land use allocation is intended to provide. Further, the proposed logging will remove many of these desired habitat elements through activities that will degrade and downgrade habitat for late successional associated wildlife. This runs afoul of the intent of the NW Forest Plan concerning LSR management.

102. Response

The Forest has completed a full analysis of potential and predicted impacts to late-successional wildlife habitat elements. The primary purpose of the project, and the intent of the variable density thinning prescriptions and other subtreatments, is to reduce the risk of losing habitat for late-successional dependent species, and also existing late-successional habitat elements, such as predominant legacy trees. The project aims to improve habitat for these species, increase conifer species diversity in plantations and natural stands, reduce the spread of blackstain and Heterobasidion root disease, and reduce the risk for future extensive mortality areas and habitat loss (DEIS, pp. 47, 138, and 139). While mortality patches and large pockets can and do provide diverse habitats for cavity-nesting bird species (flammulated owl, woodpeckers, mountain and western bluebird, nuthatch), substantial prey base, and connectivity habitat for fisher and marten through large down logs, having extensive mortality areas across extensive portions of the LSR conflicts with the overall management direction for LSRs; which is to "protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late-successional and old-growth related species, including the northern spotted owl" (USDA-FS and USDI-BLM 1994; Forest Plan pp. 4.37 to 4.43; USDA-FS 1999 p. 1). Protection of LSRs includes reducing the risk of large-scale
disturbance, including stand-replacing fire, insect and disease epidemics, and major human-caused impacts (USDA-FS 1999 p. 1). Both protection and enhancement can include application of silviculture and other treatments designed to reduce the risk of loss and/or accelerate development of late-successional stand characteristics (Forest Plan 1995 pp. 4.37 to 4.39; LSRA 1999 pp. 174-203). The project's Draft Biological Assessment and Biological Evaluation address effects to late-successional-associated species and their habitat, as well as cavity nesting species (see also the project-level cavity nesting bird report). For northern spotted owl, approximately 98 acres of suitable habitat would be downgraded through radial thinning around legacy pine and releasing black oak to increase den sites and prey base for fisher and habitat diversity for owls (Draft BA, p. 116). Habitat that is degraded provides the same level of habitat function as it did pre-treatment (Draft BA, p. 71), though with a reduced quality level over the short term due to reductions in canopy, layering, snags, down wood. However, over both the short and long term, thinning treatments benefit habitat in terms of increasing tree growth and vigor and resilience. Additionally, no nesting, roosting, or high-quality foraging habitat will be mechanically treated under the proposed action (Prelim. BA, p. 25). Effects to Forest sensitive species—including goshawk, fisher, and marten—are addressed in the preliminary biological evaluation and (Prelim. BE, pp. 26-75). Effects determinations for these species are May affect individuals, but is not likely to result in a trend towards federal listing or loss of viability (Prelim. BE, p. 88). No mechanical treatments will be performed within the ST-205 territory or other high-quality habitats that may be used as reproductive sites (Prelim. BE, p. 27). The project is in compliance with the Forest Plan and Northwest Forest Plan (Prelim. BA, pp. 4-5).

Concern# 78 - Habitat, Underburning Effects

13-122 - Underburning. This prescription will require entries over the next 30 years. The DEIS fails to analyze for this cumulative impact to habitat despite the DEIS acknowledging that further habitat may be lost to the fire.

103. Response

The comment states that the DEIS acknowledges that ‘further habitat may be lost to the fire’; however the project is not expected to result in habitat losses from prescribed fire and the record does not support the comment. The DEIS summarizes the likely losses and reductions of habitat elements, and short and long term benefits to habitat, from prescribed fire treatment, but not that further habitat loss would occur (i.e. effects over each burn entry are expected to be similar to those described for the first entry). The DEIS, and ‘no action’ fuels and fire behavior modeling does describe the potential for further habitat loss under Alternative 4 if a wildfire were to occur under 97th percentile weather conditions (McRae 2015). These effects are also described in detail in the wildlife resource reports.

The ‘Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act’ (40 CFR 1500-1508) §1502.16 state, “The discussion will include the environmental impacts of the alternatives, including the proposed action…” The DEIS (p. 52) states, “2 to 3 incremental underburns, repeated every 5 to 10 years would be implemented” (to achieve the objective of returning the natural role of fire to the ecosystem). The entire project area would not be burned in any given year, but the entire project area will be burned up to 3 times with burn entries 5 to 10 years apart for any given burn block. Also, if a wildfire occurs in the project area and conditions are appropriate, it may be managed to meet the prescribed burn objectives described in Chapter 2 of the DEIS (also Tables 8 and 9 of the BA; Tables 18 and 19 of the BE).

The temporal bounding for direct, indirect and cumulative effects, and the estimated 30-year timeframe when project actions would be occurring in connection with other ongoing or future actions, are described in Chapter 3 of the EIS (DEIS at pp. 163-164) and in the BA (Draft BA p. 21; Final BA p. 20). This temporal bounding includes timeframes for cumulative effects under both the ESA and NEPA. It is important to understand that the effects of actions do not last 30 years into the future, but incremental effects will happen for the shorter direct and indirect timeframes from prescribed fire treatments within the 30-year timeframe.
Resource protection measures and underburning objectives for maintaining trees, shrubs, down wood, snags, and grasses/forbs are described in EIS Chapter 2. These measures and objectives are more fully described in Tables 6, 7, 8 and 9 of the Biological Assessment, and in Tables 17-19 of the Biological Evaluation in terms of the species and habitat protections. They will be followed/met under each burn entry, and if changed circumstances arise, additional NEPA, or ESA, review may be required (Draft BA p. 87). Limited operating periods are also required for habitat altering, and smoke- and noise-generating activities (DEIS p. 87; Draft BA p. 69 and Table 6; Prelim. BE Table 17) during critical breeding periods. Resource protection measures also limit the time and duration of burning in any one season in potential critical breeding habitats (DEIS pp. 88-90; Draft BA p. 70).

The EIS Chapter 3 wildlife section summarizes the predicted effects of the vegetation management (and other) activities on habitat, including underburning, for each action alternative considered in detail (DEIS pp. 171-174, 177-179 for Alternative 1; and pp. 182-184 for Alternatives 2 and 3). The effects of prescribed fire (burning only, and burning after thinning) are described in detail in the BA and BE for individual species and their habitats.

For example, the Draft BA (pp. 85-86) discusses underburning on NSO habitat, including multiple burn entries. It describes specifics of how underburning would be implemented, project design features, limited operating periods, and resource protection measures for minimizing disturbance to owls and their habitat, including prey (trees, down wood, shrubs). It describes that there could be potential cumulative adverse effects to prey and measures to minimize those effects.

The predicted direct effects to vegetation and prey, including tree loss/retention, snag creation/protection, shrub loss, down wood consumption/protection, impacts to truffles (flying squirrel forage base), and the beneficial effects from increased understory structural complexity and habitat heterogeneity are discussed, along with supporting literature (Draft BA pp. 86-89). These same effects are expected during the second and third burn entries, but note that machine piling/pile burning is not a pre-treatment during these subsequent entries. If monitoring indicates that modified protection measures are needed during underburning, either due to unintended effects or changed environmental circumstances, an analysis would be completed through a Chapter 18 NEPA review prior to additional entries (Draft BA p. 87).

As described in the BA (Draft at p. 84; Final at pp. 60-61), “Stephens and others (2012) discuss that prescribed fire and its mechanical surrogates are generally successful in meeting short-term fuel reduction objectives and creating more resilient stands to high-intensity wildfire. The purpose of the [Elk LSR project’s] mechanical fuels treatment and prescribed fire is to improve the project area’s resilience such that it can tolerate fire (either through reintroduction via prescribed burning, or management of a natural ignition). Creating a modified fuelbed that supports a fire type that creates or maintains stands similar to those which occurred on the historic landscape is part of the project’s purpose and need, and any fire in the project area could offer an opportunity to restore the historically frequent, low-intensity regime (Reinhardt et al. 2008). The NWFP standards and guidelines describe that thinning prescriptions and prescribed fire can work in concert to develop diverse stands with large trees and a variety of species in the overstory and understory by releasing advanced regeneration of conifer, hardwood or other plants and reducing the risk from [high-severity, uncharacteristic] fire, insects, diseases or drought conditions (NWFP p. B-6). They [S&Gs] stipulate that prescribed fire should be planned to minimize the consumption of litter and coarse woody debris (p. C-44). The Recovery Plan also notes that “prescribed fire may be a means to reintroduce fire as an ecosystem process, but will likely need to be implemented at scales much greater than what has been done in the past to be effective (Baker 1994, Taylor 2000)” (USDI-FWS 2011 p. III-37).”

The direct, indirect and cumulative effects of underburning, with the prescribed limited operating periods and resource protection measures that will remain applicable for future entries (unless changes occur and a Chapter 18 NEPA review is completed), have been analyzed in the respective resource reports for wildlife and are summarized in the EIS.
Concern# 112 - Large Tree/Snag Retention Long-Term

13-100 - The DEIS predicts that post thin trees per acre >24” DBH will be 16-19. 20 years late 24” TPA will be 17-22. Snag habitat will actually be worse in 20 years than it is pre project [DEIS Table 37]. This isn't improving habitat in the long term. How is this improving late successional habitat? Statistically there is no difference, yet this project will cause immediate harm to late successional species. We have personally witnessed the STNF claims of "improving habitat for NSO" in the Pilgrim sale that resulted in basically miles of clearcuts that late successional species can't use and likely won't for over 100 years. This project is adjacent to the Elk project.

104. Response

See also Response 74, page I-79 regarding snag recruitment, modeling and the modeling limitations in the project area; Response 150 (to Concern 111) regarding short and long term benefits for late-successional associated species and Response 61 to Concern 151 regarding LSRA direction and species diversity.

The project includes limited operating periods, design features and other protection measures that reduce if not eliminate the potential for harm to species or their habitats. See EIS Chapter 2 wildlife section; BA Tables 6-9 and BE Appendix C Tables 17-19.

The DEIS (p. 132) states, “Modeling projections show thinning would retain approximately 77 to 80 percent of trees over 24 inches DBH in seral stage 4b and 4c stands immediately after thinning. By year 20, trees over 24 inches DBH approximate 89 to 96 percent of current levels prior to treatment.” While it is clear that thinning will reduce the number of trees per acre over 24 inches DBH from current levels, it is important to consider the relevance of this metric in the context of current stand densities and the risk they pose for large-scale disturbance. The current widespread mortality of pine in the project area, including desirable overstory trees larger than 24 inches DBH, underscores this risk. While some trees larger than 24 inches DBH are removed by thinning in the modeling exercise (and would be removed with treatment), the average stand overstory diameter increases by approximately four inches immediately after thinning.

Thinning which results in an immediate increase of average overstory diameter indicates a thinning-from-below, where tree removal focuses on smaller size classes (DEIS p. 132) and increased growth of residual trees occurs due to reduced stocking and competition for site resources (water, light, nutrients). Alleviating moisture stress and reducing tree density in terms of trees per acre increases the long-term viability of trees that are left growing on the site; this is well documented in the DEIS, resource analysis reports (Payne 2015b, Snyder 2012) and relevant scientific literature referenced in the DEIS (Oliver 1995, Agee and Skinner 2005, Cochran 1998, Fettig et al. 2007, Kolb et al. 1998).

Table 11 of the Preliminary Silviculture Report (p. 18), displays that the majority of trees per acre being thinned are in the 24 inch DBH and smaller size classes. Table 12 (p. 19), shows the majority of the tree basal area being thinned across the project is also within the 24 inch DBH and smaller size classes. The summary and conclusions section (p. 34) includes a side-by-side comparison of action alternatives and no action. The tables compare pine limiting Stand Density Index, trees larger than 24 inches DBH, average tree DBH, and average snags greater than or equal to 20 inches in diameter.

The modeling comparisons between thinning and ‘no action’ do indicate that ‘no action’ would have 9 to 10 additional trees per acre larger than 24 inches DBH per acre at year 20 than the thinning option (DEIS Table 50). It is important to understand that the post-treatment results in DEIS Table 35 (and Table 36 for tree growth and trees per acre; Tables 50 and 51 for no action, and similar tables in the silviculture and wildlife reports) are models that reflect trends in the thinned stands, not absolute numbers. DEIS (p. 133) states, “the thinning modeling is limited in that it does not reflect the unique tree selection and current snag retention that are in the marking guidelines and likely underestimates snags [and small and large trees per acre in the thinned stands].” And in the BA, “The model also does not take into account the project design elements of unthinned patches, untreated RA32 areas, or retention of habitat roost/rest clumps” (Draft BA p. 72; Final BA pp. 47, 56-58). The modeling also does not reflect the extensive and
ongoing density-related mortality directly observed in the field, including within 24 inch DBH and larger trees (DEIS p. 132).

The modeling does reflect the trend that “where thinning occurs, there would be fewer, more resilient, larger and wider-spaced trees per acre and an overall increase in total diameter classes in the dominant, codominant and intermediate tree size classes from reduced density and reduced inter-tree competition” (Final BA p. 58). These trees and stand conditions would be more resilient, and would continue contributing toward meeting LSR objectives and habitat. See Response 61 to Concern 151.

The Pilgrim (Vegetation Management Project) project’s purpose and need did not include improving habitat for NSO. Rather, it included improving forest health, growth, and sustainability; reducing surface and ladder fuels; reducing the potential for catastrophic loss of overstory trees to maintain a source of woody debris recruitment for in-stream habitat features within Riparian Reserves; maintaining and enhancing aspen, oaks, and dry meadow/open pine savannah; and reducing road density. The NSO analysis for the Pilgrim project found, “…the project assessment area is low quality dispersal habitat at best,” and, “…the actual project contains no suitable nesting, roosting, or foraging habitat…” (Pilgrim FEIS p. 55). The Pilgrim analysis further found, “The proposed regeneration harvest prescriptions have almost no effect on owl habitat because disease and insects have killed many of the trees in these areas, rendering the stands essentially unsuitable,” (Pilgrim FEIS p. 58), and “[o]penings created by regeneration harvest areas are scattered across the landscape and should not be a barrier to owl dispersal,” (Pilgrim FEIS p. 60). The regeneration treatments under Pilgrim were also in ponderosa pine that was dying or diseased, and did not provide suitable or dispersal habitat (as currently defined; Draft BA pp. 50-51; Final BA p. D15).

Concern# 126 - LSR Consistency, Habitat Needs

105. Response

Thinning prescriptions for this project were developed to reduce the risk of losing habitat for late-successional species, improve NSO habitat, increase conifer species diversity in plantation areas and natural stands, treat black stain and Heterobasidion root disease, and reduce the risk of developing future extensive mortality areas (DEIS pp. 47, 138 and 139). Salvage activities for risk reduction will occur only in large pockets of standing dead or dying trees in specific units as listed in the DEIS in (Table A-2; DEIS, pp. A6-A21). The FEIS clarifies the intent and scope of these risk reduction activities (FEIS p. 53).

The DEIS describes that there are no specific objectives for NSOs listed in the LSRA for the Elk Flat LSR, but based on habitat conditions in the ST-215 home range, and ownership, this is the likely role it would play: "Though not stated in the LSRA, the Elk Flat LSR is expected to only provide for one pair of northern spotted owls in the future, or more likely, to provide an important area for dispersing young northern spotted owls to reside in temporarily. This is largely driven by the fact that 60 percent of the home range is situated in private land ownership managed for timber production and the overall ponderosa-pine dominated stands in the LSR" (DEIS p. H-21).

The Draft and Final BA provide an assessment of NSO habitat affected by the project at various special scales. Within the LSR, approximately 98 acres of suitable NSO habitat will be downgraded and no
suitable NSO habitat will be removed (Draft BA, p. 161). The capability of the project area to serve as habitat for dispersing subadults will not be affected by the proposed action (Draft BA p. 51). Effects to Forest sensitive species-including northern goshawk, fisher, and Pacific marten-are addressed in the preliminary biological evaluation (Prelim. BE, pp. 26-75). Effects determinations for these species are May affect individuals, but is not likely to result in a trend towards federal listing or loss of viability (Prelim. BE, pp. 88-90).

Concern# 64 - Migratory Birds

4-36 - The cumulative effects analysis on migratory birds should not rely exclusively on Wilderness, Riparian Reserves and LSRs to provide for species viability into the future, because many Forest Service and BLM Districts are actively logging those land use allocations, regardless of the effects on migratory birds, despite their reserve status. We refer you to this very timber sale as one of many examples.

106. Response

See also Response 107. The cumulative effects analysis for migratory birds does not rely exclusively on Wilderness, Riparian Reserves and LSRs to provide for species viability. However, these land allocations are expected to contribute to viable populations over time, including through habitat protection and enhancement (Forest Plan p. 3-27).

The Forest Service Landbird Conservation Strategic Plan, Executive Order 13186, Partners in Flight Conservation Plans for birds and North American Landbird Conservation Plan, all reference goals and objectives for integrating bird conservation into forest management and planning. A Memorandum of Understanding (MOU) was signed between the USDA Forest Service and the USDI Fish and Wildlife Service in 2008 and was updated in early 2016. The MOU strengthens migratory bird conservation through enhanced collaboration and cooperation between the two agencies as well as other federal, state, tribal and local governments. (DEIS p. H-9, Migratory Bird Report p. 1). In early 2016, both agencies have agreed to extend the MOU as currently written. On National Forest System lands, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management (DEIS p. H-9). The MOU focuses on bird populations and on habitat restoration. It recognizes that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds (Migratory Bird Report p. 1).

Under the National Forest Management Act, the Forest Service is directed to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” The maintenance or improvement of wildlife habitats and their diversity is addressed in Forest Plan Standards and Guidelines. These Standards and Guidelines include retaining vegetative seral stages over time as well as providing for special habitat components of diversity. Also, prescriptions VI (Wildlife Habitat Management) and VII (Late-Successional Reserves and Threatened, Endangered, and Selected Sensitive Species) were developed specifically for wildlife (Forest Plan p. 2-1; Forest Plan ROD p. 22). The Forest Service has complied with this direction and the provisions in the MOU.

As described in the project-level Migratory Bird Report, opportunities to promote conservation of migratory birds and their habitats during project planning and implementation were considered (per the MOU). A suite of project design features and resource protection measures is incorporated into the project as described in the EIS (EIS Chapter 2; EIS Appendix A) and in the Migratory Bird Report (Appendix A). The project’s design, specific treatment prescriptions and resource protection measures will help ensure treated areas continue to provide necessary habitat to maintain a diversity of species at both the stand and landscape scale during and after the project is completed, and that the potential for adverse effects to individuals and project-level populations is reduced if not eliminated (DEIS p. H-10, Migratory Bird Report pp. 5, 7).
The Shasta-Trinity National Forest bird species of management concern are those listed under the Endangered Species Act as threatened or endangered, those designated by the Regional Forester as sensitive, those associated with management indicator assemblages (MIAs), survey and manage species, species of special management concern under the NWFP, and species of conservation concern (USDI-FWS 2008). The NEPA cumulative effects analyses for the project (including past, present, and reasonably foreseeable future projects) for northern spotted owl and northern goshawk is summarized in the DEIS (pp. 180-186). The Draft (and Final) BA address cumulative effects under the ESA to listed species. The NEPA cumulative effects analysis, including bounding and rationale, for Forest Service sensitive bird species (northern goshawk) is contained in the Preliminary Biological Evaluation (Prelim BE. pp. 41-47, 49-50). For Forest Service management indicator assemblages, and representative bird species, the analysis shows there would not be cumulative effects as no assemblage would be converted to another assemblage (DEIS p. H-24; project-level Management Indicator Assemblage Report, pp. 25, 32, and 40). Effects to the four bird species of conservation concern under the NWFP (white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl), and migratory species in the Great Basin Bird Conservation Region (BCR9) are discussed in the project-level Migratory Bird report.

The project has not relied solely on Congressional designations and Forest Plan land allocations to provide for species viability of migratory birds, or other species of concern.

Concern# 6 - Migratory Birds, Effects

4-35 - The regional decline of migratory birds is a significant issue for this project. Numerous studies have reported local and regional trends in breeding and migratory bird populations throughout North America (e.g., DeGraaf and Rappole 1995, Sauer et al. 2004). These studies suggest geographically widespread population declines that have provoked conservation concern for birds, particularly neotropical migrants (Askins 1993, Terborgh 1989.) The DEIS for this project fails to fully analyze and disclose the potential impacts of conifer thinning operations and brush removal on neotropical bird population trends.

4-37 - Simply concluding that the scale of the project is small, relative to the size of the nation, hence migratory bird populations will not be affected does not suffice. As you know, the Spotted Owl was driven into threatened status by lots of "little clearcuts" that individually were insignificant, but cumulatively resulted in extensive habitat loss.

107. Response

As described in the DEIS (p. H-9), migratory bird conservation is guided by the Memorandum of Understanding between the Forest Service and Fish and Wildlife Service to Promote the Conservation of Migratory Birds (MOU) in response to Executive Order 13186. Consistency with the MOU is included in the DEIS Appendix H (pp. H-9 to 10). The project is in compliance with requirements set forth in the Memorandum of Understanding.

Discussion of the presence or absence of migratory birds or their habitat is provided in the project-level migratory bird report (Jordan 2015f). Four species of birds of special management concern under the NWFP (white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl), and other bird species of conservation concern in the Great Basin Bird Conservation Region (BCR9) are also considered in the report.

Opportunities to promote conservation of migratory birds and their habitats during project implementation were considered during project development, per the 2008 MOU; specifically Section C: item 1, and Section D: items 3a-3d, and item 6. Item C1 states that: Both parties (FS and FWS) shall "Protect, restore, and conserve habitat of migratory birds, addressing the responsibilities in Executive Order 13186" (p. 4). Section D is specific to the Forest Service's responsibilities. It includes Evaluating and balancing long-term benefits of projects against any short- or long-term adverse effects when analyzing, disclosing, and mitigating the effects of actions; Pursuing opportunities to restore or enhance composition, structure, and juxtaposition of migratory bird habitats in the project area; altering the season of activities to minimize disturbances during the breeding season; retaining snags for nesting structures...
where snags are underrepresented; and retaining the integrity of breeding sites, especially those with long
histories of use (pp. 6-7).

The project-level migratory bird report discloses that the need to maintain, enhance and restore habitat
components important to migratory birds and reduce the potential for take and adverse effects from
project actions was emphasized throughout project development, in accordance with MOU Section D,
item 3b and items 3c1 through 3c4. The Forest Service also assessed the potential for environmental
contaminants and other stressors relevant to migratory bird conservation in accordance with MOU
Section D, item 3c5 (Jordan 2015f, p. 3).

The project's design, specific treatment prescriptions and resource protection measures are expected to
help ensure treated areas continue to provide necessary habitat to maintain a diversity of species, at both
the stand and landscape scale, during and after the project is completed. The potential for adverse effects
to individuals and project-level populations is also reduced if not eliminated by the project's design and
resource protection measures (Jordan 2015f, pp. 2-3). These measures will help retain and promote snag
habitat, shrubs, small trees, large trees, black oak, aspen, meadow, and riparian habitats. Noise, smoke,
and nesting habitat disturbance would also be minimized through use of LOPs specific to riparian-obligate
riparian bird species (DEIS p. 90, RPM 43). Other LOPs in place for the project (DEIS p. 37,
RPMs 31 and 34; p. 88, RPM 39) would also avoid or minimize the potential for adverse impacts on
migratory birds.

The analysis follows the guidance set forth in the 2008 MOU. The design and measures would reduce or
eliminate the potential for noise, smoke and nesting habitat disturbance during critical breeding periods,
would maintain and improve habitat function over the long term and would reduce the potential for
adverse effects to individuals (Jordan 2015f, pp. 5-6).

The Forest was unable to find the research cited in the comments, including DeGraaf and Rappole 1995,
Askins 1993, and Terborgh (1989). The Forest was also unable to confirm Sauer et al. 2004 (there are
multiple documents by Sauer et al. in 2004, none of which are specific to the project area region).

Concern# 41- NSO, Activity Center Protection, RA 25

13-113 - The FS only analyzed two activity centers despite the fact there are many more historic sites
overlapping the project area or near the project area that should have been analyzed per the RRP. We are
providing a map documenting these ACs.

13-40 - Has a 100 acre core area been designated around each activity center located in matrix lands? The
answer is no.

13-97 - Recovery Action 25: Ensure that protocols adequately detect spotted owls in areas with barred owls.

The presence of barred owls has been shown to decrease the detectability of spotted owls. Consequently,
the Barred Owl Work Group enlisted scientific support and analysis from many individual spotted owl
researchers from the Federal, State and private sectors across the range of the spotted owl. Additional
analysis of data from demographic study areas focused on addressing the questions of: 1) what are the per
visit detection rates of spotted owls with and without barred owls, and 2) what are the site occupancy rates
of spotted owls at historical spotted owl sites? These efforts have led to several white papers and pending
publications. A draft revised spotted owl survey protocol was released for use and comment during the 2010
field season along with direction on how to transition from the 1992 protocol. Field testing of, and
commenting on, several provisions of the draft protocol will occur during the next several field seasons
leading to finalization of a survey protocol.

CC Comment: As mentioned previously the 2012 survey protocol was established to identify both barred
owls and NSO. The STNF rarely utilizes this protocol despite it being the best available scientific
information. The STNF favors considering an area occupied when it fails to conduct surveys but this
approach doesn't work. Because barred owls have forced NSO out of their established territories, NSO are
using habitat they otherwise would not, including habitat that would not be considered suitable using
outdated definitions of suitable habitat. We have personally seen this on the Mendocino NF. The only way to
know for certain if NSO are in an area is to implement a consistent annual survey protocol at the appropriate
time of year (February thru September). The FS has done a few protocol surveys for the Elk LSR project.
But it skipped many years of surveys and prior to that used the 1992 protocol. As mentioned under RA 10:
It is not uncommon for an occupied spotted owl site to be unoccupied in subsequent years, only to be re-
occupied by the same or different spotted owls two, three or even more years later (Dugger et al. 2009). While temporarily unoccupied, these sites provide conservation value to the species by providing habitat that can be used by spotted owls on nearby sites while also providing viable locations on which future pairs or territorial singles can establish territories. Where unique circumstances or questions arise (e.g., multiple activity centers, etc.), the Service is available to assist land managers with applying this recovery action. Because the FS hasn't found any owls the past few years it claims the Elk Flat territory is unoccupied but evidence exists that an owl or owls may be using the area. The DEIS concedes a feather found in the nest core in 2011. There were also nesting owls in 1990; a single female in 2003; a pair in 2004; the feather in 2011; and our sighting in 2013. Tonja Chi, NSO biologist found an owl in a day roost in Unit 152-1 of the Elk LSR project in August 2013. Monica Bond and I were with her and saw the owl. We are including documentation including a Google earth map of the location and a photograph of Tonja marking the tree the owl was roosting in. As you can see the owl was using the very best habitat available to it in the area. This area should be conserved and not logged. The cumulative sightings over time and recently are enough evidence to infer the activity center is being used. The STNF should take a cautionary approach in this project and consider the activity center as being used by NSO and plan accordingly. Regardless, the RRP requires unoccupied historical sites to be protected.

108. Response

The Record of Decision for the Northwest Forest Plan outlines the Standards and Guidelines for designating unmapped late successional reserves, or 100-acre LSRs, around known northern spotted owl activity centers on matrix lands (NWFP ROD, p. C-3). Activity center (AC) ST-215, which is discussed in the project biological assessment (BA) and DEIS, is located in the Elk Flat Late-Successional Reserve and therefore it is unnecessary to designate a 100-acre LSR around this AC because it does not occur within matrix.

The Forest reviewed the map provided with the comments, and Forest records and a review of the California Natural Diversity Database in 2015, and again in March 2016, indicate only one NSO AC in the project's action area (ST-215). This AC (and home range/core conditions) was addressed in the BA (Draft BA pp. 41-42 and Final BA). Several of the ACs that were listed on the commenter's map and in the CNDDB are either: 1) not valid ACs, or 2) are designated as abandoned by the FWS (CNDDB 2015, 2016). There are currently no other ACs on private lands, or on NFS lands on matrix in the action area that require the 100-acre LSR allocation.

The Forest agrees with Dugger et al. 2009 regarding re-occupancy after a gap in detection. The Final BA pages 42 to 44 cite to Diller et al. 2016. The ST-215 activity center has not been reoccupied since the barred owl pair was removed in October 2014, however NSOs may recolonize the activity center, or use portions of the project area during dispersal.

The Forest Service has conducted northern spotted owl surveys from 1989-2015 on the SMMU. In the action area assessed for the Elk LSR project, this includes all areas within 1.3 miles of the project area (refer to Map 5 in the Draft and Final BA for the 6-visit survey maps from 2012 through 2014). Spot check surveys were also completed in 2015 within 0.25 mile of suitable habitat in the project area. This is in accordance with the 2012 FWS survey protocol guidance for spot checks, and was an agreed-to survey approach for 2015 with the FWS (Draft BA p. 45; USDI-FWS 2012 pp. 18-20).

The survey history for the Elk project is detailed in the BA and included surveys under the 1992 protocol (3-visits) and 2012 protocol (6-visits; Draft BA pp. 45-47). Both protocols were approved by the FWS to survey for NSO to determine occupancy.

Recovery Action 25 is specific to the FWS and the January 2012 survey protocol is being implemented on the SMMU. As described in the Draft BA at Table 10, surveys were conducted from 2003-2005, 2007-2011, and 2012-2015 in conjunction with stand searches. These surveys and stand searches have not confirmed a verified presence of NSO in the action area to date (Draft BA pp. 45-46). Surveys have also been conducted on adjacent private lands in the action area. Surveys were completed under the applicable protocol at the time of survey completion.

The Forest welcomes and encourages timely reporting of information from anyone who detects or locates probable NSO(s) or barred owl(s) on the Forest, as it is difficult to verify information many years after
surveys are conducted. While not mandatory to report sighting information, it is the responsibility of the individual to: (1) make timely reports to and contacts with landowners, land management agencies or regulatory agencies, and (2) make timely reports to the California Department of Fish and Wildlife for the California Natural Diversity Database (CNDDB) for inclusion in the spotted owl database. Unfortunately, the details of the sighting referenced in the comment letter (2 years and 5 months after the sighting occurred) were not reported to the Forest at the time, nor does this information appear in the State’s spotted owl database, where the Forest Service also retrieves NSO information. According to the 2012 FWS-approved protocol, this single observation (which cannot be confirmed as an NSO from the photos provided) in unit 152-1, in 2013 also does not establish that the area is occupied by a resident single NSO, nor does it warrant establishment of an additional activity center (USDI-FWS 2012 pp. 24-25).

Based on several NSO expert’s review of the feather submitted with the comments, and the feather coloration, general size and other markings that can be observed in the submitted photos, the owl may be one of the barred owls that was removed in October 2014. As this sighting was not promptly reported in August 2013, the Forest lost the opportunity to conduct a field review at that time, and attempt to verify species or establish occupancy at this site. Fieldwork conducted in fall 2014 and all through 2015, and the 2015 stand searches and spot checks in this same area, and other areas did not detect NSOs or barred owls. While this does not mean that NSOs or barred owls could not be present; the 2-year, 6-visits per year surveys establish a reasonably high likelihood of detecting spotted owls in a survey area (USDI-FWS 2012 pp. 4-5, 17). The FWS does recommend spot checks in years 3 and 4 prior to conducting activities, and the 2012 protocol includes guidance on when and how spot checks should occur (USDI-FWS 2012 p. 17, pp. 18-20). The Elk LSR project has had three years of 6-visit surveys and stand searches (2012-2015) and one year of spot checks (2015), with spot checks and stand searches planned for 2016 (Draft and Final BA).

There will be no mechanical treatments in nesting/roosting habitat or high-quality foraging habitat within the historical ST-215 NSO core or home range (DEIS p. 169, Draft and Final BA). Additionally, project design features and limited operating periods are in place to reduce adverse effects to NSOs, critical habitat elements for NSO and NSO prey species (DEIS, pp. 87-90; Draft and Final BA Tables 6, 7, 8 and 9). Surveys, spot checks and AC stand searches will be continued prior to and throughout project implementation, as agreed to with the FWS. Any new activity centers will be afforded the same protections (DEIS pp. 87-88).

Concern# 149 - NSO, Barred Owl Competition

13-85 - Because barred owls use younger forests more than spotted owls, thinning may also intensify competition among related owl species, negating efforts by FS to contain barred owl invasions.

109. Response

Based on the stand and fire effects modeling of no action vs. action, monitoring and results of similar treatments in dry forest ecosystems and available research, the proposed project activities result in a greater assurance of (short- and) long-term enhancement, protection and maintenance of late-successional habitat, thereby improving conditions favored by the NSO (DEIS pp. H-19 to H-20). The thinning and fuels treatments are expected to produce variable short-term reductions in tree density, canopy cover and layering, shrub cover, snags down logs and coarse wood. However, the range of conditions that would provide utility for late successional-associated species would be retained and enhanced post-treatment. The proposed thinning would not reduce the age classes of treated stands (neither natural stands nor plantations; though there would be a long term removal of 60 to 100-year old snags in the Extensive Mortality Area from the proposed underburning). This area does not provide nesting, roosting or foraging habitat for NSOs, though it does provide prey base habitat for NSO, goshawk, Pacific marten and fisher (draft and final BA, draft and final BE). The thinning treatments in would not increase the overall availability of younger forests to barred owls, or create conditions that would otherwise attract barred owls to the area beyond what is already represented by the current conditions.
As described in the DEIS (p. 170-171) and Draft BA (pp. 40-42, 62-63), it is recognized that when barred owls and NSOs co-occur, a reduction in habitat availability and quality may exacerbate interactions between the two species. Dugger and others (2011, 2015; Forsman et al. 2011, 2012; USDI-FWS 2011) suggest that in environments where the two species compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help NSOs to persist in the short term. At this time, direct effects to NSO from competitive interactions with barred owls are not expected to occur as a result of the project. Contributing to this determination is the fact that the ST-215 activity center has been unoccupied by territorial NSOs since 1990, and a resident single NSO has not been verified since the 2003 season. However, a potential always exists for the activity center or project area to be used by dispersing or occupied by territorial NSOs in the future (or be re-occupied by barred owls). Since the removal of the barred owl pair in fall 2014, survey results in the action area on NFS lands and private lands have not detected any other barred owl(s) or NSOs (USDA-FS 1989-2015; Feamster 2014, 2015; Wizner 2015). This includes extensive field work, stand searches and spot checks in the project area.

As described in the DEIS and BA, the project is designed in accordance with recommendations from the Recovery Plan for Recovery Actions 10 and 32 (DEIS pp. 171, 175, 177, 180; Draft BA pp. 10-11, 25, 48, 63, 93-96). There are no mechanical treatments proposed in nesting/roosting habitat, or high quality foraging habitats. Reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function, but benefit it over time. This activity is not expected to exacerbate any competitive interactions between NSO and barred owl. As described in the project design features and monitoring, NSO surveys, spot checks and stand searches will be continued in accordance with the 2012 FWS survey protocol, or modification of the protocol, as agreed to by the Level 1 team prior to and throughout project implementation (Draft and Final BA, Table 6; WL-33, WL-34). The pre-, during- and post-implementation surveys will be used to evaluate for any NSO individual or pair occupancy or barred owl presence. Also, if barred owls (or NSO) are detected during these survey efforts, technical advice or re-initiation with the FWS would occur. More information specific to the effects to NSO from proposed thinning and other treatments is available in the DEIS at pp. 173-175, the Draft BA (pp. 62-63, 78-80) and Final BA (NSO Effects section).

Concern# 148- NSO, Barred Owl Encounters

13-75 - The barred owl encounter rate assumptions used in habitat modeling may be incorrect. Encounter rates may actually increase - not decrease - as a result of active management in spotted owl habitat. It is possible that opening stands up via thinning may encourage barred owl invasions as the species appears more robust to less dense canopy cover than spotted owls and therefore this may further increase spotted owl territory extinctions (Dugger et al. 2011). The combined effect of active management coupled to barred owl invasions may occur at a certain habitat threshold and might accumulate across modified landscapes - that is, the FS needs to examine the cumulative effects of barred owl invasions and spotted owl habitat modifications together as potentially interactive and synergistic effects.

110. Response

The term “cumulative effect” has a specific definition under NEPA and ESA (DEIS pp. 123-124 for NEPA; DEIS pp. 162-164 for ESA; and DEIS Appendix F) and does not appear to be used with this definition in the above comment. The term “cumulative effect” seems to refer, in this comment, to the collective or aggregate effects of barred owl invasions within areas where spotted owl habitat modifications have occurred. This type of effect was considered throughout the analysis in the draft and final Biological Assessment (BA) and was summarized in the DEIS and FEIS. For the consideration of the collective or aggregate effects of barred owl and spotted owl interactions, see DEIS pp. 165, 170, 176 (as well as extensive consideration throughout the Draft BA at pp. 38-41, 45, 62-63, 70-72).

As described in the Draft BA (pp. 40, 62, 70; and DEIS p. 170), barred owls are recognized as a significant threat to the recovery of the NSO (Dugger et al. 2015; USDI-FWS 2011) and many studies have found negative correlations between NSOs and barred owls where they co-occur. The effect of forest management on their interactions is not well documented or understood however. Even without fully understanding effects of forest management, recent research demonstrates the importance of maintaining
high quality nesting/roosting habitat and decreasing habitat fragmentation to minimize NSO interactions with barred owls (Dugger et al. 2005, 2011, 2015; Forsman et al. 2012; Wiens et al. 2014). In environments where the two species compete directly for resources, maintaining these larger amounts of older forest (nesting/roosting habitat) as it is available, may help NSOs persist in the short term and reduce competitive interactions (Dugger et al. 2011, 2015). While details on habitat interactions are not well known or understood to date, barred owls have a broader diet, can reduce NSO detectability, can occupy former NSO activity centers and are known to interbreed with NSO (Irwin et al. 2010; USDI-FWS 2011; Wiens 2012; McCready and Mount Shasta Ranger District Survey Records). Competition with barred owls may also be the primary cause of NSO population decline across their range (Dugger et al. 2015 p. 98).

It is recognized that when barred owls and NSOs co-occur, a reduction in habitat availability and quality may exacerbate interactions between the two species. Dugger and others (2011, 2015; Forsman et al. 2011, 2012; USDI-FWS 2011) suggest that in environments where the two species compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help NSOs to persist in the short term. As described in the Draft BA (pp. 62-63), at this time direct effects to NSO from competitive interactions with barred owls are not expected to occur as a result of the project. Contributing to this determination is the fact that the ST-215 activity center has been unoccupied by a verified territorial pair of NSOs since 1990, and a resident single NSO has not been verified since the 2003 season. However, a potential always exists for the activity center or project area to be used by dispersing or occupied by territorial NSOs in the future (or be re-occupied by barred owls). Since the removal of the barred owl pair in fall 2014, survey results in the action area on NFS lands and private lands have not detected any other barred owl(s) or NSOs (USDA-FS 1989-2015; Feamster 2014, 2015; Wizner 2015). This includes extensive field work, stand searches and spot checks in the project area.

There will be mechanical treatments proposed in nesting/roosting, or other high quality habitats, and it is unlikely that underburning these areas would contribute to competitive interactions between the two species. Foraging habitat is well-distributed in the western/central portion of the project and treatments would downgrade a minor proportion of this habitat (~9% of the project area). The short or long term trends of barred owl and NSO interactions in the action area are not known, given the lack of occupancy data (Draft BA p. 70).

Also as described in the Draft BA (p. 70) barred owls do occur on the McCloud Ranger District and may be increasing (Feamster 2014, 2015). At the site scale, implementation of the proposed actions is not expected to appreciably reduce the amount of high value or foraging habitat in the project area and there is no evidence that competitive or negative interactions would increase as a result of implementing the treatments. As described in Table 6 and the Management Recommendations sections of the Draft (and Final) BA, if barred owls are detected in the action area prior to or during implementation, the project biologist will coordinate with the local Level 1 team and address the need for reinitiating consultation based on specific circumstances. Effects to prey base that NSOs and barred owls may use was considered in the Draft and Final BA, and EIS. No further conclusions are made in regards to barred owl effects on NSO for the project.

In addition, the project is designed in accordance with recommendations from the Recovery Plan for Recovery Actions 10 and 32 (DEIS pp. 171, 175, 177, 180; Draft BA pp. 10-11, 25, 48, 63, 93-96). Recovery objectives for dry forests include maintaining sufficient NSO habitat in the short-term to allow NSOs to persist in the face of threats from barred owl expansion and habitat loss from fire and other disturbances (USDI-FWS 2011). There will be no mechanical treatments in nesting/roosting habitat, or high quality foraging habitats and reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function, but benefit it over time. This activity is not expected to exacerbate any competitive interactions between NSO and barred owl.

As described in the project design features and monitoring sections of the BA (and Chapter 2 EIS), NSO surveys, spot checks and stand searches will be continued in accordance with the 2012 protocol, or
modification of the protocol, as agreed to by the Level 1 team prior to and throughout project implementation (BA Table 6). The pre, during and post-implementation surveys will be used to evaluate for any NSO individual or pair occupancy or barred owl presence. Also, if barred owls (or NSO) are detected during these survey efforts, technical advice or re-initiation with the FWS may occur. These combined factors, along with published descriptions of forest structure associated with NSO habitat in dry forest types, are used to determine the overall habitat effects of maintain/benefit, degrade, downgrade, or remove. For instance, foraging habitat suitability and the evaluation of effects consists of a wide range of stand conditions, rather than a single threshold value such as basal area or canopy cover or closure. This evaluation is consistent with the high degree of variability of foraging habitats used by NSOs described in recent research publications and previously in the Existing Environment and Habitat Status section of the Biological Assessment (Draft BA pp. 72, 47-53; and Final BA Appendix D).

Concern# 94 - NSO, Barred Owl Interactions

14-10 - Displaced NSO may be avoiding negative physical interactions with BO by spatial avoidance, thereby reliant on habitat-mediated refuge and distance-sensitive factors (Van Lanen et al. 2011). Interspecific interactions with BO modify and shift traditional habitat relationships of NSO (Davis et al. 2015; Dugger et al. 2008; Wiens et al. 2014; Yackulic et al. 2014) and survival of these owls is very likely dependent on the availability of such habitats. Although these habitat types have not been defined it is known that in the presence of BO, NSO are using what is available, a lesser quality habitat (Forsman et al. 2011). Since the increased densities of BO, there has been an average decrease in the habitat quality where NSO have been located (Davis et al. 2015). Davis et al. (2011) reported a 9.4 percent decrease in habitat suitability between 1994/96 and 2006/07 and indicated that interspecific competition between The BO and NSO could potentially confuse NSO habitat selection (Davis et al. 2011 p. 3). Dugger et al. (2008) suggests that fitness and habitat characteristics have become disconnected due to interspecific competition with BO in the landscape. Without the luxury of habitat use determinations of a scientific study, we can only use what little information we have based on existing information. In California it may also be noteworthy that stand age showed lower differences between suitability classes, where NSO used younger stands of trees (Diller et al. 2007), than in other portions of the NSO range. The Revised Recovery Plan habitat management recommends, conserving occupied NSO sites and retaining the best available habitat being used by the NSO.

14-13 - BO have been identified as a primary stressor leading to NSO declines due the competitive nature between the two species where there is a mounting concern regarding realized effects of multiple stressors on the NSO populations (Franklin et al. 2013; Raphael et al. 2013; Wiens et al. 2014). NSO population declines due to barred owl presence are undeniable, but concern regarding additive effects of additional stressors, such as loss of habitat (no matter how minor or temporary), disturbance to existing habitat causing a disruption in habitat availability (regardless of habitat quality), and loss of prey abundance, will only increase the effects to NSO and amplify the decline. The extent to which management activities can affect interactions between NSO and BO is not clear, however effects of habitat loss cannot be decoupled from the additional stressor imposed by the BO range expansion (Dugger et al. 2008). 23. Although fuels treatments may increase the long-term quality of forest habitat, it has also been recognized that many of these treatments may have substantial negative short-term effects on the occupancy and nesting of spotted owls (Forsman et al. 1984; Carey et al. 1992; North et al. 1999; Meiman et al. 2003; Seamans and Gutierrez 2007; Stephens et al. 2014; Tempel et al. 2014). In the presence of BO, Dugger et al. (2016) found that the total amount of suitable spotted owl habitat was positively associated with NSO colonization rates, whereas, more habitat disturbance was associated with lower colonization rates. At a time when the NSO population is already destabilized by competitive pressure from BO, cumulative effects of competition, past habitat loss, and current habitat loss from vegetation manipulations (such as fuels treatments, thinning, or timber sales) could result in an accelerated population decline or complete loss of the species. 24. It is not definitive what habitat is of value to NSO due to competitive pressure from BO. However we do know that habitat treatments are known to have adverse effects to NSO. Until more is known about the habitat being use by displaced NSO, any habitat alteration of nesting, roosting, foraging, or dispersal habitat, will have unknown effects on NSO. In an uncertain time for the continued persistence of the NSO, due to repercussions on populations from barred owl, it is essential to carefully weigh the complex relationships between NSO demographics and the environmental factors. Dugger et al. (2016) explicitly states that despite the continued preservation of suitable NSO habitat, the long-term prognosis for NSO population perseverance may be in question without additional barred owl management intervention.

14-9 - Although there are many gaps in understanding the complex dynamic interactions between NSO and BO, much has been established by researchers: a) BO presence reduces the detectability, apparent survival, occupancy of territories, recruitment, fecundity, and colonization rates of NSO (Dugger et al. 2011, 2016; Glenn et al. 2010; Kroll et al. 2010; Olson et al. 2005; Wiens et al. 2014). b) There is competition for the
same resources (space, prey, and habitat) (Hammer et al. 2001, 2007; Wiens et al. 2014; Yackulic et al. 2014). c) BO displace NSO from historic territories often causing location shifts of activity centers, forcing NSO to use less suitable and more marginal habitat (Dugger et al. 2011; Forsman et al. 2011; Wiens et al. 2014; Yackulic et al. 2014). d) BO negatively affects NSO populations primarily by decreasing apparent survival and increasing local territory extinction rates (Dugger et al. 2016). e) When active BO removal occurs in historic NSO territories, these are often reoccupied by more BO, the displaced NSO resident owl, or another NSO (Diller et al. 2013). f) BO is associated with increased mortality of NSO and/or increase permanent emigration through displacement of breeding birds from territories (where they become undetectable floaters; a nonbreeding population) (Diller et al. 2013; Dugger et al. 2016). 17. At this time there is minimal information regarding what habitats NSO are using when displaced by BO. Without further data it is a challenge to define or assign habitat values for areas being used by displaced NSO, or what the fate of these owls are. We do know from preliminary data that when BO were removed from previously established/occupied NSO territories, the original or new NSO have reoccupied the territory within 3 weeks and up to 1 year post-removal (Diller et al. 2012), suggesting they are still in the area. It appears that NSO can survive up to 7 years as part of a floater population. This floater population likely remains undetected due to non-territory and non-reproductive status (Dugger et al. 2016). It remains unknown how many displaced NSO become part of the floater population, emigrate out of the area, or die. However it is important to note that without a successful reproductive population to replenish available territories, the floater population may be the only source of recruitment. The results of the latest meta-analysis suggest that recruitment into the territorial breeding population may depend on the presence of sufficient amounts of high-quality dispersal habitat, enough to ensure the survival of dispersing owls until they recruit into the territorial population (Forsman et al. 2011).

111. Response

The Forest thanks the commentor for their comments. However, we cannot discern a comment statement regarding project actions or analysis. The preliminary and final biological assessment and DEIS consider the effects of barred owl interactions with NSO in relation to the conditions in the project area, including impacts to prey base and reservation of high-quality NSO habitat in the project area (Draft BA, pp. 62-63 and 67-70; DEIS, pp. 8, 165, 170-171, and 176). The Forest considered the most recent meta analysis (Dugger et al. 2015) which concludes that barred owls are a significant factor in the population decline of NSO (Draft BA, pp. 40, 62, 70, and 111). See also the response to concern group 33, comment 14-8.

There is no data available on the effects of forest management on the interactions of these species. Based on the best available science to date, the extent of potential competitive interactions between NSO and BO have been considered.

Concern# 33 - NSO, Barred Owl Interactions, Surveys

14-18 - In my professional opinion, potential threat to the NSO within the Project understates, the true magnitude of threat by the BO to NSO and overestimates the threat by wildfire to NSO.,. Although of potential loss of habitat due to fire is a potential danger to NSO, current literature and professional biologist opinions, identify the BO to be the most imminence threat to NSO survival. With the BO being a greater and more immediate threat to the NSO survival than any other factor, efforts should be placed on retaining all potential NSO habitats until more information comes available. The Revised Recovery Plan speaks to protecting ALL suitable owl habitats due to the threat of BO.

14-4 - Furthermore the conclusions do not apply key components of NSO biology in the presence of BO, as addressed in the best available scientific information.

14-6 - 13. The Revised Recovery Plan (USDI-FWS 2011, pp. 1-8) states: "It is the Service’s position that the threat from barred owls is extremely pressing and complex, requiring immediate consideration." It is the responsibility of the land manager and USFWS to use the best available scientific data to weigh the potential tradeoffs between short-term impacts to spotted owl habitat versus longer-term ecosystem restoration outcomes (USFWS 2011 p. 111-14). More importantly, the NSO Revised Recovery Plan section titled: Restoring Dry Forest Ecosystems States: "Our first objective is to develop and maintain adequate spotted owl habitat in the near term to allow spotted owls to persist in the face of threats from barred owl expansion. The second objective is to restore landscapes that are resilient to fire and other disturbances in the near term." "It is not our intent, nor do we believe it would be consistent with the above objectives, to do landscape-wide treatments for the purpose of excluding disturbance events such as fires, including high-severity fires." (USFWS 2011 p.111-32). Finally, the Revised Recovery Plan for the Northern Spotted Owl Recovery Action 10 states: "The intent of this recovery action is to protect, enhance and develop habitat in
the quantity and distribution necessary to provide for the long-termed recovery of spotted owls."

"Wherefore stands could be enhanced or developed through vegetation management activities to improve long-term habitat conditions, or to create improved habitat ... for spotted owls... should be encouraged even, if they result in short-term impacts to existing spotted owls. However, such a process should occur where a determination is made that these longer term goals outweigh short-term impacts (USDI-FWS 2011 pp. 111-44)."

14. The Northwest Forest Plan (NWFP) was introduced in 1994, along with the Interagency Regional Monitoring Program. These were largely established to protect and enhance late-successional forest resources and species associated with these habitats. The Interagency Regional Monitoring Program provides a framework to help evaluate the effectiveness of the NWFP in meeting management objectives on the Late Successional Reserves (LSRs) located within Federal lands. The NWFP produces periodical reports (every five years since 2003) "to identify potential issues and to recommend solutions for future adaptive management changes and to resolve information management issues that inevitably surface during these analyses (Davis et al. 2011 pp. ii)." These reports evaluate time frames from 1994-2003 (Lint 2005), 1994-2008 (Davis et al. 2011), and 1994-2013 (Davis et al. 2015), where they review and compile the latest results from many scientific experts which include extensive status and trend analysis for NSO populations, habitat, and other pertinent issues (i.e. Wildfire risk, climate change, barred owl). In addition the NWFP instituted a Northern Spotted Owl Monitoring Program incorporating eleven groups of NSO populations (in 1999 each had an average of 500 banded owls1. The populations are annually tracked and surveyed at eleven locations throughout Washington, Oregon, and California, to evaluate NSO demographic trends. These provide the most current science-based population trends of NSO: apparent survival, fecundity, recruitment, rate of population change, and local extinction and colonization rates for each of the study sites. From 2010 to present, Green Diamond (GDR) demographic study area established an ongoing active BO removal program to collect information regarding interspecific interactions between NSO and BO. Summaries and results of collected data have produced many publications and annual reports for each site and can be accessed through the NWFP Interagency Regional Monitoring website (http://www.reo.govI monitoring/reports/northern-spotted-owl-reports-publications.shtml).

14-6 - The BA suggests that all proposed actions meet multiple resource plan requirements as they pertain to: Northwest Forest Plan (NWFP) and Late-Successional Reserve Assessment, Shasta-Trinity National Forest Land and Resource Management Plan (including Matrix, Commercial Wood Products, and Riparian Reserves), National Fire Plan, Shasta-Trinity National Forest Fire Management Plan, and Revised Recovery Plan for the Northern Spotted Owl. Project analysis did not incorporared key scientific data regarding competitive interactions between NSO and BO, therefore does not meet goals and requirements set for in the Revised Spotted Owl Recovery Plan (USDI-FWS 2011) and NWFP.

14-8 - The active removal of this BO pair in 2014, it is clear that BO has become established as part of the environmental landscape for this area, and must be considered and integrated into all analytical evaluations. Although BO are present, without conducting surveys specific to BO, the extent to which BO has integrated into the landscape, and their population densities are not clear.

14-8 - BO is recognized as the most imminent threat to the continued survival and recovery of the NSO and is thought to be the primary cause for range wide population declines of the species based on 1985 - 2013 population demographic meta-analysis (Dugger et al. 2016). BO was first detected on the Shasta McCloud Management Unit (SMMU) in 1997, with first detections confirmed in the Elk LSR area in 2004. Incidental detections have occurred while conducting surveys for NSO, and include a BO pair in the project area in 2013 and 2014. Despite

112. Response

See also Responses 117, 110, 143, 147 and 109 regarding NSOs and barred owl interactions and Response 122 regarding the environmental baseline.

The DEIS, Draft and Final Biological Assessment, and Final EIS all considered and documented the barred owl, including competitive interactions with NSO (DEIS p. 170, Draft BA pp. 9-12, 62-63; Final BA pp. 8, 42, 43-45, 70, 79, 88; FEIS Chapter 3 wildlife section). These documents discuss overall declines in NSO populations including monitoring by Forsman and others (2011, 2012), and Dugger and others (2015; (DEIS p. 170; Draft BA p. 40).

Local NSO monitoring and the long term demographic monitoring at the range-wide level was also considered and discussed, including barred owl presence, interactions and predator status (Draft BA pp. 39-41; Final BA Appendix D pp. D2-D3, D4-D7, D10-D11, D25-D27). Based on survey results, the ST-215 AC has not been occupied by a verified territorial or reproductive NSO pair since 1990, when the last nesting attempt failed. There has not been a verified resident single in the ST-215 home range since 2003. At this time there are no verified NSOs or barred owls known to occur in the action area, but that does not
mean that NSOs or barred owls may not use or re-occupy the action area (Final BA pp. I, 41-43, 105, D26). The barred owl pair that had been occupying portions of the project area, and stands to the north on Olympic Resource Management lands since 2012, was removed in fall 2014. Neither barred owls nor NSOs were detected or verified during the 2015 survey efforts. The closest, known barred owl on the SMMU is approximately six miles southwest of the project area (DEIS p. 170, Prelim. BA p. 41).

Dugger and others (2015) findings from the recent NSO meta-analysis provide support for the previous recommendations to preserve as much high-quality habitat in late-successional forest as possible across the range of the subspecies (DEIS p. 170). The recovery objectives listed in the Recovery Plan for dry forests include maintaining sufficient NSO habitat in the short-term to allow NSOs to persist in the face of threats from barred owl expansion and habitat loss from wildfires.

The project is designed to meet the recommendations from the Recovery Plan for RA 10 and RA 32 (DEIS p. 171; consultation through January 2016 is described at DEIS Appendix E, and in its entirety in the Final BA Appendix C). The project’s design is considered consistent with the applicable dry forest restoration principles from the Recovery Plan (DEIS p. 175), as described in Response 147 (to Concern 65) and elsewhere in the EIS. Older stands containing conditions that support high-value NSO habitat were conserved. There are no mechanical treatments proposed in nesting/roosting habitat, or high quality foraging habitats and reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function, nor exacerbate any competitive interactions between NSO and barred owl (DEIS p. 171). Vegetation treatments were emphasized outside of NSO cores highly suitable habitat. The proposed actions will not reduce nesting, roosting or foraging habitat in a home range with a reproductive pair. Treatment types and locations have been prioritized within the unoccupied ST-215 core and home range, based on several factors (DEIS p. 175). Restoration treatments were developed at the landscape level (DEIS p. 176). Structural components of NSO habitat as well as heterogeneity within and among stands would be retained and restored such that the remaining conditions in variable thinned stands are well within the range of foraging habitat conditions frequently used by NSO (DEIS pp. 175-176) and spatial heterogeneity, underrepresented species (oak, aspen, Douglas fir), and structural diversity were emphasized (DEIS p. 176).

Foraging habitat for NSO degraded by variable density thinning (697 acres), or downgraded (98 acres) through variable density thinning and radial release of black oak and predominant legacy pine (DEIS pp. 172-173), will not significantly impact how NSOs use the landscape for foraging (DEIS p. 172; Draft BA p. 73). Important habitat components and attributes would be maintained and the post-treatment stand conditions would be well within the range of foraging habitat conditions frequently used by NSOs in dry forest landscapes (DEIS pp. 175-176). Treatments that degrade foraging habitat are designed to improve stand health and habitat conditions over the short and long term; increasing resiliency of foraging habitat while retaining components that continue to provide foraging opportunities for NSOs (DEIS p. 173; Draft BA p. 129). Implementation is not expected to appreciably reduce the amount of high value or foraging habitat in the project area and there is no evidence that competitive or negative interactions between NSO(s) and barred owl(s) would increase as a result of implementing the treatments (DEIS pp. 170-171; Final BA pp. 44-45; Draft BA p. 70).

Concern# 175 - NSO, Connectivity

4-17 - [Habitat] connectivity among the LSR’s and MLSA’s will be a continuing problem. Page 61. Yet the project calls for reducing canopy connectivity in the LSR, constructing logging roads and landings, and equivalent roaded acres (ERA)

13-16 - The proposal expects to lose 58 acres from landings and log the vast majority of the LSR. According to the LSRA a 100 acre opening could be considerable habitat loss. This project will create more than a 100 acre opening when all components of. The project are considered together. The project is not in compliance with the LSRA.

13-25 - The project calls for 78 landings of 0.75 acre each for a total loss of habitat of 58 acres. 4.25 acres are in PCEI owl habitat and 8.75 acres are in PCE3 owl habitat. Those 13 acres could and should have been avoided. This loss of habitat should be considered “removal” of habitat from the LSR/CHU [more on this in later comments]. The FS claims in each and every timber on the McCloud Flats that these entries are
negligible yet when added up throughout the Flats they total hundreds of acres of openings. This impacts connectivity of habitat and encourages predation of owls. The FS must analyze this potential direct impact to owls and other species.

113. Response

For the NSO, connectivity habitat would be maintained and enhanced in 97% of the project area. The Project's primary purpose and need is to reduce the risk of losing existing and developing late-successional habitat, which includes habitat that supports connectivity within and between stands in the LSR (DEIS Chapter 1). While Forest staff were unable to identify a portion of the LSRA that sets a 100-acre limit to openings in a project area, there is a significant functional difference between a single 100-acre opening and numerous smaller openings, where it has also been shown that NSOs will forage and actually benefit if adjacent to suitable or dispersal habitats (Draft BA p. 48-50). The variable density thinning and riparian restoration treatments that are aimed at protecting and enhancing habitat would result in high value/high quality areas being left in an unthinned condition, and where treatments do occur, there would be small scattered openings in the canopy and stand. These openings would not be contiguous or significantly impede habitat use as described in the Draft BA (and Preliminary BE). As described in Appendix A of the EIS (and relevant project reports), the openings created by group selections would be up to two acres in six older ponderosa pine plantations and in two natural stands; small gaps in white fir would be less than 0.25 acre in four natural stands. New landings would range from 0.5 to 0.75 acres, resulting in an estimated 40 acres of new openings across the project area, as 38 of the estimated 78 required landings are already present on the landscape (DEIS pp. 62). As stated above, the project will not mechanically treat areas within nesting, roosting, or high-quality foraging habitat for NSO (or nesting habitat for northern goshawk or known denning habitats for fisher). It is expected that connectivity habitat would be improved by the thinning treatments that will increase individual tree size and resilience within foraging, dispersal, and capable habitats (Draft BA pp. 13, 25, 39 and 72; Table 20; DEIS Table 36). At the project area scale, 98 acres of foraging habitat would be downgraded to dispersal which would still maintain protection from predators and minimal foraging opportunities and this effect would also not be contiguous. It consists of 27 acres of black oak release in unit 153; and 71 acres of scattered radial thinning around legacy sugar and ponderosa pine to protect and enhance this late-successional habitat element. As described at DEIS p. 174, these combined treatments represent 7 [to 9] percent of the foraging habitat available in the project area for NSO [and NGO] respectively, and are not expected to result in a significant negative effect to individuals or overall habitat function. This determination is based on the: 1) small scale of habitat affected, 2) position of the treatments within the outer portion of the ST-215 NSO home range and being wholly outside the ST-205 northern goshawk territory, and 3) the long-term benefit of increased stand and prey species diversity (see the BA and BE prey effects sections for benefits to prey habitat from edge effect). The functional level of connectivity habitat in the LSR for the NSO (as an example and taking NR, all Foraging and Dispersal habitat into account as connectivity habitat ) would not be significantly modified in the LSR. Approximately 41 acres of dispersal habitat would be removed through thinning and radial thinning treatments. This effect would occur where stand conditions are currently more open due to ongoing ponderosa pine mortality. Where pine would be radially thinned in these areas, roost sites and adequate cover from avian predators are either not available, or would not remain at adequate levels post-treatment surrounding the pine (Draft BA p. 88). This treatment is situated in the eastern portion of the project area, and is expected to have indirect beneficial effects to NSO in terms of increased prey base (Draft BA p. 88). This treatment that removes the function of 41 acres of dispersal habitat is intended to protect important components of late-successional habitat (predominant, legacy sugar and ponderosa pine) and would affect 13 percent of dispersal-only habitat in the project area and three percent of all connectivity (NRFD) habitat in the project area (Draft BA p.130). Approximately 97% of existing NSO connectivity habitat in the LSR would remain functional post-treatment and would be more resilient to disturbances that can cause habitat loss from overstocking, disease, epidemic insect attacks/outbreaks or uncharacteristic fire effects; Draft BA p. 116 Table 32. New landings would not be constructed in NR or high quality habitats, unthinned patch areas, or the Ash Creek Riparian Reserve that supports connectivity habitat for late-successional
associated species. Also as described in the Draft BA at p. 124; the estimated new 40 landings, approximately 14.25 acres may be constructed in foraging habitat, 1.5 acres in dispersal habitat, 6.25 acres in capable habitat, and the rest in non-habitat. Landings are not contiguous openings where habitat function is removed. The landings are distributed throughout the project area, ST-215 home range and core. While removal of 0.5-0.75 acre areas of vegetation and canopy cover occurs when constructing new landings, because of their small size, spatial distribution across a larger area and placement outside high quality habitats, these openings are considered inclusions in forest stands and are not considered a significant removal of foraging or dispersal habitat function (see also Draft BA pp. 71, 95, 96, 114, 131-132). The effects of landings within 8.25 acres of foraging habitat in critical habitat (PCE3) and 4.5 acres of capable habitat in pine plantations (PCE1) are also addressed in the Draft BA. These landings would also be widely dispersed across critical habitat and are considered insignificant at the stand level and immeasurable at the landscape scale. The created openings would not preclude an owl's ability to utilize the habitat or alter the function of existing habitat at the stand or landscape level; affecting about two percent of the critical habitat in the project area (Draft BA pp. 109-110, 132 for effects in critical habitat).

Concern# 71 - NSO, Cumulative Effects Methodology

13-108 - Under spatial bounding all direct and indirect effects are analyzed at the stand unit or project level. This fails to consider cumulative impacts. See Table 56. The ESA defines the spatial boundary for analysis as the action area that includes all areas likely to be affected directly or indirectly by the project and not merely the immediate area involved in the action. The action area is generally larger than the project area. The FS determined this area as the 1.3 mile buffer for NSO which is completely inadequate considering the project area is surrounded on two sides by private lands with no owl habitat; and the other two sides by FS lands with little to no suitable owl habitat. The FS cites to Thomas et al. 1990 for this boundary which is completely outdated and refuted by current owl biologists. The FS has been notified of this error repeatedly but continues to use Thomas because it allows for a small limited area of analysis.

13-109 - Under Temporal bounding the FS states the project will take at least 10 years to implement and long term effects extend for at least 20 years after implementation. So that is 30 years into the future therefore all of the claims of improving habitat in 20 years is invalid. Under the ESA, temporal bounding for cumulative effects consists of the period when all proposed treatments and activities are expected to be completed and when any effects from foreseeable future state or private actions can be reasonably predicted and felt on the landscape in combination with the projects effects. The FS has not conducted this analysis.

114. Response

The NSO cumulative effects bounding is sufficient. Cumulative effects to NSO are described in the DEIS on pages 180 to 182. For there to be cumulative effects, there must be overlap in time and space of the direct and indirect effects.

The DEIS and the Draft Biological Assessment (BA) discuss the applicable spatial boundaries for the effects to listed species (DEIS p. 162-163, Draft BA p. 18). As described on DEIS p. 162, DEIS/FEIS Table 56 (DEIS p. 161, FEIS p. 166) lists each biologically meaningful scale assessed for each indicator of effect.

The ESA definition for the action area is provided in the DEIS, p. 162. As noted in the DEIS p. 163, the bounding 1.3 mile bounding is an appropriate scale, as it is equivalent to the radius of the estimated median annual NSO home range size in northern California. In addition to Thomas et al. 1990, the scale cites to the Revised Recovery Plan (USDI-FWS, 2011). The Revised Recovery Plan, which was developed by the US Fish and Wildlife Service based on a review of the best available science, defines the provincial home range as a 1.3-miles radius around a nest site and assumes owl use will vary according to habitat distribution, and is also cited in the Preliminary Biological Assessment (RRP, pp. III-4, III-5, and III-60; Prelim. BA, pp. 18-19). An action area of this size accounts for habitat modification, disturbance, or any other effects to any potential NSO home range in the vicinity of the project.

The temporal bounding for cumulative effects for both ESA and NEPA is 30 years—the same bounding suggested by the commentor (DEIS p. 163-164, Prelim. BA, p. 21). The DEIS provides the rationale for the temporal bounding.
Concern# 43 - NSO, Demographic Information

13-104 - The FS is silent on how this massive timber sale will assist in maintaining owl populations now. Latest demographic results document a 32-55% decline in NSO in California and 4% throughout its range. In fact the DEIS states it was determined that the project may have an adverse effect on individuals in the project area, but not contribute to a loss of viability of the local population, or at the range of the DPS. Neither of these claims can be substantiated. The local population of owls has plummeted on the McCloud Flats due to all the FS and private lands logging. As stated in this paragraph the owl is declining at 32-55% in N CA and 4% throughout its range. Any loss of an individual is meaningful and a threat to the overall population. LSRs are more important now than ever.

13-51 - The determination for the NSO is "may affect, not likely to adversely affect." This is because the FS claims NSO aren’t in the area but it can’t possibly know that considering lack of surveys and its willingness to disregard empirical data contrary to its findings.

13-74 - Owl population data should be updated with the recent demographic study results (e.g., Dugger et al. 2015). Studies by Dugger et al. (2011 and 2015) and Wiens (2012) that clearly show there is indeed a relationship between the amount of spotted owl quality habitat and ability of spotted owls to sustain barred owl invasions.

13-93 - Recovery Action 10 - Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population. For Federal lands, create an interagency scientific tea.pl to use the latest and best available habitat modeling information and other data to identify these high value areas. This recovery implementation team will make recommendations for areas to conserve and manage based upon the following criteria and considerations: * Use of habitat modeling to better identify high value habitat, including consideration of abiotic factors that influence spotted owl usage. * Use of demographic monitoring and survey data, if available, to inform other measures of value, such as maintaining population distribution in underrepresented areas or to reflect the most current habitat conditions. * How retention of specific areas may affect probability of persistence of the spotted owl population at the province scale. Use this evaluation to establish "thresholds" for recommendations of which areas to conserve or not. * Consideration of related barred owl impacts, influence, and management decisions and the likely success of such management actions in those areas. The intent of this recovery action is to protect, enhance and develop habitat in the quantity and distribution necessary to provide for the long-term recovery of spotted owls. The Service will use the results of this effort to inform subsequent recommendations or decisions regarding the quantity and spatial configuration of habitat necessary to support the recovery of spotted owls. The spatial depiction informed by the habitat modeling efforts will better identify areas where land managers should consider protecting, enhancing and developing habitat to support recovery of spotted owls and, where appropriate, will seek additional public review and comment (e.g., as part of proposed critical habitat). It is not uncommon for an occupied spotted owl site to be unoccupied in subsequent years, only to be re-occupied by the same or different spotted owls two, three or even more years later (Dugger et al. 2009). While temporarily unoccupied, these sites provide conservation value to the species by providing habitat that can be used by spotted owls on nearby sites while also providing viable locations on which future pairs or territorial singles can establish territories. Where unique circumstances or questions arise (e.g., multiple activity centers, etc.), the Service is available to assist land managers with applying this recovery action. CC comment: It is our opinion this RA is being completely ignored in the Elk LSR as well as the LSRs established for connectivity with the Elk LSR. Bullet points 2, 3, and 4 have not been conducted for this project or any other that we are aware of.

14-16 - An accurate portrayal of the regional population may be attained by compiling survey and reproductive data for every Activity Center located within the geographic region of interest. This information gives an accurate and comprehensive view of what the spotted owl population is at a single point in time. A baseline population determination cannot be made without complete information and survey results regarding other NSO in the area. Without a baseline evaluation, there is no way to accurately measure potential impacts of the Project or changes to the population.

14-17 - To determine more information regarding population demography, and actually observe population trends within a specific area, survey data needs to be collected during regular intervals. Statistically, the more frequently the survey data is recorded, the more data points, the more accurate the analysis is. This is why all of the long established (25+ years) research demographic study sites (Cle Elum, Rainier, Olympic, Coast Ranges, HJ Andrews, Tyee, Klamath, Southern Cascades, NW California, Hoopa, Green Diamond) located throughout Washington, Oregon, and California, have been such a valuable source of information regarding northern spotted owls (Anthony et al. 2006, Forsman et al. 2011).

14-7 - The closest demographic study area in the same province is the Southern Oregon Cascades (CAS), with results most applicable to the Project. Each of these reports and all of those since (Dugger et al. 2016) have found continued decreases in NSO apparent survival, territory occupancy, reproductive output, increases in population declines, and increases in numbers of BO sites. Each clearly identifies the BO as having strong negative effects on NSO detection rates, extinction and colonization rates in the study areas (Dugger et al. 2016).
Furthermore, the NSO Meta-population analysis of trends from 1985 - 2008, identified the BO as a range-wide competitive threat to the NSO as measured by increased extinction rates and decreased colonization rates, fecundity, recruitment, survival, and detectability (Forsman et al. 2011). Since 2008, these values have only become more exaggerated and have accelerated the negative impacts range-wide in NSO populations (Dugger et al. 2016). In the Southern Cascades Province where the Project is located NSO population declines have been measured at 3.7% annually and occupancy rates have declined by 44% since 1999 (Dugger et al. 2016). The USFS fails to draw any comparisons to the trends in local demographic study areas and do not recognize that these same demographics are the best representation of population demographics occurring in the vicinity of the Project.

115. Response

The DEIS and Biological Assessment discuss range-wide NSO population trends, project area occupancy data, and long term NSO surveys on the Shasta-McCloud Management Unit (1989-2015). See DEIS pp. 170-171; Draft BA pp. 40-42 (36-66 for existing environment); Final BA pp. 43-45 and Appendix D.

The Draft (and Final) BA analyze the predicted effects of the project on NSO, its suitable, dispersal and capable habitat, and on its designated critical habitat in the project area. This includes local population viability and how the Elk LSR and ST-215 activity center likely function, or will function in the future (Chapter 3 DEIS wildlife section; NSO Effects and Critical Habitat effects sections in the Draft and Final BA).

NSO surveys and stand searches are described in the DEIS (p. 165) and Draft and Final BA (Draft BA pp. 45-47; Final BA Appendix D). Per protocol surveys and stand searches to date, a verified territorial or reproductive NSO pair has not been detected in the ST-215 home range, core or established action area since 1990. A resident single (female subadult) was observed and verified in the core 12 years ago (2003 summer season). There have been no other verified detections of NSO in the project area or action area to date (Draft BA pp. 45-47). However, dispersing juvenile, subadult or non-territorial adult NSOs could be in the project area and be unresponsive during surveys due to barred owl presence. They may also disperse through or re-occupy the AC or higher quality habitats in the project area with or without implementation (Final BA). An individual barred owl was detected in 2004, and a barred owl pair occupied portions of the project area from 2012 through October 2014 (DEIS p. 165; Draft BA p. 45). The barred owl pair was removed in 2014. The 2015 surveys and stand searches did not detect any NSOs, barred owls, or any sign (pellets, whitewash; see Draft and Final BA NSO Surveys section).

The DEIS, Draft and Final BA discuss demography information and overall declines in NSO populations including monitoring by Forsman and others (2012, 2011) as well as Dugger and others (2015, 2015a, 2014, 2012). See DEIS p. 170; Draft BA p. 40; Final BA pp. D2 to D4. This discussion includes the Southern Cascades Study Area in Oregon. The Elk LSR project, contrary to information in comment 14-7, is not located in this demographic study area. The SCSA is the “closest demographic study area in terms of distance, climate, vegetation and habitat similarity to the SMMU [Shasta-McCloud Management Unit] and project area”, however (Final BA p. D2).

Dugger and others (2015) findings in the recent NSO meta-analysis provide support for the previous recommendations to preserve as much high-quality habitat in late-successional forest as possible across the range of the subspecies (DEIS p. 170). The project includes these recommendations. The recovery objectives listed in the Recovery Plan for dry forests include maintaining sufficient NSO habitat in the short-term to allow NSOs to persist in the face of threats from barred owl expansion and habitat loss from wildfires (DEIS p. 170; Draft BA pp. 39, 62; Final BA pp. D4, D26).

The Recovery Plan provides prioritization guidance for treatments in current and historic NSO home ranges (USDI-FWS pp. III-44 to III-47), and the Forest consulted with the FWS on more specific prioritization for this Project (Draft BA p. 10; Final BA). The intent of RA10 is to protect, enhance and develop habitat in the quantity and distribution necessary to provide for the long-term recovery of NSO. Where forest stands can be enhanced or developed through vegetation management, they should generally be encouraged, particularly where long-term goals outweigh short-term impacts. As a general rule, forest management that is likely to diminish an NSO’s home range capability to support NSO occupancy,
survival and reproduction in the long-term should be discourage. The FWS recognizes, however, that active forest management may be necessary to maintain or improve ecological conditions.

As described in the Draft BA (p. 70), “The interim guidance and prioritization for treatments under Recovery Action 10, and consultation with the FWS, resulted in prioritization of the ST-215 home range for active management (USDI-FWS 2011 pp. III-44 to III-45).” The process is documented in the project record and BA (DEIS p. 171; Draft BA pp. 93-96; Final BA pp. 69-72; BA Appendix C).

Consistent with the recommendations under Recovery Action 32, the project conserves the limited high-value NSO habitat in the project area, including nesting/roosting and high quality foraging. While limited in their distribution and scale across the project area, all areas of high value habitat have been excluded from mechanical treatments and these areas will be maintained and benefitted over the short and long term with low-intensity prescribed fire (DEIS p. 172; Draft BA p. 72-73; Final BA p. 47-48, 60-62). Because mechanical treatments are primarily focused in lower quality habitat stands, are expected to result in a greater assurance of long-term maintenance of late-successional habitat over time, are not located in a higher quality NSO habitat area in general, and will not remove PCEs, the function of ECS-3 to provide demographic support in this area of sparsely distributed high quality habitat and Federal land, and to provide for population connectivity between subunits to the north and south, is not expected to be measurably impeded.

The project is expected to improve the capability of the ST-215 home range, the project-area critical habitat and portions of the Elk Flat LSR to support dispersing or potential territorial single or NSO pairs over the long term, providing a point of connectivity between currently occupied areas to support dispersal of NSO. Though not stated in the LSRA, the Elk Flat LSR is expected to only provide for one pair of northern spotted owls in the future, or more likely, to provide an important area for dispersing young northern spotted owls to reside in temporarily (DEIS pp. 170, 175, 178, H-21; Draft BA pp. 95-96, 131; Final BA pp. 71-72, 90, 107). Also as described in the Final BA (p. 84), “…while the effects of degrading and downgrading a small proportion of foraging habitat may not significantly affect the activity center in the action area, the currently unoccupied habitat is expected to provide a key area for dispersing juveniles and subadults or non-territorial NSOs. Therefore the value of the current suitable and critical habitat in the project area, home range and action area is considered important to any NSOs that may use it in the future (Dugger et al. 2009, Forsman et al. 2012; USDI-FWS 2011, 2012).” The proposed actions will help accelerate development of late-successional characteristics, will contribute to increased connectivity and resilience of late-successional habitat in the LSR, and will help reduce the risk of large scale habitat loss while maintaining important current habitat areas, attributes, and functions (DEIS H-22).

The statement in Comment 13-104 above regarding the DEIS determination “that the project may have an adverse effect on individuals in the project area, but not contribute to a loss of viability of the local population, or at the range of the DPS” is misplaced. This determination in the DEIS refers to the West Coast Distinct Population of fisher, not the NSO (DEIS pp. 108, H-6). The analysis in the project level Biological Evaluation substantiates the determination for the FS-designated sensitive fisher and the proposed listed fisher (at the time of the analysis for the DEIS). The FWS’ decision that the West Coast DPS of fisher does not require the protection of the Endangered Species Act is expected to publish in the Federal Register on April 18, 2016 (USDI-FWS, 2016).

The Project design includes provisions for continuing NSO surveys, spot checks and stand searches in accordance with the 2012 protocol, or modification of the protocol, as agreed to by the US-FWS/STNF Level 1 team (DEIS p. 171). Limited Operating Periods would also minimize the potential for direct effects to any nesting or single NSOs that may recolonize the ST-215 activity center or project area. The Surveys section of the BA fully describes the survey history for the project area and action area, and the DEIS summarizes this information (DEIS pp. 159, 165). There are no demographic study areas on the Management Unit, but annual surveys and stand searches are conducted on for NSO (USDA-FS 1989-2015). This is described in the Draft BA (p. 41) and Final BA in Appendix D (pp. D2 to D7).
The Forest has completed an in-depth evaluation of the ST-215 core and home range, utilizing prioritization recommendations from the Recovery Plan for Recovery Action 10, and has delineated high-value habitats for no mechanical treatment, meeting the intent of Recovery Action 32. Baseline information on NSOs on the Management Unit is described in the Final and Draft BA, and these analyses (along with the EIS) describe the latest NSO demography study results.

Concern # 155 - NSO, Detection

13-119 - Units 151, 161, 172 should not be logged at all. We found an NSO in Unit 151 in August 2013.

116. Response

See also Response 108 (to Concern 41) regarding the August 2013 sighting and the surveys completed for the project. This comment also conflicts with information provided in the comment letter (text, maps and GPS coordinates that state the observation of an owl occurred in proposed treatment unit 152-1, not unit 151). The Forest did consider Alternative 3 in detail in the DEIS and FEIS that does not treat these three units. Refer to Chapter 2 and Chapter 3.

Concern # 160 - NSO, Determination, BA

14-5 - I have methodically reviewed the Biological Assessment (USDA FS, Prepared by Christine Jordan USFS 1/16/16), visited the proposed treatment units on the ground (August 29, 2013), and am confused by the information not considered in the Biological Assessment determination, especially because this is the product of a collaborative federal interagency team effort. There is no baseline population established and there is no acknowledgement or integration of significant scientific information, crucial to accurately evaluating the impacts of the Project on the existing NSO population. The USFS rely on an oversimplified analysis, did not utilize the best available scientific data, fail to address the most recognized threat to the continued survival of the species, and therefore predict an unlikely outcome unsubstantiated by facts.

117. Response

The purpose of this project is specific to the Elk Flat LSR and surrounding matrix lands and meadow habitat (DEIS Chapter 1). The Draft (and Final) biological assessment (BA) for listed wildlife was based on research, local and regional monitoring as it applies to the NSO, and other applicable best available science as it pertains to the NSO (DEIS pp. 158-161; Draft BA pp. 10-11, 14, 22-24, 32, 66, 128; and NSO effects analysis at pp. 66-113).

The project's impacts on the NSO population as a whole, as suggested by the commenter, is beyond the project area or established action area for the NSO. While it is not stated in the Forest-wide LSR Assessment, the Elk Flat LSR is expected to only provide for one pair of NSOs in the future, or more likely, to provide an important area for dispersing young NSOs to reside in temporarily. This is largely driven by the fact that 60 percent of the ST-215 home range is situated in private land ownership managed for timber production and the ponderosa-pine dominated stands in the LSR (DEIS p. H-21).

The Forest prioritized treatment in the project area and ST-215 according to the guidance recommendations under Recovery Action 10 of the Revised Recovery Plan for the NSO. Based on this analysis, the ST-215 activity center likely provides, or could provide, an important role for dispersing juveniles or subadults and is considered a priority for treatment to increase habitat suitability and resilience (Draft BA pp. 95-96, 131).

As described in Response 115 (to Concern 43), the DEIS and Draft BA discuss the rangewide NSO population trends and occupancy data. Information from the demographic study areas in the NWFP area, and overall declines in NSO populations within its range as described in the metaanalysis by Forsman and others (2011, 2012) and the most recent metaanalysis by Dugger and others (2015) is summarized (DEIS p. 170; Draft BA pp. 40, 62, 70 and 111).

NSO surveys and stand searches are also described in the DEIS (p. 165) and Draft BA (pp. 45-47). Per FWS protocol surveys and stand searches to date, nesting NSOs have not been detected or verified in the ST-215 home range, core or established action area in 25 years (last confirmed nesting and territorial pair
was in 1990). A resident single NSO was detected and verified in the core 12 years ago in 2003 and remained there for the duration of the season. There have been no other verified detections of NSO in the project area or action area to date (Draft BA pp. 45-47). An individual barred owl was detected and verified in 2004, and a verified barred owl pair occupied portions of the project area from 2012 through October 2014 when it was removed (DEIS p. 165; Draft BA pp. 41, 45, 46, 62). While the action area and ST-215 home range is not considered occupied by barred owl(s) or NSO(s), this does not mean that recolonization by either subspecies could not occur, regardless of implementation (DEIS p. 170; Draft BA p. 70; Final BA).

There are no demographic study areas on the Shasta-McCloud Management Unit under the NWFP (Draft BA p. 41; Final BA Appendix D), and the Final BA describes the recent demography information on the closest study area, the Southern Cascades Study Area (Final BA Appendix D pp. D2-D3). Both the Draft and Final BA discuss local monitoring of NSO on the Unit (pp. 41-42). Intensive monitoring of NSO in the late 1980s/early 1990s indicated there were approximately 20 known territories on the McCloud Ranger District (with 35 Unit-wide). Approximately 12 of the 20 were confirmed to be consistently occupied by single NSOs or reproducing or non-reproducing NSO pairs from before 1989 through 2013. For the remainder of the 20 territories, status was unknown. In the last three seasons, an average of seven territories have been confirmed occupied by NSOs, with only four of the 20 historic territories not being surveyed through either FS project-level, activity center stand search or private land survey efforts. Since 1997, which is the earliest known presence of barred owls on the SMMU, three of the known NSO territories on the District have shifted their locations, presumably due to competition with barred owls (Draft BA p. 41).

Various research and literature on NSO life history, habitat in dry forest types, habitat effects from treatments, prey use/prey effects and barred owl interactions is described throughout the Draft (and Final) BA. For example populations (described above), habitat (DEIS pp. 165-166; Draft BA pp. 47-51, 57-58), prey (Draft BA pp. 52-53), predators and competitors (Draft BA pp. 62-63), recovery and critical habitat (DEIS pp. 171-173; Draft BA pp. 63, 103-105), primary threats (DEIS p. 170; Draft BA p. 111), and NSO use of burned areas (DEIS p. 185).

The project is not within a recently burned area, but preliminary fuels modeling for the no action alternative results in up to 40% mortality of the project area in the event of a wildfire under 97th percentile weather conditions (DEIS pp. 27, 156, 185; Fuels Report pp. 7-8, 16; Draft BA pp. 17, 104).

As described in the DEIS and in other comment responses, the project was designed to be consistent with the Revised Recovery Plan's recommendations that are most appropriate for forest vegetation management projects on NFS lands not involving fire salvage or other activities (Recovery Actions 10 and 32). The Draft BA describes project design features for Recovery Action 32 (pp. 10, 25, 63) and the prioritization process under Recovery Action 10 (pp. 93-96). Consultation with the FWS has been ongoing since 2009, and is also fully described in Appendix E of the DEIS, and Appendix C of the Draft and Final BA.

Variable density thinning, combined with prescribed fire/other surface fuel treatments are consistent with the Recovery Plan's recommendations for restoring dry forest ecosystems. Foraging habitat for NSO will either be degraded by variable density thinning (697 acres), or downgraded (98 acres) through variable density thinning and radial release of black oak and predominant legacy pine (DEIS pp. 172-173), though will not significantly impact how NSOs use the landscape for foraging (DEIS p. 172; Draft BA p. 73). Important habitat components and attributes will be maintained and remaining conditions are well within the range of foraging habitat conditions frequently used by NSO (DEIS pp. 175-176).

Concern# 137 - NSO, Diameter Limits

4-13 - While project planners arbitrarily refused to develop and consider a reasonable alternative that included a diameter limit for logging in the LSR and CHU (as has been implemented on other dry forest LSRs in the NW Forest Plan area), page E-24 of the DEIS reveals that the ID Team discussed the need for "diameter
118. Response

See also Response 135 regarding diameter limits in LSRs and Regional Ecosystem Office direction from October 2009 (Mohoric 2009).

Large trees and snags were identified as a key issue (DEIS p. 44) during scoping for the project. While the commenters during scoping did not define what a large tree, two alternatives are responsive to the issue of harvest tree size selection. Alternative 6-Limit Harvest to Trees Less than 10 Inches in Diameter, suggested by a commenter, limits tree removal to those under 10 inches DBH. Similarly, Alternative 8-Limit Harvest to Trees Less Than 20 Inches in Diameter within the Elk Flat Late-Successional Reserve is responsive to this issue. Alternatives 6 and 8 (DEIS p. 121) were considered but not in detail. Alternative 6 was eliminated from detailed study because modeling the stands shows that while it would reduce fuel ladders in the short term, it would not need to reduce the risk of late-successional habitat loss due to overstocking that is ongoing in the project area, nor would it sufficiently reduce existing standing and dead fuels. Alternative 8 was eliminated from detailed study for the same reason, with the exception that it would still meet the meadow restoration purpose and need since Elk Flat meadow is in Matrix (DEIS p. 44).

The Forest recognizes the importance of large trees on the landscape for a variety of reasons including fire resiliency, various species' habitat needs (including NSO, northern goshawk, fisher and Pacific marten) and stand structural legacies, particularly in LSR (DEIS pp. B9-10). The Forest Plan has no standard and guideline pertaining to diameter limits for timber management or for the LSR. Similarly, the applicable LSRA Activity Design Criteria do not include a diameter limit. While there is no prescribed upper diameter limit for the project, or within specific treatment units, the largest oldest trees (predominants and dominants) and those that exhibit old-growth characteristics such as large boles, decadent branching, cavities and flattened tops would be retained as long as they are not a safety hazard. In some treatment units, diameter limits are prescribed to meet certain habitat objectives (e.g., when conducting California black oak release within critical habitat for the northern spotted owl, certain species of trees that are 24 or larger would not be cut to release oak).

All predominant trees would be retained, regardless of their current health/condition when marking (DEIS pp. B9-10). While necessary or useful in some instances, "hard diameter limits can make it difficult or impossible to achieve desired composition in many mixed-conifer forests, which would compromise their future resilience, (Franklin et al. 2013, p. 74; Johnson and Franklin 2009, p. 4). Protecting and nurturing existing old-growth trees and other foundational elements are key aspects of ecologically-oriented forest restoration goals for dry forest stands and landscapes (Franklin et al. 2013, pp. 26, 30, Johnson and Franklin 2009, p. 4). Please see comment 4-4 (concern group 103) for additional discussion on diameter limits. See also the response to Concern Group 2, Comments 4-7, 4-8, 4-9, 4-10.

Concern# 72- NSO, Effect Determination Standard

13-76 - The use of a 500-acre effects determination standard is arbitrary and not based on best science. This standard would exclude small patches of old forests and legacy trees that are more typical of the dry forest systems and is not robust to differences in owl territory sizes across the range. For instance, Seamens and Gutierrez (2007) report thinning effects on owls extending out to 400 meters beyond the nest site, clearly this is greater than a 500-acre core area assessment proposed by the FS.

119. Response

While it is not clear from the comment (or surrounding text in the comment letter) to which 500-acre analysis area the comment refers, the 500-acre core area was not the sole analysis area used to make the effects determination for the NSO, or its critical habitat. However, assessing habitat conditions in provincial core and home range areas is based on guidance from Thomas and others (1990) for the Klamath and California Cascades NSO province, other research and literature on territorial NSOs, the
FWS’ Revised Recovery Plan (USDI-FWS pp. III-44, C-15) and the FWS’ Final Critical Habitat Rule for NSO (USDI-FWS 2012 p. 71904). While average sizes of NSO territories vary across its range; with larger territories in the northern portion, and smaller territories in the southernmost areas (USDI-FWS 2012 p. 71901), the appropriate scale at which to assess effects to provincial NSO home ranges, and core use areas, in the California Cascades and Klamath Provinces is 3,398 acres for the home range (or a 1.3 mile radius area around an activity center). This includes a 500-acre core/0.5 mile radius area. The NSO analysis also considered all effects to suitable (NRF), dispersal and capable habitats in the project area and in the Elk Flat LSR (Draft and Final BA, effects sections).

As it is not clear to which ‘500-acre analysis area’ the comment refers, it is also important to note that the proposed Rule on Revised Critical Habitat had recommended using 500 acres as the scale for Section 7 consultation effects to critical habitat. That recommendation was revised in the Final Rule where the FWS clarified that Section 7 consultation effects analyses to critical habitat, and critical habitat effects determinations, should be made “at a scale consistent with the localized biology of the life-history needs of the northern spotted owl (such as the stand scale, a 500-acre (or 200-ha) circle, or other appropriate, localized scale)” (USDI-FWS 2012 pp. 71888-71889, 71939, 71991, 72008). For the Elk LSR project, effects to critical habitat and the primary constituent elements were not based on a 500-acre analysis area, but rather the stand scale relative to designated critical habitat in the project area and current suitable habitat in the ST-215 NSO home range (Final BA pp. 81-89; Draft BA pp. 105-110).

The commenter also cites Seamens and Gutierrez (2007), suggesting that an analysis should be done at a scale of 400 meters out from a nest site. Utilizing this distance would result in an approximate 0.25-mile distance out from the nest (or activity center), and therefore a smaller area of analysis than that undertaken for the project. The project’s analysis of the ST-215 NSO core is based on a 0.5-mile 'circle' around the last verified nest site in 1990 (Draft BA p. 20; Final BA p. 19) and the last verified detections of a resident single NSO in 2003 (Ibid.); which is a 500-acre core area. The distance the comment recommends is: 1) less than the distance assessed, and 2) less than the distance recommended by research and literature for the California Cascades Province, and less than the distance recommended by the FWS. The analysis for effects to the ST-215 NSO core, and NSO critical habitat in the project area, are in accordance with the best available science on NSO territory use in this Province, and the recommendations set forth by the FWS.

Concern# 124 – NSO, ESA and Best Available Science

13-61 - We have noted in comments on the 2010 DRRP that additional research within the context of an adaptive management program should focus on both short- and the longer-term effects of fire on demography and habitat selection of spotted owls as well as on their prey. Management that reduces this burn heterogeneity could eliminate the benefits of foraging in burned areas. Until such information is available, the Service and land managers should take a conservative approach to managing forests to reduce the risk of fire. An example of a conservative approach could be a limit on the diameter of trees permitted for harvest within Critical Habitat, if any harvest is deemed necessary to protect towns and infrastructures or rare natural features from severe fire. For example, a diameter limit of 8 inches (20 cm) in the east Cascades and Klamath would reduce risk of severe fire without eliminating habitat elements important for the maintenance of current and the creation of future Northern Spotted Owl habitat. Thinning trees below eight inches is adequate to effectively modify fire behavior - above that and thinning is simply removing canopy cover with no added reduction in potential fire behavior (Omi and Martinson 2002, Martinson and Omi 2003, Stephens and Moghaddas 2005, Strom and Fule 2007).

13-61 - Furthermore, any harvest within Critical Habitat must be accompanied by pre- and post- treatment occupancy and reproductive surveys for Northern Spotted Owls to determine effects and provide data for adaptive management. Unfortunately, this does not appear to be the approach that is recommended by the Service to manage owl habitat in dry forests of the eastern Cascades, where as much as 70% of the landscape might be treated to reduce risk without a well-designed and funded research and monitoring program to evaluate the effects. We believe this was a major deficiency of the Recovery Plan and the strategy that evolved out of the Dry Forest Working Group, which overemphasized the risk aspects of forest fires without sufficiently considering either the potential benefits of high-severity fire or the adverse effects of forest restoration (i.e. thinning operations) on spotted owl habitat and their prey. Because much of the purported need to conduct "active forest management" in Critical Habitat in the East Cascades and Klamath
is based on the same unsubstantiated rationale in the 2011 Revised Recovery Plan. We are submitting the latest NSO Bibliography containing at least 15 new papers on NSO and fire since the RRP went into effect. Under the BSA the FS is required to consider the best available scientific information to date.

120. Response

The majority of the text in this comment is an excerpt from comments that the commenter submitted to the United States Fish and Wildlife Service on their 2010 Draft Revised Recovery Plan for the Northern Spotted Owl and is beyond the scope of this analysis. See also Response 124, 130 and 141 regarding active management. The Forest completed a review of the highlighted, new citations in the submitted bibliography, and cross-referenced the other literature in the bibliography with the analysis in the Draft and Final BA. A summary of findings for the highlighted, new papers is included in the project record, and is incorporated by reference. The Forest also utilized the majority of the other literature and included citations in the NSO bibliography in its effects analysis, as long as the information was relevant to this project.

Concern # 92 – NSO, ESA Status

13-45 - In April 2015 the US.FWS announced there was substantial evidence to warrant the uplisting of the NSO to "endangered" status under the ESA. That review is currently ongoing. The FS appears to not have considered this information in the development of the Elk LSR project.

121. Response

The Forest is aware of the FWS’s April 10, 2015 Federal Register Notice to complete a 12-month species status evaluation of the northern spotted owl, as required under the Endangered Species Act. This review would also serve as the five-year status review for the species, which was last completed in 2011.

The FWS evaluated a petition received from the Environmental Protection Information Center in August 12, 2012 and determined that the NSO was not warranted for emergency uplisting (September 27, 2012 response to petitioner). In April 2015, the FWS found that based on their review of the petition and sources listed in it, there was substantial information warranting further review. The FWS did not determine that an uplisting was warranted, as suggested in the comment.

A five-year status review evaluates whether a federally protected species should remain listed, or if it meets the criteria for reclassification and the FWS will not make any finding regarding a change in the status of the species until after that review. To date, this review has not been completed.

It is expected that during their review, the FWS will take into consideration the December 2015 meta-analysis for the NSO and the likely greater threat that barred owls pose to population recovery (Dugger et al. 2015); the latest 20-Year NWFP Monitoring Report on NSO Habitat and the risks that uncharacteristic wildfire, and other habitat disturbances, pose to NSO habitat (Davis et al. 2015); the ongoing experimental removal of barred owls and those results on NSO recolonization rates (various studies; Diller et al. 2016); climate change factors; West Nile virus and other avian diseases; and other best available science.

As described in the BA and EIS, the Elk LSR project design considered the Recovery Plan, the competitive interactions that can result when barred owls and NSOs overlap and the risks of habitat loss specific to the project area.

Concern# 106- NSO, Habitat Baseline

13-12 - the current configuration of habitat in the Elk LSR according to the DEIS is 25% plantations, 15% meadow, and 60% natural stands and 10% mixed conifer, 75% ponderosa pine, and 15% elk flat meadow. It would appear the 25% plantations also came from the suitable owl habitat listed in the chart above. A legitimate environmental baseline documenting habitat in the LSRA when it was written and what currently exists would help explain exactly what the FS has done in the ELK LSR in the past. These past actions have had significant impacts on NSO and their ability to recover.

122. Response
The comment describes the current configuration of vegetation types in the LSR, not habitat. The comment also refers to the initial Elk Flat LSR assessment and vegetation classification /acreage data that was prepared for the 1995 McCloud Flats Ecosystem Analysis (MFEA). The 1995 MFEA does not contain the best available data for the current conditions in the LSR, or even the conditions in the LSR when the 1999 Forest-wide LSRA was prepared.

When the 1999 LSRA was prepared, a cursory inventory of the area was made, which resulted in a description of larger areas as late-successional habitat. In years succeeding the document, as described below, more in-depth inventories of the Elk Flat LSR were conducted, resulting in a more accurate designation of mid-successional habitat.

The Elk LSR project area vegetation and NSO habitat conditions presented in the DEIS and supporting analyses are based on the 2007 Common Stand Exams (USDA-FS 2007), fuels sampling (2007, 2011, 2014) and numerous field reviews for wildlife and NSO habitat (Draft and Final BA methodology section and Appendix C; and Final BA Appendix E). See also Chapter 3 of the Draft (and Final) EIS and the methodology sections for Silviculture and Forest Health (DEIS p. 124), Fire and Fuels (DEIS p. 149), and Wildlife (DEIS pp. 158-160). The various resource reports also contain a more in-depth description of the methods, tools and data sources used to determine vegetation classes and NSO habitat in the project area.

As described in Responses 39 and 40, the 1995 MFEA was updated and superseded in the project area by the Edson Watershed Analysis (USDA-FS 2011), and more importantly, conditions in the LSR were updated in the 1999 Forest-wide LSRA. The baseline of vegetation and habitat conditions in the Elk Flat LSR when the 1999 Forest-wide LSRA was completed is in the Forest-wide LSRA (USDA-FS 1999 p. 124-129).

When comparing the amount of suitable habitat for NSO in the 1995 MFEA and its initial LSR assessment, the 1999 LSRA, and the NSO habitat typing for the project from 2012-2014 for the project, there are differences in the amount of suitable habitat (NRF), though not significant. As habitat was typed based on tree size and canopy cover in the past, and did not take species composition and owl’s use of species into greater account, it is not surprising that the amount of NRF habitat in 1995 and 1999 was higher (1553 and 1353 ac) than current conditions (1259 ac). There were also land purchases/exchanges to the north of the LSR in the ST-215 core area, and the treatments on private lands since 1995 have removed or downgraded habitat function in the home range in these areas. Mortality in portions of the LSR in foraging habitat (unit 346, which now functions as dispersal and would be underburned only) also had an impact. This area was treated under the Elk Salvage project to remove dead and dying trees, but did not impact suitable habitat function.

While projects in the larger watershed area may have included regeneration with green tree retention or other prescriptions that resulted in plantations, the Biological Assessments for those projects describe no effect to nesting/roosting habitat and degradation (maintaining) foraging habitat. This was usually because nesting roosting habitat was avoided for treatment, the habitat was not suitable, or the stands had extensive root disease and bark beetle mortality and no longer functioned as suitable habitat.

The comment also refers to baseline, and misinterprets the requirements of the environmental baseline under the ESA. The project-level Biological Assessment addresses the existing environment for NSO in the action area (see Section V of the Draft BA, and Appendix D of the Final BA).

The existing environment in the action area fully reflects the aggregate impact of all prior human actions and natural events that have influenced and contributed to the environmental baseline. It is the best representation of the species’ biological baseline relative to assessing project-related effects and can include other aspects as relevant to species level effects, such as the known or possible presence of competitors or predators (Draft BA p. 37; Final BA p. D1). The 1998 Consultation Handbook and 50 CFR §402.02 define the environmental baseline under the ESA as “the past and present impacts of all Federal, State, or private actions and other human activities in an Action Area, the anticipated impacts of all proposed Federal projects in an Action Area that have already undergone formal or early section 7
consultation, and the impact of State or private actions that are contemporaneous with the consultation in process” (USDI-FWS and NMFS, 1998 p. XIV).

The existing environment/existing condition for species affected by projects, revise plans or programs is assessed at the established spatial scale for the species’ action area, which is typically described in the Spatial Bounding section of project-level Biological Assessments. For the NSO, these assessments analyze if habitat would be degraded (function maintained), downgraded, removed or beneficially affected in the action area. For those projects where a likely to adversely affect (to either a species or its designated critical habitat) determination is made, the FWS (the agency responsible for maintaining the environmental baseline under the ESA) prepares a Biological Opinion, including an analysis of the environmental baseline in accordance with the ESA. For purposes of preparing a biological opinion under Formal Consultation procedures, the direct and indirect effects of an action on a species or its critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, are considered along with the environmental baseline and the predicted cumulative effects in order to determine the overall effects to the species or its critical habitat. This is fully described in Chapter 4 of the 1998 ESA Consultation Handbook and at 50 CFR §402.02. The environmental baseline covers past and present impacts of all Federal actions within the Action Area (USDI-FWS and NMFS, 1998 p. XIV).

The Forest considered the past, ongoing and future actions when describing the existing environment for the NSO, and gray wolf, in the project-level Biological Assessment (see Section V of the Draft BA, Appendix D of the Final BA and the cumulative effects section of the Draft and Final BA). The FWS is preparing a Biological Opinion and will address the environmental baseline, as required under the ESA.

Concern# 39 - NSO, Habitat Connectivity, LSRs, CH

13-111 - The CH subunit's function is to provide demographic support in an area of sparsely distributed, high quality habitat and federal land, and to provide population connectivity between subunits to the north and south. The NSO action area is 52% FS lands and 48% private lands that provide no suitable owl habitat, leaving only the 52% FS lands. The FS states that late successional habitat and old growth areas (there are none) don’t have to be connected because species can move across areas not in late successional habitat. The DEIS is silent on risks of predation when moving across areas that don't provide cover. The McCloud Flats does not provide adequate connectivity habitat because it has been unsustainably logged for decades as the cumulative effects table and maps show despite the FS lack of analysis.

13-17 - The DEIS failed to include an analysis of connectivity for NSO between these LSRs. The RRP requires this analysis. Furthermore, NSO forage out to 15 miles and in order to ascertain connectivity, prey, and security needs this analysis must be conducted. The FS keeps logging each individual LSR and continually fails to take the hard look at how each LSR is supposed to work with the others to recover the NSO.

13-33 - According to the MFEA the LSRs and the MLSR within and adjacent to the landscape were designed to support seven pairs of spotted owls. The nesting and occupancy status is four pairs and one single of the seven projected. The Mud Creek Owls were present in 1994 and are in the focus area; the Kinyon owls were present in 1994 and nesting in 1995; the Whiskey owls were present in 1994 and 1995; the Intake owls were present in 1994; the single Cold Creek owl was present in 1993. The FS does not include information on these territories because it fails to consider connectivity of LSRs in the McCloud Flats. It also fails to emphasize the importance of the local population of owls to overall recovery.

13-47 - Unit 8 Subunit 3 -East Cascades (ECS-3) totals 112,179 acres and includes the Shasta Trinity, Modoc and Klamath NFs. Its function is to provide demographic support in an area of sparsely distributed, high quality habitat and Federal land, and to provide population connectivity between subunits to the north and south. There are 720 acres of CH in the Elk LSR proposed alternative and 624 acres would be logged (87% of the total project area). This subunit's function is to provide demographic support in an area of sparsely distributed, high quality habitat and federal land, and to provide population connectivity between subunits to the north and south.
123. Response
Discussion of connectivity between the Elk Flat LSR and neighboring units can be found in the project preliminary biological assessment (Prelim. BA, pp. 13-14). Additionally, the RRP is not a regulatory document, but a document generated to provide recommendations to land managers (RRP, p. I-3). While the distance NSO forage may vary by region and available habitat, the commenter does not provide a source to support their claim that NSO forage up to 15 miles. The Forest analyzes effects to all known NSO activity centers located within the action area, which included only the ST-215 activity center (Prelim. BA, pp. 18-20). Approximately 629 acres of critical habitat PCRs will be treated under the proposed action, which comprises 17% of the project area (Prelim. BA, p. 130). While the Forest does not administer private lands, there was a comprehensive habitat typing completed for the action area, which includes suitable habitat on adjacent private lands (Prelim. BA, Map 4). Each NEPA project produced by the Forest includes a cumulative effects analysis, as does this project (Prelim. BA, p. 125-128).

Concern# 38 – NSO, Habitat, Active Management Effects

13-129 - This section fails to include any peer-reviewed scientific journal articles by Monica Bond who has published more papers on spotted owls than other scientist. It fails to include recent works by Dr. Derek Lee, Dr. Dennis Odion, Dr. William Baker, and Dr. Chad Hanson - all scientists who have studied NSO and published papers. We have sent these papers to the FS in the past and they continue to ignore it because it doesn't support the unsustainable logging of owl habitat. We are including the latest NSO Bibliography that includes all recent papers that have been published since the 2011 RRP. The FS must analyze this information as required by the best available science standard under the ESA.

13-66 - We are unaware of any science (let alone extensive science) that shows active management, including logging, is required to produce the desired conditions or variety of stands of trees for owls particularly given that there has yet to be a single empirical study of active management on spotted owls, prey, or barred owl invasions and the owl was listed in the first place due to habitat destruction caused by logging. These types of politically motivated statements underscore an ongoing lack of scientific credibility in the agencies’ planning processes that unfortunately continues to hamper its ability to use or even properly explain the best science. While active management is listed in the RRP, the RRP also states it will be revised when new information becomes available. That information is available now and the FS is required to use it under the best available science standard in the ESA.

13-67 - The FS continues to mischaracterize alternative positions on management as based on “the fallacy of passive management,” when, in fact, we have repeatedly stated in published papers (see Hanson et al. 2010) and our prior comments that we would support active management that was consistent with owl conservation provided it were tested first on a small scale with sufficient controls and replicates what FWS is aptly doing with the barred owl removal experiments. Hanson et al. (2010) recommend road closures and road obliteration to reduce anthropogenic fire ignitions and appropriate wildland fire response that includes let burn policies (a mix of passive and active restoration). Owl biologists also state that a prohibition on post-disturbance logging (passive) may in fact be a bigger conservation gain to owls than any of the active management provisions - yet this too is largely ignored by the FS.

13-68 - The FS assumes the effects of active management are short-lived and therefore consistent with owl conservation in stating "....actions with some short-term adverse impacts to spotted owls and critical habitat, but whose effect is to conserve or restore natural ecological processes and enhance forest resilience in the long-term, should generally be consistent with the goals of critical habitat". Citing the recovery plan, the FS often states that silviculture prescriptions that approach ecoforestry principles to address the conservation of broader ecological processes are compatible with maintaining critical habitat essential features in the long-term. This type of overstating of active management’s benefits and understating of its potential consequences is prevalent throughout the Elk LSR DEIS and widely endorsed by the FS as best science when in fact it is a testable hypothesis lacking empirical evidence.

13-69 - The FS also has failed to produce any peer-reviewed documentation on whether thinning is truly as benign as assumed given extreme reductions in basal area under the ecoforestry provisions of Johnson and Franklin (2009) and may likely impact owl habitat more than assumed. The agency is approving such projects on Forest Service lands without the upfront benefit of comprehensive monitoring studies and this is risky business for a threatened species proposed for uplisting to endangered status.

13-71 - Complex early seral vegetation is generated by natural disturbances such as fire and insect outbreaks (Swanson et al. 2010), the very disturbances that the FS is looking to minimize or dampen through active management. In addition, this highly rich pioneering stage is often a rarity on unprotected lands because it is most often logged post-disturbance. In general, there is a consensus among scientists that post-disturbance logging is incompatible with natural successional processes (Lindenmayer et al. 2004, Donato et al. 2006, Hutto 2006, Beschta et al. 2006, Karr et al. 2006, DellaSala et al. 2006, Lindenmayer et al. 2008). It also
likely impacts Owls more than the fires themselves (Clark 2010 and Monica Bond 2015). Therefore, the
primary threats to complex early seral at this time are two-fold: (1) the desire by the FS to manage fires so
they are of lower intensities (thereby increasing fire suppression effects and homogenization of the fire-
habitat mosaic); and (2) a lack of strong prohibitions on post-disturbance logging.
13-72 - The agency instead emphasizes active management to mimic natural disturbance processes through
patch cuts and thinning. However, these do not mimic fire mosaic spatially or temporally (especially with
respect to legacies) that characterize dry forest provinces. Instead, active management to dampen fire
severity could result in novel ecosystems as more areas are transformed to low severity fire or experience
no fire for unusually long periods due to suppression and thinning (see Hutto 2008 for similar ecosystem
concerns).
13-78 - The FS offers no guidance or standards regarding assessing impacts of fuel treatments on owls. The
agency instead assumes localized treatments in foraging PCEs, for instance, are likely to be minor yet this is
akin to leading the witness. The agency has no data and no monitoring studies in support of this assertion.
The FS also assumes that if impacts are small in scale relative to the size of the unit then such impacts are
pot likely to adversely modify habitat. This assertion ignores cumulative effects of multiple projects that might
on face value appear individually insignificant but accumulate across the larger landscape triggering a
threshold response.
13-80 - Despite the U.S. Fish & Wildlife Service’s (FWS) revised recovery plan for the northern spotted owl using
the best available scientific information at the time, the portion relating to “active forest management” is
based on fundamentally flawed assumptions (“ecoforestry” or thinning) derived from untested provisions.
These assumptions are: (1) fire is bad for owls; (2) fire severity is increasing in the owls’ range; (3) thinning
is a remedial measure whose benefits outweigh larger impacts from fire; and (4) logging in mature forests is
needed to create early seral forest and foraging habitat for owls and other species. Below we provide the
best available science on owls and forest ecosystems to counter these assumptions:
13-84 - Thinning in Suitable Owl Habitat Will Degrade NOT Restore Owl Habitat - FS incorrectly assumes that
thinning is a short-term impact to owls and such impacts are less detrimental than impacts from wildfires.
However, the only published empirical study of thinning on spotted owls documented habitat use shifting
away from the thinned stands.
13-87 - Recommendation: Before thinning is employed over large landscapes, FS should: (1) conduct
comprehensive studies of thinning effects on spotted owls, prey, and barred owl invasions using pairwise
comparisons (controls, thinned) over small and replicable landscapes; and (2) release an Environmental
Impact Statement to determine a range of alternatives that better present the science.

124. Response

The recommendation at the end of the comment is noted. See also Response 141 (to Concern 34)
regarding NSOs and use of burned landscapes and Response 130 (to Concern 176) on thinning effects and
NSO habitat.

As defined on p. 261 of the DEIS, resilience, in the context of the analysis conducted for the Elk LSR
Project, refers to the capacity of an ecosystem to not only accommodate gradual changes but to return
toward a prior condition after disturbances including fire, extreme weather events, and climate change.
Ecologically healthy and resilient landscapes, rich in biodiversity, will have greater capacity to adapt and
thrive in the face of natural disturbances and large-scale threats to sustainability, especially under
changing and uncertain future environmental conditions such as those driven by climate change and
increasing human use. The chapter 3 silviculture and forest health section (DEIS pp. 124-127) and
wildlife section (DEIS pp. 165, 172-176) discuss increasing resilience in terms of the known effects that
thinning treatments have on individual remaining trees as well as maintaining and enhancing legacy
structures such as predominant sugar and pine and other species, large snags and large down wood.

The project is not a Forest Service research project, and therefore is not intended to prove any particular
theory or practice. The analysis conducted and summarized in the DEIS and FEIS (and the incorporated
reports, surveys, tree growth and fuels modeling) demonstrates that post-treatment tree health, vigor and
forest structure will improve and enhance the LSR’s forest stands resilience to wildfire and other stressors
(drought, disease, insects). Treatments are focused on a set of management objectives for fuels, including
reducing woody surface fuels, ladder fuels, and crown densities, and retaining large trees of fire resistant
species (DEIS p.172). Reducing woody surface fuels helps reduce the potential for surface fire intensity
(heat release), flame lengths and fire severity (Lehmkuhl et al. 2015). Reducing ladder fuels can also
disrupt vertical continuity of fuels and reduce the probability of surface fire transitioning to crown fire.
Retaining large trees of fire-resistant species in seeks to maintain stand structural and compositional stability by keeping existing trees that are most likely to persist through future fires and retaining seed sources that facilitate regeneration of fire-resistant species.

As described in the DEIS at pp.172-173, the Revised Recovery Plan for NSO discusses silvicultural practices that promote forest resilience that can be applied to various forest types. Short-term decisions to increase a forest ecosystem’s ability to adapt to climate-driven drought stresses may include vegetation management around older individual trees to reduce competition for moisture. Longer-term strategies may include promoting heterogeneity among and within forest stands. In many areas, fire could be encouraged to perform its ecological role of introducing and maintaining landscape diversity, though it may be desirable to manage fire severity or return intervals through vegetation management at various temporal and landscape scales (USDI-FWS 2011 p. III-21). As described at p. 172 of the DEIS (and in the Draft and Final BA), variable-density thinning is a silvicultural technique intended to promote biological diversity and structural heterogeneity characteristic of old-growth forests, it induces fine-scale variation in homogeneous second-growth forest canopies (Aukema, et al., 2008; Muir, et al., 2002). It consists of thinning a forest stand at different intensities in patches at a scale of approximately 0.1 to 0.5 hectare to mimic the scale of patchiness found in old growth and late-successional forests and create a mosaic of overstory and midstory tree densities (Carey 2003; Carey et al. 1999). Retaining large trees of fire-resistant species also seeks to maintain stand structural and compositional stability by keeping existing trees most likely to persist through future fires and other disturbances and retaining seed sources to facilitate regeneration of these species (Franklin et al. 2013, 2007). Retaining and promoting patches of dense trees, understory trees, hardwoods and canopy gaps that provide sunlight and growing space for a second cohort, shrubs or herbaceous plants on the forest floor also contributes to heterogeneity.

Irwin and others (October 2015) describe that “…recent research indicates that spotted owls often hunt for prey or may nest in relatively young or mid-seral forest stands that were thinned or partially harvested in previous decades, but little information has been available to evaluate short-term direct responses (<5 year) by spotted owls to such practices.” Their study evaluated nocturnal use of areas two years before and two years after thinning occurred (within 1200 meters or 0.75 miles of nest sits) of nest sites for California and Northern spotted owls in western Oregon and northern California. They found that prior to thinning/harvest, radio-tagged owls generally used stands scheduled for treatment in proportions significantly less than their availability and that after thinning/harvest, selection ratios increased ( n = 4), remained the same ( n = 4), or decreased ( n = 2) among 10 owl pairs for which they acquired sufficient telemetry data before and after treatments. They found that across all owls and all post-harvest conditions, overall selection ratio increased after thinning/harvest, suggesting that many of the treatments were benign or may have resulted in improved habitat. While the authors did not obtain information on prey abundance or foraging efficiency, their study suggests that judicious applications of partial-harvest forestry, primarily commercial thinning, have the potential to improve foraging habitat for spotted owls. They found that the probability of use of thinned or partially-harvested stands increased with the size of the harvest-unit, decreased with distance from nest sites, and varied with the intensity of harvest. They found that thinned/harvested stands that contained 25-35 m2/ha (110-150 ft2/ac) basal area of midstory trees were more likely to be used (Irwin and others 2015; DEIS p. 179; Draft BA pp. 49, 79-80. 106, 112).

As described in the DEIS (pp. 171-180), the predicted effects to NSO habitat are based on a comparison of pre-treatment stand and habitat conditions, the modeled immediate and 20-year post treatment stand conditions, and the project design and marking guides that maintain important habitat elements. Conclusions regarding post-treatment habitat function are supported by published descriptions of forest structure associated with NSO habitat in dry forest types and local monitoring data (also described in the Draft BA pp. 72, 47-53; and Final BA Appendix D). Also as described in the DEIS (pp.175-176), approximately 57 percent of the existing or capable habitat for NSO in the Elk Flat LSR would be improved over the 20-year modeling period post-treatment. The treatments are considered consistent with the ecological forestry principles discussed in the Recovery Plan and 2012 Final Critical Habitat Rule where long-term NSO recovery will benefit, even if short-term impacts may occur (Franklin et al. 2006).
The treatments are proposed to improve the resiliency of the landscape in light of the threats to NSO habitat from the existing risk conditions in the project area that have been exacerbated by prolonged drought. The treatments are intended to promote spatial heterogeneity within patches, restore underrepresented species (oak, aspen, Douglas fir) and structural diversity. While some of these management actions may degrade habitat in the short-term, they are considered beneficial in the long-term as they would reduce future losses of ecosystem structure or result in a higher resilience to future disturbance events (USDI-FWS 2011 p. III-14).

Concern# 37 - NSO, Habitat, Baseline

13-11 - What happened to this suitable owl habitat (F/RIN) and why is there no Environmental Baseline to document the loss of this habitat as required under the ESA? The FS now claims approximately 1,500 acres (54%) of the land is capable of producing late successional forest and currently consists of mid-successional forest of dense, overstocked stands that are near or exceed site capability. The LSR Assessment documented 58% late successional habitat but in very different configurations as cited above. The DEIS seems to imply that all of the acreage listed in the table above was logged and turned into plantations. The FS must account for these past actions that violated the FOREST PLAN and the LSRA.

13-131 - The FS did not conduct a cumulative effects analysis under NEPA Instead it claims the current landscape represents the current landscape. This is a violation of NEPA, ESA and fails to account for an Environmental Baseline under the ESA. Appendix F contains about 6 pages of past, ongoing and foreseeable FS and private 1HP projects. Virtually every acre of the McCloud Flats has been logged at one time or another and all of the LSRs and designated critical habitat have been entered over the years. We included a map of timber sales we have been involved in on the SMMU since 2004 and all of them are in LSR/CHU. Simply claiming all this logging represents the current landscape fails to analyze the impacts to species and habitat. Some of the projects in Appendix F are in the Elk LSR project yet not analyzed for cumulative effects. We also call attention to the map on page F-8 that documents the amount of logging we just described. Map F-2 shows ongoing projects. All of this logging has detrimentally impacted the NSO and its habitat. It is clear the FS has done nothing to work towards the recovery of the NSO, instead an argument could be made for a path to extinction. The FEIS must include a legitimate cumulative effects analysis under NEPA and the ESA, as well an Environmental Baseline documenting all of these projects and the cumulative impacts to owls and their habitat.

13-32 - The DEIS describes a historical and current landscape that other documents the FS is relying upon contradict. The McCloud Flats Ecosystem Analysis (MFEA) was written in 1995 and last updated in 2004. This document provides a more detailed historical perspective of the area that the DEIS appears to ignore, misconstrue or misrepresents. The following information was taken from the MFEA. We include it because it documents that only 15 years ago there were numerous spotted owls and adequate N/R/F/D habitat in the McCloud Flats to sustain them. That habitat has been logged and the owls have disappeared. The STNF has continually failed to work toward recovery of the owl; in fact it would appear it has taken a management course that forces the NSO into extirpation and extinction by logging its mixed conifer habitat in the Matrix, LSR, MLSA, and designated critical habitat and replanting it with ponderosa pine -a species the owl does not prefer and that is most susceptible to disease and long term maintenance. We have included many of these large timber sales since just 2004 in the SMMU map we included with our scoping comments. It is important to note these comments are not outside of the scope of the Elk LSR project. The FS relied on the MFEA in this analysis, and Elk Flat is just one more timber sale that logs LSR and designated critical habitat. It is a connected action and a cumulative impact when combined with the all the other timber sales in the McCloud Flats.

13-36 - The focus area may be able to provide one pair of owls in the Mudflow MLSA, one pair in the Elk Flat riparian canyon or one pair on Black Fox Mountain. In reality, all of these owls did exist at one time along with other owls not mentioned. However, as we noted in one of the maps we included with our scoping comments, the STNF has had an aggressive timber sale program in the McCloud Flats and has logged virtually all of the owl habitat needed by the Mud Flow owls (Mud Flow timber sale); Elk Flat owls (Pilgrim timber sale); McCloud River riparian canyon (Algoma timber sale); and Black Fox Mountain (Porcupine and Harris timber sales).

13-53 - The DEIS claims the Elk Flat Proposal is just a tiny piece of the overall subunit. That is an invalid argument. Since this subunit covers the Shasta-Trinity, Modoc and Klamath and there have been literally dozens of timber sales on each forest since the 2012 CH Rule, the FS/FWS should disclose how much critical habitat has been logged in the subunit in a valid Environmental Baseline. The only way to determine if Jeopardy is occurring is to disclose this information. We already know the NSO population is plummeting yet the FWS continues to authorize take of the species; most recently 100 owls in the westside salvage sale on the Klamath- in the same CH subunit. Simply claiming the Elk LSR project isn't harming the overall subunit has not been proven.
14-20 - The presence of barred owl in the Action area makes it especially relevant to accurately evaluate and include potential cumulative effects of the Project, addressing past, present, and future Forest activities. Lamberson et al. (1992) evaluated effects of habitat loss due to timber harvests, where a sharp shift threshold value for the minimum habitat requirements were indicated, at which time spotted owl population viability plummeted. With such a small margin for error, habitat requirements strained by the presence of barred owl and past timber sales, must be even more cautiously evaluated. In results of their study of site characteristics of spotted owls and barred owls, Pearson and Livezey (2003) suggest that a combination of habitat loss due to timber harvest and the presence of barred owls may work synergistically to put spotted owl pairs at risk of losing their territories. Reiterating the need to develop an understanding of the baseline population and how the Project may impact the spotted owl, an accurate and comprehensive evaluation of all actions need to be incorporated into the analysis.

14-3 - A baseline must be established and is essential to evaluate potential effects of treatments on individuals, the local population and its context within the NSO provincial population recovery unit.

125. Response

See Response 122 regarding the environmental baseline under the ESA, the BA Appendix D fully describes the existing environment for NSO in the action area. See response 39 and 40 regarding the MFEA. The cumulative effects analysis is complete under the ESA and NEPA. See Chapter 3 and the BA.

Concern #75 - NSO, Habitat, Capable

13-114 - See Table 57 for suitable acres of dispersal habitat and capable habitat. Again capable habitat is not usable until such a time as it becomes dispersal. There is less than 800 acres and that include "capable" habitat. The FS should split out the dispersal from the capable so the public knows exactly how much dispersal habitat exists.

126. Response

It is unclear what the commenter is asking. Table 57 in the DEIS includes separate acreages for both NSO dispersal habitat and NSO capable habitat (DEIS, pp. 167-168). Additionally, suitable habitat is defined in the DEIS and Draft Biological Assessment as nesting, roosting, and foraging habitat. Suitable habitat does not include dispersal habitat, capable habitat, or non-habitat (DEIS, p. 161; Draft BA, pp. 6, 48-52). The older (40+ years), dense, monotypic ponderosa pine plantations are considered capable of transitioning to dispersal or lower quality suitable foraging habitat for NSO (and other species) over the short and long term (with treatment) given their age and that they contain some level of remnant mixed conifer stand or patches (Draft BA, p. 52). One of the reasons capable habitat was included was to help evaluate the effects of the alternatives in moving capable habitat toward dispersal/suitable habitat. DEIS Table 57 indicates there are 335 acres of capable habitat in the action area and 331 acres in the project area. The project would improve capable habitat on 317-329 acres (DEIS pp. 106, 174).

Concern #102 – NSO, Habitat, Critical Habitat

13-48 - DEIS pages 101-104 show NSO designated critical habitat PCE1, PCE2, PCE3 and PCE4 and states 624 acres will be logged in one owl activity center. Habitat will be degraded and downgraded in core areas and home ranges. It conceives "short term adverse effects to PCE3 but Meets final CH rule recommendations on most acres." This means it violates the RRP on some acres. While the DEIS claims this project will improve habitat in the long-term it minimalizes the impacts in the short term to a species that is going extinct and needs habitat now - not 100 years from now. The FS even included 13 acres of designated critical habitat as landings that will result in complete removal of habitat. This removal was not analyzed.

127. Response

Note that the FEIS and the Final BA have been revised to summarize and analyze effects to 629 acres of PCEs of critical habitat in the project area. No suitable habitat (NRF) will be removed or downgraded in a core; and no dispersal habitat would be removed in a core (Draft BA Table 32, Final BA Tables 26, 30).

Both the Recovery Plan and 2012 Final Critical Habitat Rule recommend active management in the California Cascades in a manner that reconciles overlapping goals of NSO conservation, and response to climate change and restoration of the dry forest ecological structure, composition and processes, including wildfire and other disturbances. The Final Rule describes that in the drier, more fire-prone regions of the
NSOs range, habitat conditions will likely be more dynamic, and more active management may be required to reduce the risk to the essential physical or biological features from fire, insects, disease, and climate change, as well as to promote regeneration following disturbance (Draft BA, pp. 38-39). The Recovery Plan also describes that short-term impacts to provide for long-term benefits may occur, and that “land managers should not be so conservative that, to avoid risk, they forego actions necessary to conserve forest ecosystems necessary to the long-term conservation of the spotted owl. But they should also not be so aggressive that they subject spotted owls and their habitat to treatments where long-term benefits do not clearly outweigh short-term risks. Finding the appropriate balance to this dichotomy will remain an ongoing challenge...” (Draft BA p. 9).

The BA fully describes the Section 7 consultation, how recommendations for dry forest management were used to develop silvicultural treatments, and how the project meets the dry forest restoration principles (Draft BA p. 9; Daft and Final BA Appendix C). The Recovery Plan advocates "action in the face of uncertainty" for the simultaneous maintenance of habitat and active management for long-term benefit (USDI-FWS p. II-2; Draft BA p. 105). For that reason, and in keeping with the intent of the Recovery Plans guidance for dry forests, and Recovery Action 32, no mechanical treatment will be performed in PCE 2 or high-quality PCE 3 habitat. Lower-quality PCE 3 and PCE 4 habitat will be treated in order to reduce risk of habitat loss and develop better-quality habitat over time (Draft BA pp. 72, 106). See also Responses 117, 99 and 115 (to Concerns 160, 63, and 43) regarding the likely function of the ST-215 home range and the Elk Flat LSR in terms of contributing to NSO recovery.

The BA assesses effects to NSO, suitable, dispersal and capable habitat from all treatments proposed under Alternative 1 (BA NSO Effects sections) and the EIS (Chapter 3 NSO section) summarizes these effects, describing effects for other action alternatives and no action (DEIS pp. 168-186; FEIS Chapter 3 NSO section and Tables). The analyses include predicted effects to NSO prey from variable density thinning and subtreatments, piling/burning piles, and underburning. Effects from new temporary roads, landings and road decommissioning area also assessed (see the Interrelated and Interconnected Actions section of the BA). The prioritization for treatment of the ST-215 home range under Recovery Action 10 guidance is fully described (Final BA pp. 9, 69-72 and Appendix C pp. C4, C6 to C7). The project was also designed to meet recommendations under Recovery Action 32 (Final BA pp. 9-10, 22, 38, 50, 56, 61, 82 and Appendix C pp. C6 to C7). This meets Forest Plan standard and guideline 25h to “Maintain and/or enhance habitat for TE&S species consistent with individual species recovery plans” (Forest Plan p. 4.30).

The project treatments are not expected to significantly or appreciably reduce the function of suitable (NRF) or dispersal habitats or habitat connectivity at the NSO action area, project area or ST-215 home range or core scales, or significantly affect the ability of NSO to forage or disperse across the landscape. All treatments, despite removing, reducing or disturbing components of PCEs, are considered a short and long term improvement to the existing habitat conditions. They affect less than one percent of the ECS-3 subunit and would not significantly reduce the value of primary constituent elements of critical habitat (Draft BA pp. 112-113).

In the NSO action area, there are 794 acres of critical habitat in the ECS-3 subunit (East Cascades South). 720 acres are in the project area, and is entirely within the ST-215 home range (DEIS pp. 166, 168; Draft BA p. 59). Of that, approximately 629 acres of critical habitat will be treated under the proposed action. Effects to critical habitat are analyzed in the BA (Draft and Final BA critical habitat sections), as are the effects to the one ST-215 NSO core and home range (Draft BA pp. 93 102; Final BA pp. 69-77). Effects to PCE1, PCE2, and PCE4 would be beneficial, discountable or insignificant (Final BA pp. 82, 85; FEIS Chapter 3 NSO section).

There will some short-term minor adverse effects on 224 acres of PCE3, and a longer-term effect on 46 acres of PCE3 (Final BA p. 89). There would be long-term beneficial effects on all acres of treated PCE3, with treatments resulting in a greater assurance of long-term maintenance of suitable foraging habitat (Final BA pp. 83-84). As described in the Final BA (p. 84), “While treatments [in PCE3] would result in
both a short and long term beneficial effect to NSO habitat and critical habitat, they are not considered insignificant or discountable in the short term. These effects would occur in 82% of the PCE3 in the project area, in a home range that is 59% on private lands and currently below the recommended levels of suitable habitat to better support survivorship and productivity (37% suitable in the total home range; 69% in the core but with N/R habitat at half the recommended amount in the core; see [Final BA] Table 35). While there would be short term and minor adverse effects to components of PCE3 and prey base, the larger proportion of suitable habitat on NFS lands at both core and home range scales, all critical habitat being designated on NFS lands, and the management direction for the Elk Flat LSR (contrasted with past and ongoing private lands management) affords an opportunity to positively affect structural and compositional changes in the components of PCE3 over the long term, increasing its resilience and long term capability to support NSO life history functions. Also, while the effects of degrading and downgrading a small proportion of foraging habitat may not significantly affect the activity center in the action area, the currently unoccupied habitat is expected to provide a key area for dispersing juveniles and subadults or non-territorial NSOs. Therefore the value of the current suitable and critical habitat in the project area, home range and action area is considered important to any NSOs that may use it in the future (Dugger et al. 2009, Forsman et al. 2012; USDI-FWS 2011, 2012).”

All treatments in critical habitat contribute positively to the overall function of the ECS-3 subunit, which is to provide demographic support in an area of sparsely distributed high-quality habitat and Federal land, and provide for population connectivity between subunits to the north and south. The project would not result in a measurable change in the ECS-3 subunit’s ability to provide the functions for which it was designated (DEIS pp. 178-179; Final BA p. 89; Draft BA, p. 113).

Treatments in PCE3, and other PCEs of critical habitat, have been carefully designed, through consultation with the FWS and Interdisciplinary Team involvement, to maintain important elements of critical habitat such as large trees and snags, down logs, under and midstory layering and broom structures, and per the project’s resource protection measures, will be implemented in a manner that minimizes the short-term negative impacts. The project’s short term adverse effects are balanced with the long term beneficial results (Draft BA p. 113).

Effects of proposed landings in critical habitat are discussed in the BA, and effects are not considered to be significant at the stand level (Draft BA pp. 109-110). Proposed landings will not be placed in PCE2 or high-quality PCE3 habitats (Draft BA, p. 109). There is an approximate need for 17 new landings in critical habitat, ranging from 0.5 to 0.75 acre (up to 13 acres total; 4.5 in PCE1 and 8.25 in PCE3). These effects are widely dispersed and are considered insignificant at the stand level and immeasurable at the landscape scale. The created openings would not preclude an owl’s ability to utilize the habitat and would not alter the function of existing habitat at the stand or landscape level. These openings would affect about two percent of the critical habitat in the project area (Draft BA pp. 109, 132).

With the project, 92 of the total suitable habitat in the project area would remain suitable post-treatment (with 100% pre and post NR and high-quality foraging habitat), and 100% percent of the dispersal habitat would remain as dispersal habitat due to an additional 57 acres. There would be long term increases in both suitable and dispersal habitat at the ST-215 core, home range and project area scales (Final BA Table 30; see also Response 99.

Concern# 42 - NSO, Habitat, Dispersal

13-44 - What is the amount of dispersal habitat (11-40 and above) in each ROD land allocation within the watershed? Including reserves and matrix, 18,162 acres provide dispersal habitat over 43% of the watershed. Dispersal Habitat ROD Alloc. All reserves Matrix CHU Acres 4,644 11,793 Matrix not CHU 1,725 PVT none What are these figures today?

13-50 - 179.5 acres of dispersal habitat will degraded and 41.5 acres will be removed.

13-106 - 990 acres degraded; another 608 acres thinned; may affect determination. The FS claims it is "improving" 2,018 acres over 20 years. The DEIS states direct effects to individual late successional species (NSO, goshawk and fisher) are not expected because they can simply move away to a different
area. This idea fails to consider carrying capacity of other areas and whether they can absorb additional animals and fails to account for the lack of connectivity for animals to disperse to other areas.

128. Response

The first part of comment 13-44 above is a direct quotation/question from the 1995 McCloud Flats Ecosystem Analysis that addresses the dispersal habitat within the watershed area. See Response 39 and 40 regarding the MF EA and how in the project area, it was replaced by the 2011 Edson Watershed Analysis. The request for watershed level dispersal habitat of 11” DBH and 40 percent canopy cover (past generic description of dispersal habitat) is not relevant to the decision to be made. As described in the BA for NSO, dispersal habitat is generally considered adequate if about 50% of the assessed landscape meets the 40% canopy/11-inch DBH tree conditions described by Forsman et al. 2002, Thomas et al. 1990 and USDI-FWS 2012 (Draft BA p. 51). This is a narrow definition as it does not recognize that in order for NSOs to successfully move across a landscape, and eventually occupy a territory, dispersal habitat must also be in proximity to suitable foraging and roosting habitat (USDI-FWS 2011 p. A-8; Draft BA p. 51). However, Appendix H of the DEIS (pp. H-26 to H-29) and FEIS summarize vegetation seral stage classes and diversity at the project-level watershed area (Ash Creek 5th field watershed). Utilizing the 3b, 3c, 4b and 4c seral stage classes (medium and large tree/>40% canopy closure) from DEIS Table Appendix H-2 as a proxy for total dispersal habitat, inclusive of nesting, roosting, foraging and dispersal, it is estimated that the Ash Creek 5th field watershed may have 52,487 acres of dispersal habitat (~66% of the watershed).

The analysis completed for the project and existing environment for NSO in the action area, which is relevant to the decision to be made, is described in the DEIS (pp. 158-168; Table 57) and the Draft and Final BA (Bounding section). The Final BA tables and text in Appendix D (pp. D20 to D24) display and describe NSO dispersal habitat in the action area, project area, ST-215 home range and core, treatment unit, and Elk Flat LSR scales. The NSO action area consists of NFS and private lands. About 47% of the action area provides dispersal habitat inclusive of suitable NRF and dispersal-only habitat. This is below the 50% level typically used to evaluate the dispersal capability of a landscape and is primarily due to the natural stands and plantations of ponderosa pine and open meadow conditions in the eastern and southeastern portions of the action area (and project area) that preclude development of suitable or dispersal habitat (DEIS pp. 167-168, Draft BA p. 56; Final BA p. D21).

Comment 13-50 reiterates the NSO dispersal habitat acres that would be affected by the project treatments (acres treated and function maintained; and acres removed). Approximately 301 acres of dispersal habitat will be treated (DEIS p. 168; Draft BA p. 87). Of those acres, approximately 180 acres would be modified but habitat function would be maintained post treatment (~degraded). Dispersal function would be removed on about 41 acres from variable density thinning combined with radial thinning around legacy pine. The treatments that modify and maintain 180 acres of dispersal habitat are not expected to preclude habitat function or significantly affect the ability of NSOs to disperse across the project area or action area. This treatment represents approximately 57 percent and 5 percent of the dispersal-only habitat in the project area and action area, respectively. At the project scale of all dispersal habitat (NRFD), it affects 11 percent (Draft BA p. 130). Treatments that remove 41 acres of dispersal habitat are intended to protect the predominant, legacy sugar and ponderosa pine; important components of late-successional habitat. This treatment affects 13 percent of the dispersal-only habitat in the project area, 3 percent of all dispersal habitat in the project area, and less than one percent in the action area (Draft BA p. 130).

Comment 13-106 also reiterates the amount of suitable fisher habitat that would be thinned and function maintained (990 acres), with 608 acres of capable habitat also treated and transitioned toward suitable habitats for fisher. There is no claim in the DEIS, biological evaluation or other wildlife resource reports that states “direct effects to individual late successional species (NSO, goshawk and fisher) are not expected because they can simply move away to a different area.”
As described in the Draft BA, “Direct effects are the direct or immediate effects of a project activity on a species or its habitat; including effects of interrelated and interdependent actions. Direct effects are generally described as those that result in physical harm, death or the disruption of reproductive attempts during project implementation or near occupied habitat but also include effects to habitat structure or function. Indirect effects are those caused by the proposed action that occur later in time, but are still reasonably certain to occur [50 CFR §402.02] (Draft BA p. 66). Also as described in the preliminary Biological Evaluation for sensitive wildlife species (p. 26), “Direct effects are those that result in direct mortality, physical harm, or disruption of reproductive attempts during project implementation, or near occupied habitat, and direct changes to suitable habitat components. Indirect effects are those that occur later in time, but are reasonably certain to occur.”

The DEIS describes the indicators of ‘effect’ for wildlife (DEIS pp. 160-161, Table 56) and the bounding used (DEIS pp. 162-164). While DEIS (p. 169) describes that “Adult and sub-adult NSOs and goshawks, and adult fishers are mobile and able to move away from disturbances (noise from heavy equipment use; falling of trees; smoke from pile burning or underburning; noise from road actions and hauling of logs and/or chips)”, this is in direct relation to the discussion for why LOPs during critical breeding periods are proposed and important. This section further states that: “These stressors have a higher likelihood of affecting adults, juveniles and kits during the breeding season however, when adults are closely associated with a core, territory or multiple natal and maternal den sites. Juvenile NSOs and NGOs are not yet able to fly, and fisher kits are not mobile enough to travel with their mothers until about 4 months of age (Aubry and Raley 2006). Adults expend high amounts of energy defending their territories during the critical breeding periods (typically extending from February 1 through 1) the end of July for fisher; 2) mid-August for NGO; and 3) mid-September for nesting NSOs. The LOPs and other measures developed in coordination with the FWS, and the IDT, are expected to minimize, if not eliminate, the likelihood that project activities will have direct effects on single and/or breeding NSOs, goshawks, fisher or their young. The project also includes provisions for limiting activities in the event of any new discoveries. Smoke from pile burning and underburning may cause foraging or dispersing individuals to move away from smoky areas in the short-term, though this potential effect would be of short duration, several days or less in any single location” (DEIS p. 169).

The analysis for the project and treatment effects fully considered whether the activities will prevent the Elk Flat LSR from playing an effective role in its established objectives. This LSR was identified as an area of important late-successional habitat during the mapping efforts undertaken for the NWFP, and its origins are as a habitat conservation area under the Interagency Scientific Committee’s northern spotted owl management strategy (DEIS p. H-21; LSRA p. 124). The analysis has concluded that “the project activities will not prevent the Elk Flat LSR from playing an effective role for which it was established. The proposed actions in the LSR will help accelerate development of late-successional characteristics, will contribute to increased connectivity and resilience of late-successional habitat in the LSR, and will help reduce the risk of large scale habitat loss while maintaining important current habitat areas, attributes, and functions. This will be achieved by: 1) not treating current high quality late-successional habitat stands and patches within stands that provide cover, layering and density, 2) retaining important legacy components such as roosting and resting structures, large snags, large down wood, and large trees with cavities and decadence, 3) retaining multiple canopy layers (where these conditions currently exist), and 4) varying the thinning prescriptions within and between stands based on species composition to increase individual tree and stand resilience and to promote spatial heterogeneity through openings contrasted with dense forest areas.

The treatments are expected to protect and enhance the current habitat function and quality for the northern spotted owl, fisher and northern goshawk in approximately 70 percent of the LSR, and 100 percent of the areas where habitat for these species currently exists. Actions taken under the preferred alternative will increase the probability that large-scale habitat loss will not continue, but also retain stand elements and conditions more representative of endemic insects, disease and mortality” (DEIS p. H-22; FEIS Appendix H LSR compliance section).
Concern# 170 - NSO, Habitat, Foraging, Hardwoods

13-13 - The DEIS describes a very different scenario than the one predicted in the LSR Assessment. It's obvious the habitat intended to develop into F/R/N habitat was logged since there have not been any major fires, in this area since 1900. Now the FS is proposing to log what little foraging habitat remains and degrade 224 acres as well as downgrade 46 acres. The FS proposes to log mixed conifer forest on 567 acres to increase hardwoods when they have been scarce in this area. This is just another excuse to log mixed conifer forest. The DEIS claims the FOREST PLAN directs the FS to maintain hardwoods at naturally occurring levels and enhanced. It cites to FOREST PLAN 4-42, 4-44. Neither page even mentions hardwoods. We don't have a problem with maintaining current hardwoods but logging 567 acres of natural stands to increase hardwoods is detrimental to current habitat and arbitrary and capricious. The only reason the LSRA is not in the intended condition is because the FS has aggressively logged the mixed conifer and replanted with Ponderosa pine. This should have never occurred as it violates the LSRA, NWFP and FOREST PLAN. Now the FS is proposing to continue these violations. Trying to maintain and enhance hardwoods in an area where they are naturally scarce is arbitrary and capricious.

129. Response

The context under which the commenter is referring to the "LSR Assessment" in this comment is not the current 1999 Forest-wide LSR Assessment, but the initial Elk Flat LSR assessment from 1998 that was completed for the 1998 McCloud Flats Ecosystem Analysis. The 1999 Forest-wide LSR Assessment supersedes that initial assessment and the existing conditions described in the EIS, and analysis of effects on late-successional habitat for this project, are based on more recent, best available data. This includes the 2007 Common Stand Exams in the project area (USDA-FS 2007); subsequent field reviews (2009, 2011, 2012-2015); the 2009, 2010, 2012 and 2014 NAIP photography; insect and root disease assessments in the project area (Snyder 2012); and other field data for various resources. See Chapter 3 of the DEIS and FEIS for a description of methods and data sources for each resource considered, and DEIS Appendix E. See Chapter 3 of the DEIS and FEIS for a description of methods and data sources for each resource considered, and DEIS Appendix E.

The existing conditions and rationale for focused treatments in NSO foraging habitat are fully discussed in the Draft and Final BA, and summarized in the Chapter 3 wildlife section of the DEIS and FEIS. The comment references treatment and degrading habitat on 224 acres and downgrading 46 acres. These treatment effects in foraging habitat are specific to designated critical habitat that serves as foraging habitat for the NSO (PCE3).

The downgrading of foraging habitat PCE3 on 46 acres includes both California black oak release (27 acres) and radial thinning around predominant, legacy pine on 19 acres. This will result in this habitat functioning as dispersal post-treatment (DEIS pp. 103, 112, 178-179; Draft BA pp. 95, 98, 106-107, 112, 129). These treatments are intended to increase hardwood diversity of California black oak, and also help maintain and protect important components of late-successional habitat such as predominant, legacy sugar and ponderosa pine. Black oak is an important species for both fisher and NSO in terms of providing rest and den sites, nest sites, roost sites and increases in oak mast for prey (Final BA pp. 26, 35, 52).

The Forest Plan at page 4.44 states that one of the five standards and guidelines for LSRs is to: “Maintain dead/down material, hardwoods, and snags at naturally occurring levels.” The oak release treatments are based on research and studies (Devine and Harrington 2006, 2013; Franklin 2013 pers. comm.; Final BA Appendix C pp. C5, C6, C7-C8), that have proven to enhance growth of oak species by reducing competition from encroaching conifers.

There is no proposal to thin 567 acres to promote hardwoods and based on field review, there are about 54 acres of area where hardwoods are known to be present, though there could be more. The 567-acre amount reported in the DEIS and silviculture report refers to the total acreage of treatment units where hardwoods (black oak and aspen) likely occur, not the total acreage where black oak and aspen release treatments would occur.

Concern# 176 - NSO, Habitat, LSR, NWFP, ESA Compliance
13-112 - The FS concedes that 46% of the project area is not capable of supplying NSO habitat as they generally avoid forest stands with overstories dominated by ponderosa pine and relative Probability of use declines within increasing basal area of ponderosa pine (USD FWS, 2011; Irwin et al, 2007; Irwin et al, 2012.) These areas also don’t provide prey. As we have previously argued the LSRA states the LSR should never be more than 25% ponderosa pine. NSO avoid it and stands with greater than 25% ponderosa pine develop insect and disease problem. Yet the FS continues to log mixed conifer habitat and replace it by planting ponderosa pine. It appears the FS is working against recovery and for extinction and/or extirpation of the NSO. The above statement proves why the Elk LSR project is not valid and fails to meet the FS planning documents for LSR and TES species. It violates the NWFP and the RRP.

130. Response

As described in Responses 58 to comments regarding the purpose and need and post-treatment NSO habitat conditions, the Forest Service is not proposing to replace mixed conifer habitat with ponderosa pine. Where mixed conifer habitat (which can provide suitable foraging habitat depending on stand age, stocking and understory conditions) is thinned, residual basal areas would range from 125-175 sqft/acre or higher (DEIS pp. 173, 175, 178 and Appendix E pp. E-19, E-21, E-23 to E-24; Draft BA pp. 28, 76, 79, 96, 98; and Draft BA Appendix C pp. C-4, C-6, C-8 to C-9). This is well within the range of basal area conditions frequently used by foraging NSOs in the dry forest types (DEIS pp. 173, 175-176, 179, and H-21; Draft BA pp. 79-80, 112).

The project's design and resource protection measures fully considered the recommendations in the Revised Recovery Plan for the NSO (specifically RA 10 and RA32 as described in the Draft and Final BA). The special management considerations for the ECS-3 critical habitat subunit were also considered during project design and analysis (DEIS pp. 8, 46, 117, 161 and 176; Draft BA pp. 3-4, 103-105).

When the 1999 LSR Assessment was completed, late-successional habitat comprised approximately 46% of the capable area that could support it in the Elk Flat LSR; with 30% and 24% in a mid- and early-successional condition, respectively (DEIS p. 20; USDA-FS 1999 pp. 125-126).

Under current stand conditions and tree species composition, it is correct that about 46% of the entire 3,519-acre project area (not the 3,074-acre LSR), is considered non-habitat for the NSO. This is due to the natural or plantation stands that are pine-dominated (as referenced in the comment), the open meadow at Elk Flat, and the early- and mid-seral/pole size stands of smaller diameter trees and canopy cover <35% (Draft BA pp. 51-52). About 39% of the LSR is considered non-habitat due to these conditions (DEIS p. 168, Table 57).

The 1999 Forest-wide LSRA discusses management of forests and forest types within LSR and MLSA land allocations. Forest staff reviewed the current 1999 Forest-wide LSRA to try to locate the reference about 25% pine provided by the commenter, and this 'statement' could not be found in that Regional Ecosystem Office-approved management guidelines document. On the contrary the LSRA states, "Late-successional forests are those forest successional stages that include mature and old-growth age classes (USDA, USDI 1994b). The structure and composition of these forests vary by forest type, site quality, and fire regime. Typically, such stands include live old-growth trees, standing dead trees (snags), and fallen trees or logs. In Douglas-fir forest, other features include multiple canopy layers with smaller understory trees. In pine dominated forest, stands under normal conditions are more open with relatively fewer snags and logs. In wet climates, on productive sites, these old-growth characteristics can begin to develop as early as 150 years. On dry sites, stands may be well over 180 years before these characteristics develop (LSRA p. 1)."

It is true that the 1995 McCloud Flats Ecosystem Analysis (Appendix A p. 101) indicates: “Ponderosa pine should ideally make up 25 percent of the stand. More than this risks blackstain outbreaks in the pine. Less increases the risk of large-scale white fir mortality.” However, as described in the response to comment 128, the project utilized the 2011 Edson WA and 2012 Mt. Shasta WA, Forest Plan and other direction, the 1999 Forest-wide LSRA and current best available science.
The project is in compliance with the management direction in the NWFP, Forest Plan, and LSRA; as well as being consistent with the recommendations in the Revised Recovery Plan for Recovery Actions 10 and 32, and dry forest restoration treatments, and the Final Critical Habitat Rule for ECS-3 and active management.

Concern# 96 – NSO, Habitat, Mature Forest, Disturbance

13-88 - Recommendation: Protect all mature forests (along with high-quality owl habitat), allow for development of complex early seral forests through prohibitions on logging after disturbances, and conduct studies to determine how much early seral forests, and in what condition, occurred historically vs. currently.

13-88 - Logging Mature Forests (generally >80 years old) Further Degrades Important Habitat for Owl Recovery

- FS proposes to execute modified clearcuts in mature dry forests to create early seral habitat for owls and other species however, this provision would set back owl recovery by reducing mature forest (also rare) extent and its ability to become high quality old-growth owl habitat. Complex early seral forests used by countless species can simply be created by a prohibition on post-disturbance logging.

131. Response

See also Response 135 (to Concern 95) regarding protection of high-quality NSO habitat and treatment of mature forests.

As described in the EIS and BA, the project is designed in accordance with Recovery Plan recommendations for RA 10 and 32, through consultation with the FWS. There are no mechanical treatments proposed in nesting/roosting habitat, or high quality foraging habitats and reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function (DEIS p. 171). The variable density thinning, combined with follow-up prescribed fire and other surface fuel treatments, meet the recommendations in the Recovery Plan for restoring dry forest ecosystems. Treatments would degrade or downgrade foraging habitat (DEIS p. 171), though will not significantly impact how NSOs use the landscape for foraging (DEIS p. 172; Draft BA p. 73). Foraging habitat for NSO will either be degraded by variable density thinning (697 acres), or downgraded (98 acres) through variable density thinning combined with radial release of black oak and predominant legacy pine (DEIS pp. 172-173). Project-wide, the variable density thinning treatments will maintain important habitat components and attributes such that the remaining conditions are well within the range of foraging habitat conditions frequently used by NSO (Irwin et al. 2007, 2012). Additionally, the retained species diversity, residual large trees, snags and down wood would contribute to habitat functioning as foraging post-treatment, providing prey base habitat and thermoregulation sites (DEIS pp. 175-176).

Conducting studies “to determine how much early seral forests, and in what condition, occurred historically vs. currently” is outside the scope of the project. Regardless, the project does not propose to increase early seral habitat for owls (or other wildlife species) through modified clearcuts. It does include small group selections (0.6 to 2-acre gaps) within six ponderosa pine plantations and two natural stands. Group selection would occur in about 11 acres of lower quality NSO foraging habitat in units 152-1 and 160, and in all older ponderosa pine plantations that are NSO capable habitat (Draft BA p. 78). Spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken topped live trees, mistletoe, cavities, large snags, and fallen trees (Draft BA p. 10). The mortality pockets and plantations where these groups are proposed are either low quality NSO habitat, or non-habitat, but capable of contributing to habitat over time with treatment.

See also Response 139 (to Concern 127), Response 80 (to Concern 119), and Responses 53, 58, 65 and 60 for a discussion of openings/gaps.

As described in the Final BA (pp. 53-54) “The group selection treatments will help to break up disease centers and would be replanted with a mix of non-host species resistant to Heterobasidion and blackstain root disease (Snyder 2012, Franklin et al. 2007). This treatment is expected to provide some additional structural and species diversity in the homogenous portions of these stands as inducing this fine-scale heterogeneity into homogeneous canopies has been shown to have positive effects on diverse biotic communities and ecosystem function in the short term (Carey 2003). The light level increase on the forest
The openings and heterogeneity created by the group selections can also help the stands better sustain natural disturbances through higher resilience while increasing wildlife habitat heterogeneity and ecosystem function (North et al. 2012; Churchill 2013). It is documented that irregular tree patterns, large openings, and resulting variation in surface fuels can also reduce the potential for the spread of crown fire and help perpetuate variable post-fire patterns (Churchill 2013). The proposed gaps are also consistent with the Revised Recovery Plan and the Revised Critical Habitat Rule for the Northern Spotted Owl in that both discuss using ecological forestry techniques in the dry forest ecosystems to increase stand resilience to stressors and potential influences from a changing climate (e.g. Franklin et al. 2007, Carey 2007, Johnson and Franklin 2009, Long 2009, and Spies et al. 2010a, among others). These techniques include retaining or restoring spatial heterogeneity, species and structural diversity, and ecological processes (USDI-FWS 2011 pp. III-11, III-14; USDI-FWS 2012 p. 71910).

Mature forest is described in Response 145 (Concern 147). Tree and stand age, although a useful indicator of old growth, is often considered less important than structure because the rate of stand development depends more on environment and stand history than age alone (Society of American Foresters 2008). As described in the Vegetation Diversity compliance section of the DEIS (pp. H-26 to H-27), mature forest would not be reduced (DEIS Table Appendix H-3) at the stand level. Approximately 75 acres scattered within existing plantations and two natural stands would be temporarily changed to seral stage 2 from group selections. Because they are few, scattered and small (2 acres or less), group selections do not cause a change in seral stage at the stand level.

The thinning prescriptions were specifically developed to reduce the risk of losing habitat for late successional species, accelerate development of late successional habitat, and increase hardwood species diversity in plantations and natural stands. To reduce risk of losing habitat to black stain and *Heterobasidion* root disease and increase stand heterogeneity in dense white-fir stands, small group selections and gaps are proposed (DEIS pp. 47, 138, 139).
treated. Unburned areas will be monitored as control areas. The proposed project fails to follow any of the direction listed above for future treatment options.

132. Response

The future treatments options shared by the commenter were an excerpt from the McCloud Flats Ecosystem Analysis or MFEA (September 1995, edited November 2004). See Responses 39 and 40 regarding the 1995 MFEA. These treatment options were considered when developing the Elk LSR project, along with direction from the Forest Plan, NWFP, 1999 LSRA, recommendations from the Edson Watershed Analysis (2011) and Mount Shasta Watershed Analysis (2012), as well as the best available science as described in the DEIS. Management direction and the project’s purpose and need are described on DEIS pages 4-38.

Concern# 179 - NSO, Habitat, Post-Fire

14-14 - Attention placed by the Revised Recovery Plan, on potential loss of habitat due to fire, has shown to be less of a threat to NSO than maintaining existing habitat as a refuge for NSO in the presence of barred owl. Removal of what was traditionally considered marginal or suboptimal NSO habitat as a way to actively manage for fuels, reduce the chance of future catastrophic fires, and create better NSO habitat in the future, are all irrelevant to what is needed now. Rafael et al. (2013) performed a multi-scale analysis to evaluate combined interactions between fuel treatments, wildfire risk, NSO habitats and populations. The analysis integrated interspecific competition with barred owls, and determined that aggressive fuel reduction treatments have the potential to contribute to the extinction risk for NSOs. Roloff et al. (2012) performed a comparative hazard assessment for NSO in a fire-prone landscape and determined that although fuels and treatments may benefit the NSO in the long-term (75 years), for short-term fire reduction (within 15 years) a no management approach would be recommended. When considering short-term benefits to NSO, results of Rafael et al. (2013) coupled with Roloff et al. (2012), suggest a prudent approach is to postpone or halt any planned treatments until the interspecific competitive pressure is better understood.

14-15 - Management may reduce the likelihood of fire, but may not have the negative impact on owls previously thought. Recent research indicates that fire does not decrease the habitat value or use by spotted owls and that fire may not be a significant danger to spotted owls at all. It has been shown that California spotted owl occupy forest fire burned sites and these owls were actually found to utilize fire burned areas of all intensities (Bond et al., 2002; Roberts et al. 2011; Lee et al. 2013). Lee et al. (2015) just published a paper on April 30, 2015, documenting a 92% owl occupancy rate (higher occupancy than before the fire) after the Rim Fire - the largest wildfire in recent history. Owls will use burned habitat, where they will not use habitat post logging. 27. A recent analysis and evaluation of empirical data calculated and compared potential spotted owl habitat loss over a time period of 40 years due to high-severity fire versus commercial thinning, findings indicated a far greater loss of habitat acreage would result from fuels management practices rather than high-severity fires (Oden et al. 2014). The habitat loss due to fire danger may be overstated. It has also been recognized that there is an ecological need for fire to produce complex early seral forests, a crucial component necessary to maintain an ecological balance and rich biological diversity in forested landscapes. These complex early seral forest conditions cannot be imitated by commercial forestry operations and are produced by mixed-severity fires (DellaSala et al., 2014).

133. Response

See Response 141. An analysis of the cited literature is contained in the project record, along with the review of the 15 new citations in the submitted bibliography.

Concern# 181 - NSO, Habitat, Post-Fire Use

13-59 - With respect to habitat use, Bond et al. (2009) found that California Spotted Owls occupying burned forests 4 years post-fire preferentially foraged in severely burned forests more than other categories of burn severity (specifically unburned forests) within about 1.5 km of a core-use area. Salvage logging was minor in this study. This counterintuitive finding suggests that at least some spotted owl prey increase rapidly in resource-rich early successional environments (Lawrence 1966). Spotted owl diet in this study was dominated by pocket gophers and woodrats (M.L. Bond unpublished data). Bond et al. (2009) recommended that burned forests within 1.5 km of nests or roosts of California Spotted Owls not be salvage-logged until long-term effects of fire on spotted owl and their prey are more fully understood. Clark (2007) investigated post-fire space use and habitat selection of Northern Spotted Owls in southwestern Oregon. Average Sizes of home ranges of spotted owls’ were larger after the fire/logging than before, but not different between burned/logged and unburned landscapes. Nesting, roosting, and foraging Habitat that burned with low, moderate, or severe fire was selected by foraging spotted owls in recently burned landscapes, and roosting
and foraging habitat with moderate severity burns was also selected. Clark (2007) also recommended against the use of salvage logging after fire because it reduced the overall habitat suitability of the area.

13-64 - In sum, a reasonable working hypothesis based on available science and knowledge of spotted owl ecology is that some amount of high-severity fire within a Northern Spotted Owl core-use area does not affect occupancy probability (Roberts et al. 2011, Lee et al. in press) and may even be beneficial to reproduction (Bond et al. 2002, Jenness et al. 2004, Roberts et al. 2011) and foraging (Clark 2007, Bond et al. 2009), but beyond a threshold amount of core area burned by high-severity fire and then subjected to post-fire salvage logging occupancy (Lee et al. in press) and possibly vital rates (Clark et al. 2011) may be adversely affected. In other words, some degree of early successional habitat created by fire in a territory may enhance short-term owl fitness, as long as sufficient old forest habitat is also present for nesting and roosting - and the owl's territory is not salvage logged after fire. Further evidence for the development of this hypothesis and for longer-term beneficial effects of fire disturbances is from Franklin et al. (2000) who documented higher fitness in territories with an optimal degree of older forest habitat interspersed with other earlier successional types in various stages of development. Another testable hypothesis is that salvage-logging compounds adverse effects (Clark 2007, Lee et al. in press). We strongly recommend research be carried out to test these hypotheses in the dry-forest landscapes within the range of the Northern Spotted Owl. It would be valuable to determine optimal amount and spatial configuration of fire that confers fitness benefits and amount and spatial configuration that reduces fitness, before widespread landscape-level logging is carried out to reduce risk of severe fire in Critical Habitat. It is entirely possible that logging projects could have greater adverse impacts on occupancy and vital rates of Northern Spotted Owls than severe fire.

13-81 - Recommendation: More research is needed on habitat use by spotted owls in the dry forest landscapes and fire effects on owl occupancy and reproduction, effects on owl prey, and barred owl invasions before widespread active management. Tighter prohibitions on post-fire logging are needed within owl suitable habitat.

13-81 - Owls Appear to be Resilient to Wildfires - Available evidence and knowledge of spotted owl ecology across all three subspecies (Mexican, California, Northern) show that owls tolerate some degree of moderate to high-severity fire within territories, and in some cases, appear to prefer foraging in severely burned stands as long as a burned territory is capable of supporting a pair of owls, whereas owls abandon salvage logged areas.

134. Response

See Response 141.

Concern# 95- NSO, Habitat, Recommendations

13-79 - The FS would also encourage management in mid-successional moist forests by converting mature forests to young forests under the provisions of active management. For instance, it is conceivable under this scenario that a stand of 80-120 year old trees that functions as NRF habitat but may not yet be high quality is logged to regenerate early seral. The FS would view this as contributing to owl recovery because even though it degrades NRF it creates foraging or dispersal habitat. In addition, this conclusion could be falsely justified without regard to how this type of degradation might encourage barred owls, which do well in fragmented areas (Dugger et al. 2011). This is exactly the situation in the Elk LSR project. We view these kinds of treatments as unnecessary for the reasons stated above - natural disturbances are the best generator of complex early seral - and because a reduction in mid seral forests will greatly inhibit their capacity to eventually become high quality owl habitat.

13-94 - Recovery Action 32: Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees. Maintaining or restoring forests with high-quality habitat will provide additional support for reducing key threats faced by spotted owls. Protecting these forests should provide spotted owls high-quality refugia habitat from ‘the negative competitive interactions with barred owls that are likely occurring where the two species’ home ranges overlap. Maintaining or restoring these forests should allow time to determine both the competitive effects of barred owls on spotted owls and the effectiveness of barred owl removal measures. Forest stands or patches meeting the described conditions are a subset of NRF habitat and actual stand conditions vary across the range. These stands or patches may be relatively small but important in a local area, may not be easily discernable using remote sensing techniques, and likely require project-level analysis and field verification to identify. This recommendation can be justified at several scales and is supported by the best available research. At the scale of a spotted owl territory, Dugger et al.
found an inverse relationship between the amount of old forest within the core area and spotted owl extinction rates from territories. At the population scale, Forsman et al. (2011) found a positive relationship between recruitment of spotted owls into the overall population and the percent cover of spotted owl NRF habitat within study areas. Both of these studies provide scientific support for the value to spotted owls of retaining structurally complex stands on the landscape. CC Comment: The FS claims it is meeting this RA but we fail to see how considering the; aggressive logging of natural stands leaving a basal area insufficient to support nesting or roosting; the majority of ponderosa pine and the proposal to replant even more; and the proposal to log some large old trees over 21" DBH. ALL trees over 21" DBH should be left in the LSR as directed by the LSRA.

14-19 - A lack of resources could adversely impact spotted owls in two ways; forcing more direct confrontations with barred owls or inability to take in enough nutrients for survival. Each potential scenario could result in mortality to an adult spotted owl or pair, thus taking them out of the reproductive pool. Pulling together all I know and have observed regarding spotted owls and applying the most recent scientific data available regarding barred owls and their interactions with spotted owls, this appears to be a very real threat in the form of "take" not by temporarily adversely impacting habitat or reducing reproductive output for a few years, but by causing mortality of an adult spotted owl or owl pair and taking them out of reproduction permanently.

14-19 - It is important to understand that NSO will attempt nesting or successfully reproduce when there is ample availability of resources in the form of food and shelter within their Home Range. The possibility alone, that it could be a lack of resources, suggests the need to move forward mindful of how an additive stress may potentially impact the owls. For example Project activities resulting in a loss of foraging resources already strained by other events, could result in more direct confrontations with BO for the remaining resources.

135. Response

See also Response 131 regarding early seral forests (to Concern 96), Response 145 (to Concern 147) regarding mesic and dry forests and Response 140 (Concern 142) regarding the purpose and need. The Forest is not proposing to convert moist or even mature forests to young forest with the Elk LSR Project (see Purpose and Need section in Chapter 1 of the EIS). The Forest is proposing active management to meet the Forest Plan, NWFP and 1999 LSRA management direction to protect and enhance late-successional habitat. The comment also does not use the term "degrade" in the same context as the Forest Service or FWS for habitat effects. When habitat is degraded, this signifies when treatments have a negative influence on the quality of habitat due to the removal or reduction of NSO habitat elements [canopy closure reduction, snag and down wood reduction, understory layering reduction] but not to the degree where existing habitat function is changed. Habitat that is degraded maintains its pre-treatment function post-treatment (DEIS p. 171; Final BA p. 46; Draft BA p. 71). Under the Elk LSR project, no NR habitat would be degraded, downgraded or removed; but habitat function would be maintained/benefitted (DEIS p. 172; Draft BA pp. 25, 102, and 106). Foraging habitat would be degraded (maintained) and about 98 total acres would be downgraded to dispersal function (DEIS pp. 172-174).

In the project area, trees that are 21 inches (dbh) are not considered old growth per the definitions of old-growth forest under the NWFP (1994 Standards and Guidelines p. F-4), the 1993 FEMAT report, the Forest Plan (1995 p. 3-6 and Table 4-3 at p. 4.15), and in the Forest-wide LSRA (1999 p. 276). These definitions and sources are included in the EIS Glossary.

In general, old-growth forest stands area usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground. For Forest Plan seral stage tracking purposes, old-growth is labeled as “4C-older” (Forest Plan p. 3-6) and Table 4-3 (Forest Plan p. 4.15) notes that dominant trees are over 180 years of age. The average tree age in the 21” dbh size class is 71.5 years (by species, ponderosa pine averaged 76 years and white fir averaged 70 years based on measured tree averages and diameter classes from the 2007 Common Stand Exams). Within the 20-30” dbh size class, all measured trees averaged 77 years of age. While there are individual measured tree between 120-180 years old, they are typically larger diameter dominant or predominant trees that would be retained and promoted per the tree selection criteria and project design. These scattered individual older trees do not comprise old-growth forest stands. Table 5 in the DEIS (pp. 19-20) displays the seral stage condition of treatment units and there are no 4c-older stands.
The request that all trees over 21 inches be left in the LSR is noted and was addressed in Chapter 2, alternatives considered but not in detail. The LSRA does not direct that trees over 21” DBH should be left (Mohoric 2009). As described in the October 18, 2009 memorandum from the Regional Ecosystem Office (REO), “the NWFP S&Gs (C-12-13) [Standards and Guidelines at pp. C-12 to C-13] for risk reduction treatments do not limit the size of trees that can be removed when reduction of risk of large-scale disturbance is the primary objective of treatments within LSRs. However by incorrectly referencing letters that exempt specific silvicultural activities from REO review, dated July 9, 1996 and updated on September 30, 1996, the LSRA limited trees to be removed to less than 20 inches dbh. Reference to these letters is removed by this correction. The LSR Work Group also concurred with a 150 year age limit on trees, which could be cut to enhance development of late-successional habitat. It is logical to assume that trees this old would be larger than 20 inches dbh. This issue is clarified by the edits” (Mohoric 1999 p. 1). Refer also to FEIS p. H-17 (footnote 138).

The 1999 LSRA designated the Elk Flat LSR as a priority to treat because it is “currently lacking late-successional habitat and mid-successional habitat, but [has] have high proportions of early successional forest habitat” (pp. 178-179).

The Forest has also included recommendations from Recovery Action 32 (which are based on the research by Dugger et al. 2011 cited in the comment in regard to barred owl and NSO competitive interactions). The Draft and Final BA, including Appendix C, describe how nesting, roosting, and high-quality foraging habitat was reviewed and delineated for no mechanical treatment (Draft BA pp. 10, 25, 36, and 63).

The Forest does not dispute that barred owls use a wider range of habitat than NSOs, have a broader range of prey base, and the analysis discusses this information, as well as demographic and other research on the competitive interactions between the two subspecies (Final BA pp. 43-45, D2 to D6, D25 to D27). Dugger et al. (2011) describe that “Barred Owls have been documented using a wider range of forest types (younger seral stages with more fragmentation) than Spotted Owls (Kelly et al. 2003, Hamer et al. 2007). Consequently, the loss of late-successional old-growth forest and increased fragmentation of these forests will decrease the amount of suitable habitat for Spotted Owls. The fact that we had no strong support for interactions between Barred Owls and habitat characteristics supports the conclusion that on our study area, exclusive suitable Spotted Owl habitat may not exist, as the degree of fragmentation and amount of old forest at the core did not ameliorate the effects of Barred Owls when they were detected” (Dugger et al. 2011 p. 2466). The Final BA describes that “Wiens and others (2014) also found a strong potential for exploitation and interference competition between NSOs and recently established barred owls, and that availability of old forests and associated prey species are likely to be the most strongly limiting factors in the competitive relationship between the two subspecies. Therefore, the evaluation of direct and indirect effects from barred owl [in the project area] focuses on whether the proposed treatments could potentially act to exacerbate competitive interactions between the two subspecies by reducing the availability of high-quality habitat or prey availability.” The Draft and Final BA fully explore the various treatments in NSO habitat, and their effects to habitat function and prey over the short and long term (BA effects sections).

The Forest Service does not issue take statements, but it has been involved in the streamlined consultation process with the Red Bluff FWS field office (August 2009-October 2011) and Yreka FWS field office for the remainder of the consultation (DEIS Appendix E; Draft BA pp. 11-12, Appendix C; Final BA Appendix C). Through consultation, the agencies determined that the project may affect NSO, but would not adversely affect NSO. The project includes multiple protection measures, survey provisions, and Limited Operating Periods during critical breeding periods (DEIS Chapter 2 Wildlife RPMS; Draft and Final BA Table 6 and Direct Effects sections for NSO). Interactions between NSOs and barred owls, and the project area NSO survey history (including removal of a barred owl pair in fall 2014) are described in the DEIS (pp. 165, 170-171, 176), Draft and Final BA (Draft BA pp. 38-41, 45-46, 62-63 and 69). These factors were considered in the project's effects determinations.
Concern# 145- NSO, Hardwoods and Pine

13-52 - For all the claims of how beneficial this project is to late successional habitat the determination for critical habitat is "Likely to Adversely Affect designated critical habitat due to oak release and radial thinning to promote legacy pine, general expance of treatments over time and space in critical habitat, and impacts to snags/down logs." As we have stated previously, according to the LSRA this LSR was never intended to have 75% ponderosa pine and hardwoods are scare. Yet the FS is proposing a project that will adversely affect designated critical habitat for the recovery of the owl to protect a pine species that is 50% over the amount expected and to expand hardwoods that were scarce to begin with. This is contrary to both law and logic. The project violates the ESA and every other legally enforceable document pertinent to this project.

136. Response

See also Response 130 and 140 (to Concern 176 and Concern 142) regarding the 1999 Forest-wide LSRA, purpose and need, and treatments in mixed conifer and NSO habitat; Response 129 (to Concern 170) regarding hardwoods; and Responses 127 and 148 (to Concerns 162 and 102) regarding effects to critical habitat. The project would not adversely affect critical habitat (foraging PCE3) in order to protect pine; effects to PCE (short term and minor adverse effects) are described in the Final BA (pp. 83-84). The comment refers to the initial LSR assessment from the 1995 McCloud Flats Ecosystem Analysis, which was superseded by the 1999 Forest-wide LSRA (See Responses 39, 40 and 80).

As described in Response 130, the project's purpose is not to convert stands to ponderosa pine but, where ponderosa pine is the dominant species, to create stand conditions that result in higher levels of resilience to withstand drought, disease and insect attacks. The variable density thinning prescriptions vary based on stand and tree species composition, with lower basal areas and SDI targets prescribed for pine-dominated stands (80 to 140 sqft/ac; 220-230 SDI), and higher basal areas prescribed in mixed conifer stands that support NSO habitat (125 to 175 sqft/ac/250+ SDI). Appendix A of the EIS outlines the treatments proposed, including radial thinning around legacy predominant sugar and ponderosa pine that are current late-successional habitat components also at risk. The project's design includes unthinned patches, in accordance with the LSRA direction (LSRA pp. 185 and 188), and other design features that maintain late-successional habitat attributes on the landscape (EIS Chapter 2; Appendix A) and in the higher quality habitats for northern spotted owl, northern goshawk and fisher, no mechanical thinning would occur.

The project's Draft and Final Biological Assessment and Biological Evaluation fully describe how thinning treatments would maintain, protect and enhance habitat for late-successional associated species in both the short and long term. Project effects to critical habitat are discussed in the Draft BA (Draft BA pp. 105-113). While there may be short-term adverse effects to critical habitat, there will be a long-term increase in ecosystem resiliency and quality of NSO habitat (Draft BA p. 111). It is recognized in the Revised Recovery Plan and Final Critical Habitat Rule that long-term benefits to NSO habitat may require short-term impacts (Draft BA p. 111).

Concern# 36 – NSO, Impacts to NSO Habitat

4-67 - Page 106 of the DEIS indicates that the Forest Service intends to downgrade approximately 98 acres of NSO foraging habitat in the LSR. Page 107 reveals that the proposed action is "likely to adversely affect" designated NSO critical habitat located within the LSR. Habitat downgrading of critical habitat is antithetical to the management objectives of both the LSR and the critical habitat unit.

13-102 - 697 acres foraging degraded; 98 acres foraging degraded; 179.5 acres dispersal degraded; 41.5 acres dispersal removed. DEIS claims 1,743 acres improved over 20 years from all this degrading and removal [13 acres removed for landings] of habitat. The DEIS concedes that loss of forest cover on a total of 58 acres is an irreversible and irretrievable commitment of resources, yet for the NSO it claims the loss of 13 forest acres for landings is negligible. The FS fails to explain how all of this habitat will recover in 20 years and function as late successional habitat.

13-103 - NSO prefer old growth habitat classified as 180-220 years of age. DEIS pp. 101-103 document the PCE1, 2, 3, and 4 that will be degraded, downgraded and removed affecting 23% of the designated critical habitat. The determination for critical habitat is likely to adversely affect due to radial thinning for oak release and to promote legacy ponderosa pine -the former species rare and latter species 50% over LSRA direction.
The FS claims it is improving 57% of the LSR - 1,743 acres improved over 20 years. The data suggests otherwise.

13-110 - The baseline year used for this analysis and the existing condition is 2014. See maps F-8 and F-2 to document the arbitrary and capricious decision to use the year 2014. The FS claims temporal bounding will be 30 years. Regardless, logged habitat won't provide suitable owl habitat in 20 or 30 years. It will take 100 years at least for large tree development and 70-90% canopy closure. This will never occur because of the ponderosa pine plantations that have to be thinned every 20 years. The DEIS is silent on this issue and the impacts repeated entries will cause to late successional habitat.

13-4 - The FS states LSRs were established as part of a conservation strategy for species associated with late-successional and old growth forest ecosystems under the NWFP to maintain a functional late-successional and old growth ecosystem. The proposed project would log 87% of the LSR with the exception of 323 acres (10% of the LSR left in small patches); it would favor Ponderosa pine over mixed conifer species which is a type of pine not favored or used preferably by NSO; the basal area left is also not preferred by NSO and would not provide the canopy cover to support nesting or roosting; and the FS is seeking REO approval to log large diameter trees 120 years old that are well on their way to becoming old growth and are preferred by NSO for habitat needs. The FS admits there is no old growth in the entire LSR yet claims it is meeting RA 10 and 32 by logging 120 year old trees. The preferred alternative is out compliance with federal regulatory requirements and is unlawful as proposed.

13-46 - In November 2015 The Condor published the peer reviewed scientific journal article "The Effects of habitat, climate, and barred owls on long-term demography of Northern Spotted Owls." This study (submitted with these comments) found that NSO populations are declining in all parts of their range in the Pacific Northwest. Based on 11 study areas across Washington, Oregon and Northern California, a rangewide decline of nearly 4% per year was estimated from 1985 to 2013. This research indicated that since monitoring began spotted owl populations declines 55-77% in Washington, 31-68% in Oregon, and 32-55% percent in California. In addition, population declines are now occurring on study areas in southern Oregon and northern California that were previously experiencing little to no detectable decline through 2009. One of these study areas is on the Shasta Trinity NF. The lead author, Dr. Katie Dugger is a research biologist at the USGS Oregon Cooperative Fish and wildlife Research Unit, Oregon State University. The paper emphasized the amount of suitable habitat required by spotted owls for nesting and roosting is important because spotted owl survival, colonization of empty territories, and number of young produced tends to be higher in areas with larger amounts of suitable habitat. The Elk LSR project does not emphasize maintaining suitable habitat for the NSO rather it logs the majority of the LSR leaving about 323 acres intact.

13-92 - Conservation of important spotted owl habitat depends on the application of a two-tiered approach to forest land management decisions as follows: 1. Conserve spotted owl sites and high-value spotted owl habitat where possible in addition to Federal conservation blocks to provide additional demographic support to the spotted owl population (see Recovery Action 10, below). a. This recommendation includes currently occupied as well as historically occupied sites (collectively "spotted owl sites," see Appendix G: Glossary of Terms). b. Work with land managers and spotted owl field scientists to develop prescriptions and approaches to implement this recommendation. At a minimum, this prescription should retain sufficient NRF habitat within the provincial core-use area and within the provincial home range to support breeding. Feeding and sheltering. 2. Maintain and restore the older and more structurally complex multilayered conifer forests on all lands (see Recovery Action 32 under Listing factor E). It is clear that these two recommendations overlap

137. Response

See Response 128 (to Concern 42). The Forest considered all of the referenced research in analysis. The effects analysis is complete and supported by research, literature, and local monitoring. Refer to the BA.

Concern# 35 – NSO, NRF Habitat Effects

13-116 - In NSO habitat the FS intends to only leave 150 sq. ft. basal area. This will not provide for nesting or roosting habitat. And depending on canopy cover may not provide foraging habitat.

13-121 - These will be tightly spaced groupings of 3 to 6 trees with smaller trees (less than 10" DBH) surrounding them. No DBH is given for the 3 to 6 trees that will be left. About 4 to 6 clumps (12 to 36 trees will be left per acre). This is supposed to provide roosting habitat for NSO. No literature citations are given to support this paltry amount of habitat yet there is a plethora of literature refuting it.

13-41 - How many acres of nesting, roosting, and foraging habitat are there in the watershed? N/R habitat is known as suitable owl habitat. a. What percentage of the watershed is this? b. Which stands have been surveyed to protocol?
Elk LSR Enhancement Project

13-42 - What is the amount of nesting, roosting, and foraging habitat in each ROD land allocation in the watershed? The MFEA lists the following: Habitat (N/R/F) ROD Alloc. LSR, MLSA Matrix CHU Matrix not CHU PVT Acres 2,616 acres 5,426 723 none What are these figures today using current figures? Please respond to the questions in #3 in the FEIS.

13-43 - The Elk Flat LSR area total 3,440 acres, or 6 percent of the watershed. 5b. What are the current totals of NRF habitat and capable habitat in the LSR? Suitable habitat within the LSR is 1,553 acres (45% of LSR). Only 313 acres are suitable nesting habitat. The remainder is forage and roosting habitat. These figures are based on district vegetation typing. In addition, the capable forested habitat is 3,060 acres (89% of the LSR). Acres of suitable habitat plus acres of capable forested habitat total 89% of the LSR in 20 years. The DEIS claims only 1,500 acres is capable of providing late successional habitat. This does not match the figures above based on district vegetation typing. Why?

13-49 - Page 106 and 107 of the DEIS claim N/R/F habitat will be “benefited” although 697 acres of foraging habitat will be degraded by thinning. 98 acres of foraging habitat will be downgraded to dispersal habitat.

138. Response

See also Response 128 (to Concern 42) regarding the amount of NRF in the watershed. The Elk Flat LSR is 3, acres and Table 57 and Table 58 (EIS) and Table 30 in the Final BA display the habitat types in the LSR, the project area, NSO action area, treatment units and at the ST-215 core and home range scales. See also Response 39 and 40 regarding the MFEA.

Concern# 127 – Wildlife – NSO, Nesting/Roosting/Foraging, Habitat, Group Selections

13-77 - What evidence is there that creating small openings in owl habitat is compatible with NRF habitat? We view this omission as a serious breach of scientific integrity underlying the assumptions of the habitat models. That is, the FS cannot meet Recovery Criterion 3 of stable or increasing NRF habitat with active management degrading critical habitat for decades to come

139. Response

The Elk LSR Project proposes various ecological forestry-based treatments to meet the purpose and need, and management direction for the project area. This includes variable density thinning (e.g. Carey 2003; Franklin et al. 2013, 2012; North et al. 2009, 2012). Variable density thinning does not include a singular density target, rather it retains a range of densities by including unthinned patches (“skips”), areas of heavy thinning or small openings or “gaps” (radial release of legacy trees, structures or minor species, or group selections), and thinning within a target basal area range elsewhere (DEIS pp. 48, H-18). It is a silvicultural technique intended to promote biological diversity and structural heterogeneity characteristic of old-growth forests, and it induces fine-scale variation in homogeneous second-growth forest canopies (Aukema and Carey 2008; Muir 2002; (Final BA pp. 49-50).

The Revised Recovery Plan for the NSO (USDI-FWS 2011) and Revised Critical Habitat Rule for the NSO (USDI-FWS 2012) both discuss using ecological forestry techniques in the dry forest ecosystems to increase stand resilience to stressors and potential influences from a changing climate (e.g. Franklin et al. (2007), Carey (2007), Johnson and Franklin (2009), Long (2009), and Spies et al. (2010a), among others). These techniques include retaining and/or restoring spatial heterogeneity, species and structural diversity, and ecological processes (USDI-FWS 2011 pp. III-11, 14; USDI-FWS 2012 p. 71910). See also Response 147 (to Concern 65) regarding active management recommendations and the Recovery Plan dry forest restoration principles as they relate to the project design and existing conditions.

The group selections (≤ 2 acre openings) would be placed in six older ponderosa pine plantations, and may occur in mortality areas in these plantations; and in two natural stands in diseased white fir. These treatments are intended to help develop a second age and more diverse species class in the plantations, reduce fuels, reduce root-to-root connectivity for blackstain and Heterobasidion, and to also promote pine where it is a lacking component in units 152-1 and 160 (DEIS pp. 48-50). See also Response 131 (Concern 96) that addresses this treatment.

NSO nesting, roosting, and foraging habitat is marked by the presence of large trees, dense canopy closure, and structural complexity, and decadence components such as broken topped live trees, mistletoe, cavities, large snags, and fallen trees (DEIS p. 167; Draft BA pp. 48-50). However, gaps created by
natural mortality may also be present as part of these stands (DEIS p. 17). There is evidence to suggest that NSOs still use these openings in NR habitat to forage (Draft BA pp. 79-80). Under the Elk LSR project, there would be no group selections, small gaps in white fir, black oak release or radial thinning around legacy ponderosa or sugar pine in NR habitat (or high quality foraging habitat) for the NSO (Draft BA pp. 63, 72). No group selection treatments are proposed in PCE 2, 3, or 4 (Draft BA p. 106; Final BA p. 81 Table 25). The gaps contribute to within and between stand heterogeneity (DEIS pp. 126, 133), break up fuel continuity (DEIS pp. 126, 157), and in the project area, contribute to wood rat habitat, the likely primary prey species for NSO (Draft BA pp. 52-53; Final BA pp. 67, D17).

Groups and small gaps can create and contribute to edge effect (discussed in the Final BA at pp. 53-54). There would be no groups in the core, but <0.25 acre gaps in white fir would be placed in the core (units 151, 161, 153). In some southern portions of the NSOs range, their survival is positively associated with the area of old forest habitat in the core, but reproductive output is positively associated with amount of edge between older forest and other habitat types in the home range (Franklin et al. 2000, pp. 573, 579). This pattern suggests that where dusky-footed woodrats are the primary prey species, core areas that have nesting habitat stands interspersed with varied types of foraging habitat may be optimal for NSO survival and reproduction (USDI-FWS 2012 p. 71884).

As described in the Draft (p. 79) and Final BA (p. 55), “Other important habitat elements such as existing shrubs and openings for dusky-footed wood rat and other prey base would be retained, and promoted by small gap creation and group selections. Research suggests that creating small openings may increase habitat use by foraging owls (Irwin et al. 2007, 2012). Research suggests that creating small openings may increase habitat use by foraging owls (Irwin et al. 2007, 2012; Courtney et al. 2004-Appendix 5). NSOs can frequently forage at the margins of early seral habitat and benefit nutritionally from being near openings (Hayward et al. 2011; Zabel et al. 1993, 1995). Understory layering where biomass is not thinned will continue to contribute toward vertical structure, cover and perch sites, and where biomass is thinned; it will create improved foraging conditions for NSO and reduce dense fuel ladders.”

Also as described in the Final BA (p. 54), “The group selection treatment is expected to provide some additional structural and species diversity in the homogenous portions of these stands as inducing this fine-scale heterogeneity into homogeneous canopies has been shown to have positive effects on diverse biotic communities and ecosystem function in the short term (Carey 2003). The light level increase on the forest floor would also reduce root disease progression and the mix of non-host conifer species would also help to reduce potential reinfection (Snyder 2012). Both group selection and gap creation treatments in foraging habitat are intended to contribute to structural heterogeneity and understory development in combination with the variable density thinning of 125-175 sqft/ac, retention of unthinned patches and roost clumps, and biomass thinning in some units. While there will be an immediate reduction in white fir density from these treatments, the openings are expected to promote development of understory shrubs, forbs and a second age class of trees (and in group selections, more diverse tree species) due to increased sunlight hitting the forest floor (McConnell and Smith 1970; Covington and Moore 1994; Carey 2003; Franklin et al. 2007). At this microsite level, the ‘skip’ and ‘gap’ treatment that will: 1) retain current stand structure in portions of the stands, 2) thin other dense portions to desired basal areas that reduce stand density index, and 3) create openings for shrubs and understory conifer regeneration are expected to contribute to within-stand heterogeneity while maintaining the function of foraging (and dispersal) habitat for NSO.”

As described in the Recovery Plan (p. ix), “Recovery Criteria are measurable, achievable goals that we believe will result from implementation of the recovery actions in this Revised Recovery Plan. Achievement of these criteria will take time and is intended to be measured over the life of the plan, not on a short-term basis and should not be considered near-term recommendations.”

Recovery Criterion 3 is the continued maintenance and improvement of NSO habitat (p. ix).

The Recovery Plan (p. II-5) also describes that “The Effectiveness Monitoring program initiated by the NWFP includes tracking the status and trends of spotted owl habitat (Davis and Lint 2005). This
monitoring program will allow us to assess progress towards meeting Recovery Criterion 3: Continued Maintenance and Recruitment of Spotted Owl Habitat and help the Service determine whether the threat of habitat loss has been reduced or eliminated such that spotted owls are unlikely to become threatened again in the foreseeable future.”

The DEIS (pp. 11, 170, 186) and BA (Final BA pp.88, D2, D4; Draft BA pp. 39, 111-112) discuss the latest NWFP monitoring report for NSO habitat. As described in the Final BA (pp. 88, D2, D4) “The 20-year monitoring report for the NWFP and ‘Status and Trend of Northern Spotted Owl Habitat’ describes that large wildfires continue to be the leading cause for loss of NSO habitats on federal lands and that most of these fire-related losses have occurred in the network of large reserves designed for the protection and restoration of habitat for long-term NSO conservation (Davis et al. 2015). Range-wide, the nesting/roosting habitat lost from fire (505,800 acres) represents about 31 percent of the total habitat loss. The report further describes that loss rates in fire-prone portions of the NSOs range exceeded the expected 2.5% rate for the 20-year period at rates of 3.9 to 7.4% per decade, including the California Cascades province. Climate change is also expected to expand the area of fire-prone landscapes and an increased frequency of large wildfires this century has already been observed (Davis et al. 2015).”

The DEIS and BA also discuss that based on the results from the latest NSO meta-analysis, barred owl competition may be the primary cause of NSO population decline (Dugger et al. 2015; DEIS p. 170; Final BA pp. 44, D5, D26).

As described in Responses 135 and 148, when habitat is "degraded" it means that the habitat function pre-treatment is the same post-treatment (DEIS p. 171; Draft BA p. 71; Final BA p. 46). See other related Responses for a discussion of effects relative to critical habitat, as well as Chapter 3 of the EIS, the BA and the Biological Opinion. While individual habitat components of critical habitat PCE3 would be removed, reduced or variously affected, the effect is not at a scale that would significantly reduce the residual PCEs value in critical habitat or the overall ability of the foraging habitat PCE to function (Final BA p. 83; Draft BA p. 107). All treatments contribute positively to the overall function of the ECS-3 subunit, which is to provide demographic support in an area of sparsely distributed high-quality habitat and Federal land, and provide for population connectivity between subunits to the north and south. The project would not result in a measurable change in the ECS-3 subunit’s ability to provide the functions for which it was designated (DEIS pp. 178-179; Draft BA p. 113; Final BA pp. 89-90).

Also as noted elsewhere in Responses, the project conserves the limited high-value NSO habitat in the project area, including nesting/roosting and high quality foraging habitats. Because mechanical treatments are primarily focused in lower quality habitat stands, are expected to result in a greater assurance of long-term maintenance of late-successional habitat over time, are not located in a higher quality NSO habitat area in general, and will not remove PCEs, the function of ECS-3 to provide demographic support in this area of sparsely distributed high quality habitat and Federal land, and to provide for population connectivity between subunits to the north and south, is not expected to be measurably impeded (Draft BA p. 131). The proposed actions are expected to help accelerate development of late-successional characteristics, contribute to increased connectivity and resilience of late-successional habitat in the LSR, and help reduce the risk of further large scale habitat loss while maintaining important current habitat areas, attributes, and functions (DEIS p. H-22).

The proposed group selection and gap creation treatments would increase within-stand heterogeneity and complexity, contribute to prey species increases and fit within the recommended dry forest restoration treatment objectives. Recovery Criterion 3 cannot be measured at the project level, or in the short term. However, the current monitoring data used to inform this Recovery Criteria show that NSO nesting/roosting habitat remains at risk to loss (Davis et al. 2015).

**Concern# 142 - NSO, Ponderosa Pine**

**13-1 - The Purpose and Need for this project is fatally flawed along with the primary purpose to protect ponderosa pine. The FS concedes that 46% of the project area is not capable of supporting NSO habitat as they generally avoid forest stands with overstories dominated by ponderosa pine and relative probability of**
use declines within increasing basal area of ponderosa pine (USDI FWS, 2011; Irwin et al, 2007; Irwin et al, 2012.) These areas also don’t provide prey.

140. Response

See Response 130 (to Concern 176) regarding the concern about ponderosa pine, and the treatment effects to NSO habitat. Refer also to the Management Direction section of the EIS in Chapter 1.

The purpose, need and design of the project is guided by management direction found in the Shasta-Trinity National Forest’s Land and Resource Management Plan, which incorporated the Northwest Forest Plan (NWFP), as amended (Final BA p. 4).

As described in the BA (Final BA p. 11), “The purposes of the Project are derived from project area management direction. This includes the NWFP, Forest Plan and the LSRA management objectives, priorities and criteria for desired conditions. The primary purpose is to reduce the current and future risk of large-scale disturbance events within early, mid and late-successional habitat within the Elk Flat LSR and nearby stands. This is consistent with Objectives I and III from the LSRA, which guides development and application of treatments within the Forest’s LSRs (LSRA 1999 pp. 1, 174-179). Risk reduction also meets the need of increasing stand and habitat resilience to disturbances such as drought conditions, insect attacks and fire and would promote continued development and connectivity of late-successional forest habitat in the LSR. This meets LSRA Objectives II and IV (pp. 175, 178-179 and 180-181). The LSRA describes the Elk Flat LSR as a treatment priority due to a high proportion of early successional forest habitat (p. 178). The need for action was determined by comparing existing conditions with desired conditions relative to the identified purposes. [The Forest Plan describes the desired condition, which is embodied in the forest goals and objectives, further clarified by the standards and guidelines, and is described for each Management Area (Forest Plan p. 4.6). The 1999 LSRA provides desired condition descriptions (starting on p. 162) and conditions existing at the time of LSRA publication in 1999 (LSRA Chapter 2). The Recovery Plan provides a recovery strategy and recommendations for conserving and prioritizing NSO habitat. Additionally, compliance with regulatory frameworks, consistency with policy, and consideration of best available science (per 40 CFR 1607.3) help guide identification of the desired condition.]

Also, based on direct observations of extensive mortality, the project area was prioritized for analysis and treatment. Common stand exams (CSE) were completed in 2007 (USDA-FS 2007), fuel loading was reassessed in 2011, and the project-level interdisciplinary team conducted additional field reviews in 2012-2015. These reviews assessed tree stocking and species composition of natural stands, plantations and meadow conditions, and the Ash and Swamp Creek stream channel morphology (tree age, stand density, snags, down wood, ongoing mortality and fuel loading, presence of insects and disease and stream channel conditions/function. The Methodology section and Appendix C of the BA fully discuss wildlife habitat reviews, unit prioritization and treatment development specific to the NSO (and other species). Existing conditions, causal mechanisms and needs for action relative to the Forest Plan desired conditions were also identified in Step 5 of the Edson Watershed Analysis (2011) and Chapter 5 of the Mount Shasta Watershed Analysis (2012). These analyses include several recommendations that have been incorporated into the project’s design (Final BA p. 12-13).

Concern# 34 – NSO, Post Fire Habitat Use

13-70 - Additional bias toward active management is further evident in the slanted presentation of fire risks by the FS that ignored Hanson et al. (2009) who actually tested and then rejected the hypothesis of a recent up-tick in high severity fire in dry provinces. In its explanation of fire risks, FS further ignores the paper by Miller (2012) that reaffirmed findings about a lack of high severity fire increases in northern California; although authors did report an increase in fire extent over the previous century, this increase may in fact be compatible with owl habitat management as it will generate the habitat mosaic needed for owl nesting, roosting, and foraging (NRF). Notably, the FS continues to use vegetation change as the primary proxy of fire risk without examining the fire data itself especially in the context of long-fire rotation intervals (Hanson et al. 2009, 2010) and long-term episodic events that show fire regimes are within historic bounds in some areas (Colombaroli and Gavin 2010), as well as how owls are actually responding to fire themselves (i.e., is
it a threat or is it habitat?). The available evidence shows owls are quite resilient to fire across all 3 subspecies (Bond et al. 2002, et al. 2009, Bond 2015, and Clark 2010 for northern spotted owl).

13-83 - Recent studies also have challenged perceptions about historical conditions in dry forests in the owls' range that FS has incorrectly portrayed as open and park-like when in fact these conditions appear to be the exception NOT the rule iv. This has important implications for owl recovery, as thinning will create novel forests that replace the habitat mosaic generated by most fires that owls and other wildlife require (e.g., black-backed woodpeckers nest almost exclusively in charred, snag-rich forests). Recommendation: Projects that open dense forests are incompatible with spotted owl recovery. Further studies must be conducted and peer-reviewed prior to FS treating active management as recovery actions.

Concern Statement: The Forest Service should incorporate new scientific knowledge regarding fire impacts to owl occupancy and habitat, and consider these before applying active management.

141. Response

See also Response 130 (to Concern 176) regarding management direction for LSRs, the project area, critical habitat and treatment effects; and Response 124 (to Concern 38) regarding active management, fire and NSO, thinning treatments and NSO habitat function.

The NWFP, Forest Plan, and LSRA contain management direction and standards and guidelines for protecting and enhancing late-successional and old-growth forests and contributing to the recovery of the NSO. The Revised Recovery Plan for the NSO (USDI-FWS 2011) provides guidance for the survival and recovery of the subspecies. The revised Critical Habitat Rule for the NSO states that “As discussed in the Revised Recovery Plan, recovery of the NSO will likely require that an ecosystem management approach that includes both passive and active management, to meet a variety of conservation goals that support long-term NSO conservation, be implemented” (USDI-FWS 2012 p. 71881). The Rule also notes that the FWS is “not encouraging land managers to consider active management in areas of high-quality owl habitat or occupied owl sites; rather, we encourage management actions that will maintain and restore ecological function where appropriate” (Ibid.). The Forest considered this guidance when designing the project, including Special Management Considerations for the East Cascades Critical Habitat Unit and East Cascades South subunit where the project is located. The Forest seriously considered management direction and standards and guidelines from the NWFP, Forest Plan and LSRA, and recommendations from the Recovery Plan in the project’s design and proposed treatments (thinning treatments, down wood and snag levels, no-treatment areas, etc.). The comment seems to express concern with the overall guidance in the FWS Recovery Plan and FWS Final Critical Habitat Rule for the NSO, and it is beyond the scope of this project, and the Forest Service’s authority, to address those concerns.

At the project level, the risk of habitat loss (ongoing and potential future loss) in the Elk Flat LSR was the main consideration when developing stand treatments and treatment area prioritization. The DEIS, FEIS, and Biological Assessment all discuss how stands were excluded from treatment as they are higher value for NSO and other late-successional dependent species. The site-specific fire behavior modeling (DEIS and FEIS Chapter 3 fuels section; McRae 2015) also shows that under no action, up to 40% mortality in the natural stands is predicted from passive crown fire and flame lengths of 4-6 feet (Final BA p. 16). Approximately 63 percent of this area is situated in the portion of the project designated as NSO critical habitat (Final BA p. 80). In older plantations (within and outside critical habitat), and some younger plantations, flame lengths would likely be 6-10 feet (Riegle 2010; map 6 data set in Appendix B of the Draft and Final BA). The existing conditions and predicted effects of ‘no action’ framed the proposed treatments.

A number of papers were presented in the comments above. Studies by Miller et al. (2012) and Colombaroli and Gavin (2010); and papers by Hanson et al. (2009) and Hanson et al. (2010) examined fire risks and trends in Southern Oregon and Northern California. Colombaroli and Gavin (2010) concluded that the fire regime in the Siskiyou Mountains is highly episodic and climatically influenced, with severe fires associated with drought. But they also noted that the current landscape is different from pre-settlement landscapes. It is important to note that their study area did not include the Southern Cascades Range, where the project is located.
Miller et al. (2012) did include the Southern Cascade Range in their study area, finding that climate is of growing importance in terms of wildfires. The authors also found that under the right circumstances, fire may be used to achieve management objectives (such as reducing fire hazard and restoring the role of fire to the ecosystem). However, they also noted that due to a lack of fire severity data for the Cascade Range of the Shasta-Trinity National Forest, the relationships and patterns they found may not be representative of that area. The purpose of the Elk LSR project is also not to stop fire, but protect and enhance existing and developing late-successional habitat so that it can be more resilient to disturbances, including fire. As described in the Final BA (pp. 88-89), returning a more frequent, low-intensity fire regime to the project area that is more representative of the historical conditions and range of variability (Skinner and Taylor 2006; Miller et al. 2012; Long 2009; Franklin et al. 2002, 2007) is integral to the purpose and need.

Hanson et al. (2009) stated there was not enough data to accurately predict fire risk and trends that were described in the Draft Recovery Plan for the Northern Spotted Owl, and that best available science is needed to address Recovery Plan strategies in an adaptive management framework (and also that there is ample time for additional research on fire risk). Hanson et al. (2010) reiterated their conclusions from their 2009 paper. The Revised Recovery Plan (2011 p. III-32), does not agree with Hanson et al. 2009 and 2010 on some of their fire regime descriptions. The FWS states “…given the highly altered condition of the existing dry forest ecosystem and the effects of ongoing climate change on the currently compromised functions, we believe restoration of dry forest ecosystem structures and processes must begin now and cannot wait for all key information gaps to be filled” (USDI-FWS 2011 p. III-37). The Elk LSR project was designed with full consideration for recommendations in the 2011 Revised Recovery Plan for dry forest ecosystems (Final BA pp. 3, 8-10, 47, 49-50), and recommendations under Recovery Action 10 and 32 (see Response 147 regarding the Recovery Plan).

The remaining papers cited in the comment pertain to effects of fire on NSO and its habitat, with the statement that owls are resilient to fire. Clark et al. (2011, we assume the citation is from 2011 as we could not find a 2010 citation that was related to the topic) examined survival rates of NSO in burns and adjacent areas in southwest Oregon (Timbered Rock Fire area). They “found no evidence for an effect of fire severity or quantity of habitat on Spotted Owl survival…and were unable to support or reject our predictions regarding the effects…” (Clark et al. 2011). Bond et al. (2002) looked at short-term effects of wildfires on NSO, concluding that NSO may be able to withstand immediate short-term (1 year) effects of low- to moderate-severity fires, and that prescribed burning may be an effective tool in restoring habitat with minimal short-term effects to resident owls. The Elk LSR project also includes low-intensity prescribed fire as a treatment to begin the cycle of returning this lacking disturbance element on the landscape (Final BA p. 47).

The Bond et al. (2009) paper is similar to the Bond 2002 paper, with the exception that it examined post-wildfire effects on California spotted owls (CSOs) in the southern Sierra Nevada. Bond et al. 2009 found that those owls foraged in high-severity burned forest more than areas burned at other severities, in part, and that there is variability in owls’ use of different fire severity burned areas and surrounding unburned areas. This paper concluded with recommendations that “burned forests within 1.5 km of nests or roosts…not be salvage-logged until long-term effects of fire on spotted owls…are understood more fully” (Bond et al. 2009). We assume this statement was made due to the observations of increased prey abundance in moderate and even high-severity burn areas due to the complex early seral habitat that supports and increase of mammalian (and avian) prey post-fire.

The Forest assumes the comment’s citation to Bond 2015 is actually Lee and Bond (2016). Lee and Bond (2016) studied CSOs use of habitat affected by the Rim Fire (Sierra Nevada Range); concluding that owls continued to use the post-fire landscapes as similarly concluded in Bond et al. 2002 and 2009. They also recommended that land managers should consider burned forests as post-fire owl habitat. When wildfires occur in NSO habitat and a Forest (or other land management agency) decides to take some management action, fire-affected nesting, roosting and foraging habitat is assessed and evaluated as either non-habitat, dispersal or suitable. This was done for the 2012 Bagley Fire on the Shasta-Trinity National Forest (STNF), 2008 fires on the west side of the STNF, the 2014 fire on the Klamath NF, and the 2015 fires on
the west side of the STNF and Six Rivers NF). Depending on the severity of burn (determined from RAVG data) and habitat suitability pre-fire, NSO habitat is ‘typed’ and either considered suitable, dispersal, or non-suitable, based on specific vegetation characteristics.

The 2016 Lee and Bond paper also recommends not salvage logging within 1.5 km of nests or roosts. While the 2002, 2009 and 2016 papers regarding post-fire NSO and CSO habitat use are not directly applicable to the project’s purpose and need, as there is no salvage logging post-fire proposed, they are informative in terms of describing the owl’s use of burned forests for foraging (and nesting/roosting) under specific habitat conditions. In the Elk LSR Project area, NSO nesting/roosting habitat is primarily location in the northern portion of the project area (DEIS p. 166; Draft and Final BA Appendix B Map 4). While the project includes a salvage adaptive management treatment to reduce risk from ongoing pine mortality (DEIS p. 51), no salvage adaptive management or other mechanical treatments will be implemented in nesting/roosting habitat, or other high value habitats.

The Revised Recovery Plan also addresses much of this research and literature regarding the effects of fire on NSO habitat (USDI-FWS 2011 pp. III-29 through III-31), stating that they can only conclude that fires are a change agent for spotted owl habitat, but there are still many unknowns regarding how much fire benefits or adversely affects spotted owl habitat. Applicable literature presented in the comment, and additional research literature, was considered in the DEIS (p. 185) and FEIS when discussing no action. The DEIS (pp. 185-186), FEIS, Draft BA (pp. 39-40, 111) and Final BA (pp. 88, Appendix D pp. D4 to D5) also discuss the NWFP 20-year monitoring report. This Report concluded that large wildfires continue to be the leading cause of NSO habitat loss on federal lands (Davis et al. 2015) and that range-wide, NSO nesting/roosting habitat lost to fire (505,800 acres) represents about 31 percent of the total habitat loss. Nesting/roosting habitat is one key variable in terms of contributing to long-term NSO recovery, though barred owls appear to be the primary cause of NSO population declines across their range (Dugger et al. 2015 p. 98). Miller 2012 was considered in the Draft and Final BA, and in the DEIS (p. 25) in the discussions regarding the Elk LSR project area’s existing conditions and fire regime.

Regarding what is known about historical conditions of dry forests in the project area, the comments note that some studies have challenged the actual historic conditions of dry forests in the NSO’s range. The Elk LSR Project’s purpose and need is to reduce risks of habitat loss and increase stand resilience to disturbances, and accelerate development of late-successional and old-growth habitat characteristics (DEIS p. 9). Treatment would reduce stand densities to increase individual tree and stand resilience and reduce ladder fuels. Many stands are extremely dense with small and medium sized trees, due to the lack of frequent, low- to mixed-severity fire (DEIS p. 127). An “open, park-like” forest is not the goal within suitable or even dispersal habitats for NSO in the project area and the Chapter 3 section of the DEIS and FEIS for NSO, and the Draft and Final BA, address what the post-treatment basal area and habitat function would be.

In conclusion, the best available science relative to the existing conditions in the Elk Flat LSR regarding the risk of ongoing and future habitat loss and potential uncharacteristic high-severity fire (including papers and studies presented by the commenter), the effects of thinning treatments and fire on NSO habitat were considered during project development and analysis.

Concern# 182- NSO, Post-Fire Habitat

13-138 - The following citations were taken from the 2011 Revised Recovery Plan and the Elk LSR must address how each one is being complied with in the FEIS: Recovery Action 8: In Eastern Washington, Eastern Oregon and California Cascades Provinces, analyze existing data on spotted owl occupancy pre- and post-fire and establish a consistent database to track owl occupancy response to fires across the dry Cascades provinces. Data currently exist that may aid our understanding of spotted owl occupancy of sites after a fire. Most National Forest units in these provinces annually monitor known spotted owl sites for occupancy, and they have accumulated occupancy data sets in burned and unburned areas. Members of the DFLWG have begun compiling and analyzing existing data on occupancy rates of spotted owls in burned and unburned sites, as well as fire extent and severity in the burned sites, to determine how fire influences occupancy rates of spotted owls. We anticipate the DCWG will continue this effort. Existing data on pre- and
post-fire vegetation structure is also being analyzed to determine possible connections between pre-fire estimates of fuel loads, fire severity, and subsequent owl occupancy to inform risk analysis efforts. These data should be entered into a database to track future data on spotted owl occupancy and fires. Data collection standards should be established to aid comparison of data among the provinces to aid in comparison across the provinces, though these standards will be subject to change if methodology improvements become available. This synthesis and analysis will inform land managers about how fuel loads in and adjacent to spotted owl habitats can be managed. CC Comment: The Regional Office and the STNF have both received documentation regarding owl occupancy after wildfire including areas burned at high severity (Report on Rim Fire Owls). The FS continually ignores this data and develops timber sale claiming it has to protect it from wildfire. The data is clear that NSO will use burned habitat but will not use salvaged habitat. Timber sale such as Elk LSR project cause immediate harm to owl habitat because of a wildfire that may never occur. In fact a fire hasn't occurred in the Elk Flat area since 1900 and due to the area being surrounded by private lands, heavily logged matrix forest lands, and heavy road density, the chance of any fire getting out of control is limited. RA 8 requires the FS to examine existing data on owl occupancy pre and post fire. This information should inform the development of any timber sale alleged to prevent wildfire.

142. Response

See also Response 117 regarding the NSO determination, and Responses 133 and 141 regarding NSO use of burned forests. Regarding Recovery Action 8, the 2011 Revised Recovery Plan indicates, “Members of the DFLWG [Dry Forest Landscape Work Group] have begun compiling and analyzing existing data on occupancy rates of spotted owls in burned and unburned sites, as well as fire extent and severity in the burned sites, to determine how fire influences occupancy rates of spotted owls. We anticipate the DCWG [Dry Cascades Work Group] will continue this effort” (p. III-40). The DCWG responsible parties include FWS, FS, and BLM (p. IV-4).

Recovery Action 8 consists of tracking pre-and post-fire habitat conditions and NSO occupancy. That is not specific to this project. The summary of the wildlife analysis begins on page 178 of the FEIS, and includes the NSO, its habitat and its critical habitat. An assessment of the project's consistency with the Revised Recovery Plan is contained in the BA for Recovery Action 10 and 32, those most relevant to the NSO and Forest Service vegetation management that does not include salvage (Recovery Action 12 addresses salvage, and there is no post-fire salvage proposed under this project). An assessment of the other Recovery Action is contained in the project record.

LSRA guidance is described in the FEIS (p. 5) and describes that “Protection of LSR’s includes reducing the risk of large-scale disturbance including stand-replacing fire…. Both protection and enhancement can include application of silviculture and other treatments designed to reduce the risk of loss and/or accelerate development of late-successional stand characteristics.” The revised recovery plan guidance recommends active management in a way that reconciles the overlapping goals of NSO conservation, responding to climate change and restoring dry forest ecological structure, composition and processes, including wildfire. The province where the Elk project is located scores high in the recovery plan in terms of ongoing habitat loss as a result of wildfire, and the effects of fire exclusion on vegetation change (FEIS p. 10).

The purpose and need for action (FEIS p. 12) describes the desire to return a low-intensity, frequent fire regime to the project area landscape. Refer to Response 141 regarding fire and the project. The purpose is not to stop a fire, but to increase forest stand and tree resilience in the LSR to such a disturbance, while protecting and enhancing late-successional habitat. The desire is to reduce the likelihood of undesirable fire effects. The FEIS (p. 13) describes that "Natural landscape resilience mechanisms have been decoupled by fire exclusion and wildfire suppression activities (Hessburg et al. 2005, Moritz et al. 2011). Before the era of management, patchworks of burned and recovering vegetation, caused by mostly small and medium-sized fires, reduced the likelihood of the largest fires, which usually resulted from extreme weather events. Twentieth century fire suppression eliminated most of these fires, and forest landscapes are now susceptible to large wildfires.”

The desired condition for fire in the project area is described in the FEIS (p. 26), with existing conditions described at page 28. The project area is the result of both overstocking, lack of low-intensity fire as a
disturbance and effective fire suppression. Under extreme weather conditions, a wildfire that starts under 90th or 97th percentile weather conditions could grow and have undesirable effects to late-successional habitat (FEIS p. 172).

In regards to the comment’s concern that there would be immediate harm to owl habitat, the project does not propose to eliminate fire and was designed to be consistent with recommendations in the 2011 Revised Recovery Plan for NSO and the 2012 Final Critical Habitat Rule for NSO. There are no mechanical treatments in nesting/roosting habitat, or high quality foraging habitat and reintroducing low-intensity prescribed fire is not expected to degrade, downgrade or remove PCEs of nesting, roosting or foraging habitat (Final BA pp. 47-48, 60-63, 81-86). Foraging habitat for NSO will either be degraded (function maintained) by variable density thinning on 697 acres, or downgraded by variable density thinning and radial release of black oak and predominant legacy pine on 98 acres (DEIS pp. 172-173; Draft and Final BA). These effects to foraging habitat will not significantly impact how NSOs may use the landscape for foraging (DEIS p. 172; Draft BA p. 73; Final BA Foraging Effects section). Important habitat components and attributes will be maintained and remaining conditions are well within the range of foraging habitat conditions frequently used by NSO (DEIS pp. 175-176).

Concern# 70 – NSO, Prey

14-12 - thus reducing likelihood of NSO survivability, reproduction, and occupancy of historic Activity Centers. The presence of BO at all, creates a stress to the NSO for all of these competitive reasons. Kelly and Forsman (2004 pp. 808) discussed hybridization of BO and NSO, but concluded that it is "inconsequential, compared with the real threat-direct competition between the two species for food and space." In the Management Implications summarized in Wiens’ Dissertation (2012) titled: Competitive Interactions and Resource Partitioning Between Northern Spotted Owls and Barred Owls in Western Oregon, he highlights a strong potential for interference competition between SO and BO, and indicates that high quality habitat and associated prey species are likely to be the most strongly limiting factors in the competitive relationship. Even though BO may be taking NSO’s primary prey only as a generalist, NSO may be affected by a sufficient reduction in the density of these prey items due to BO, leading to a depletion of prey to the extent that the NSO cannot find an adequate amount of food to sustain maintenance or reproduction (Gutierrez et al. 2007, p. 187: Livezey and Fleming 2007,p. 319). 21. Accounting for prey species availability in the Project (pre- and post-treatment) is essential due to the presence of BO and NSO. The "Northwest Forest Plan-The First 15 Years (1994-2008): Status and Trends of the Northern Spotted Owl Populations and Habitats ", included extensive information regarding the complexity of the BO and NSO relationship, necessary to fully understand the risk factors and stressors facing the NSO. One such risk factor with a need for more information is the need to determine prey cycles and their relationships to NSO in the presence of BO competitive effects. These are necessary in "understanding of spotted owl ecology, and our lack of baseline information increases the difficulty we face trying to manage spotted owl populations in conjunction with the BO (Davis et al. 2011 p. 91)."

14-12 - BO competes for habitat and resources such as food and nesting habitat with NSO and reduce site occupancy, reproduction, and survival. They more aggressively defend territories, have a size advantage, produce larger clutches, and are more opportunistic in their dietary requirement. These characteristics provide them with a natural adaptive advantage over NSO,

14-2 - The degree of potential impacts to the northern spotted owl (NSO) that might be incurred by initiating the Elk LSR Treatment Project (hereafter referred. to as Project) are severely under estimated, do not consider the long established presence of barred owl (BO) in the vicinity, enlist a simplistic approach to habitat evaluation, and fail to quantitate short-term effects to primary prey species (pre-treatment vs. post-treatment abundance).

143. Response

The Draft (and Final) Biological Assessment (BA) addresses project-level effects to NSO, its habitat and its prey, with a determination that the project may affect but is not likely to adversely affect the NSO (Draft BA, p. 129). These documents also discuss the historic presence of barred owls in the project area, stating that the only known barred owls were removed in October 2014 (Draft BA, pp. 41, 45-46, 62, C-10; Draft EIS, pp. 165, E-25). The Management Recommendations section and the project design criteria state that if barred owls are detected, the Forest Service and FWS would engage in technical assistance, and consultation would be reinitiated depending on specific circumstances (Draft BA, pp. 62-
Habitat for NSO (suitable NRF, dispersal, capable and non-habitat) in the ST-215 core and home range; project area; critical habitat areas; and NSO action area was reviewed and ‘typed’ by experienced FS and FWS biologists. They used a combination of field reviews and review of electronic sources (Forest Service 2007 existing vegetation layer, 2012 and 2014 aerial photos - DEIS pp. 158-160; Appendix E; Draft BA, pp. 55-60; Final BA Appendix C and E). There is no requirement to assess prey populations or abundance pre- or post-project implementation, but monitoring for NSOs and other species is completed pre-, during and post-project implementation. The Draft (and Final) BA describes prey base habitat in the project area and action area (Draft BA, pp. 52-53) and addresses likely effects to prey from thinning, machine piling/burning and prescribed fire activities (Draft BA, pp. 73, 76, 78, 79-80, 83, 85-87 88-89 and 90-92; Final BA prey effects sections). The following statement was also added to the Analysis Assumptions section of the Final BA (repeating information from the Draft BA at pp. 52-53): "Prey assessments or surveys have not been completed for the project, but during fieldwork and NSO habitat typing, abundant woodrat nests were observed. It is assumed that based on suitable habitat conditions, and observations during fieldwork, that woodrats are abundant and northern flying squirrels are present to a limited extent in the higher quality habitat areas."

The Draft EIS (pp. 170-171; Appendix E pp. E-13 to E-14) and the Draft and Final Biological Assessments discuss the competitive interactions between barred owl and NSO where the two subspecies overlap. Appendix B of the Revised Recovery Plan for the NSO (which discusses barred owls and NSO interactions in depth) was incorporated by reference into the Draft and Final BA (Draft BA, p. 40; Final BA Appendix D p. D5). The Draft (and Final) BA also describe that "While details on habitat interactions [between NSO and barred owls] are not well understood, they [barred owls] have a broader diet, may reduce NSO detectability and may occupy former NSO activity centers (Irwin et al. 2010, USDI-FWS 2011, Wiens 2012). Their range completely overlaps with the NSOs range (Gutiérrez et al. 1995) and they can negatively affect NSO site occupancy, reproduction and survival (Livezey et al. 2007). Similar effects may occur on any NSO from barred owls utilizing the action area, regardless of project implementation" (Draft BA, p. 40).

To the extent feasible at the project level, the Forest Service has considered the ongoing demographic study results for NSO and conclusions about barred owls and NSOs (Dugger et al. 2015 p. 98). It has also considered other research and literature on barred owl and NSO competitive interactions (Final BA pp. 42-45, 79, 88, Appendix D pp. D2 to D7, D10 to D11, D25 to D26), and effects to prey base from treatments in foraging and dispersal habitats (Final BA pp. 48, 51-55, 59-60, 62-65, and 66-69 Prey Effects Summary; FEIS Chapter 3 section on NSO). The project incorporates recommendations from the Revised Recovery Plan (for Recovery Action 32), and recommendations from Dugger and others (2005, 2011, 2015), Forsman and others (2011, 2012), and the FWS regarding preserving as much high-quality habitat in late-successional forests as possible across the range of the subspecies (Final BA pp. 9-10, 50-51, 61, 74, 77 and Appendix C p. C7).

As the comment acknowledges, there is a lack of information in the scientific community regarding the relationship between NSO and barred owls, including effects of forest management (Final BA p. 44, Appendix D p. D6). The Forest will continue to use the best available science in their project-level analyses as it relates to barred owls and NSOs and in making resource management decisions. For the purposes of this project, this includes reserving out the highest quality habitat in the project area in accordance with Recovery Action 32 of the Revised Recovery Plan (DEIS, pp. 177, E-14, and H-20; Draft BA, pp. 10, 25, 36, 63; Final BA).

**Concern# 77 – NSO, Prey Species, Effects**

13-86 - Decades of research on owl prey - primarily but not exclusively northern flying squirrels - show declines following thinning
144. Response

The wildlife BA and effects to NSO habitat and their prey was based on research, local and regional monitoring as it applies to the NSO, and other applicable best available science (DEIS p. 160; Draft BA p. 66). Various science is described throughout the DEIS and BA, along with the existing environment for prey species, including northern flying squirrel (DEIS pp. 165, 166, 172, 173, 176; Final BA pp. 27, D13 to D17; Draft BA p. 52-53). Woodrats likely constitute the majority of NSO prey in the majority of the Elk LSR project (and action) area, with other minor species such as deer mice and voles. In some stands (nesting/roosting, high quality foraging), flying squirrels may be present, but at lower densities. There may also be some flying squirrel/woodrat overlap in the higher elevations of the action area and within the denser, contiguous mixed conifer/fir stands in the northwestern portion of the project area (Draft BA p. 53; Final BA p. D17).

Effects to NSO prey are summarized in the Final BA (pp. 66-69) and Draft BA (pp. 90-92). Specific treatments (thinning, prescribed burning, piling/burning piles) and their effects on suitable, dispersal and capable NSO habitat also address impacts to prey (Final BA pp. 48, 51, 53, 54-55, 59-61, 63-65). Flying squirrels are included in these discussions (Final BA pp. 60 discussing piling on truffle abundance, p. 66 regarding thinning and retaining midstory cover, and pp. 68-69 regarding effects). In general, responses by NSO prey species to the thinning and fuels treatments are expected to vary (Draft BA p. 90). As just described, the Final (and Draft) BA explain that where mixed conifer/foraging stands are thinned, piled and burned, or thinned and burned in NSO foraging habitat, there will be short term impacts to tree squirrels and potentially flying squirrel. Treatments are not expected to adversely affect the short or long term prey forage or prey availability however, as they would not significantly reduce the understory or overstory density (Wilson 2010; Manning et al. 2012). Variable density thinning and tree selection would maintain some high density patches and structural occlusion in the midstory to reduce predation and detection rates of flying squirrel (Wilson and Forsman 2013). Also, the best available habitat for flying squirrel would be retained in an unthinned and un-piled condition, but subject to low-intensity prescribed fire. While tree and flying squirrel forage base may be impacted in the short term, since arboreal lichen primarily occurs in larger, older living trees, it is expected to be largely unaffected by these treatments (Final BA p. 68; Draft BA p. 91).

Concern# 147 – NSO, Protection of Mid Seral Forests

13-73 - Notably, mesic mature forests in the Klamath Siskiyou ecoregion have been recognized by scientists for their climate refugia benefits as these forests are most likely to maintain conditions for moisture sensitive species in the region. Scientists recommend protecting mature mesic forests as climatic refugia and because they are the next cohort of late seral habitat for owls and hundreds of other species. To recover the owl, the FS needs to place a higher degree of protection on mid seral forests so they can eventually become high quality habitat.

145. Response

The Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS 2011) provides guidance regarding the survival and recovery of NSO. The Elk project area is not located in mesic forests of the Klamath Siskiyou ecoregion, but is located in the California Cascades physiographic province composed of dry forests. This province is also at high risk from the threat of ongoing habitat loss as a result of wildfire, and the effects of fire exclusion on vegetation change (Final BA pp. 8, 88-89, D2 to D5; Draft BA pp. 9, 38-39, 111-112). The Recovery Plan recommends active management which includes restoring dry forest ecological structure, composition and processes (USDI-FWS 2011 pp. I-8, III-20 to III-21).

The Recovery Plan also defines mature forests as those where growth rate has peaked, generally containing smaller average diameter, less age-class variation, and less structural complexity than old growth stands of the same type (USDI-FWS 2011 p. G-3). To develop characteristics such as larger diameter trees and create heterogeneity within a stand, some disturbance event(s) will need to occur. Additionally, the Recovery Plan notes that a mixture of forest types may be ideal for NSO habitat (USDI—FWS 2011 p. A-11). There will be no mechanical treatments (thinning, roads, machine
Thinning, piling/burning piles, and prescribed fire in foraging, dispersal and capable habitat types will promote resilience and survival of larger trees while retaining characteristics such as stand diversity, structure, and health (DEIS p. 47). Treatments in mid-seral forest stands will reduce inter-tree competition, increase stand resilience, and are expected to accelerate development of large diameter trees, moving stands toward late-seral habitat (DEIS pp. 131-132). Treatments also include retaining unthinned patches for diversity, structural heterogeneity, and rest/roost clumps for wildlife (DEIS p. 48).

In summary, the Elk LSR project area is not located in the Klamath Siskiyou ecoregion and does not contain mesic mature forest. It is located in the California Cascades physiographic province and is composed of dry forest type of early, mid and late-successional forest. As stated in the purpose and need, the project is designed to protect and enhance late-successional habitat, including reducing risk of further habitat loss and moving early and mid-seral stands toward late-seral character that support NSO (DEIS pp. 9 and 27).

Concern# 98 - NSO, Recovery Action 11

13-95 - Recovery Action 11: When vegetation management treatments are proposed to restore or enhance habitat/or spotted owls (e.g., thinnings, restoration projects, prescribed fire, etc.), consider designing and conducting experiments to better understand how these different actions influence the development of spotted owl habitat, spotted owl prey abundance and distribution, and spotted owl demographic performance at local and regional scales. Additional research that identifies both short-term and long-term responses of prey populations (northern flying squirrels, woodrats, and other small mammals) to thinning treatments is also needed. Such forest management experiments should recognize the management activities known to negatively affect spotted owls discussed earlier and seek to expand our understanding of practices that will improve conditions for spotted owls and their prey. CC Comment - We have argued this point repeatedly regarding unproven active management. The FS lacks any empirical data to demonstrate that active management projects such as Elk LSR work. What we do know is that. After dozens of these types of projects in the McCloud Flats, the NSO is disappearing along with its habitat that is continually logged. If the FS wants to legitimize active management it should develop some small scale experimental projects with an active monitoring program to obtain legitimate data that its course of action will work. To date no such data exists. The McCloud Flats is largely cut over and in many places resembles SPI lands more than a natural forest.

146. Response

Recovery Plans are not regulatory; they provide recommendations to support recovery goals (USDI-FWS 2015, USDI-FWS 2011 pp. I-3 to I-4). The Forest Plan goals are as follows: "Threatened & Endangered species will continue to be managed under existing recovery goals identified in individual species recovery plans" (USDA-FS 1995 p. 3-28), and the Forest Plan Standards and Guidelines require the Forest to "Maintain and/or enhance habitat for TE & Sensitive species consistent with individual species recovery plans (Forest Plan p. 4.30).

Recovery Action 11 in the Revised Recovery Plan for the Northern Spotted Owl (RRP) describes that "when vegetation management treatments are proposed to restore or enhance habitat for spotted owls (e.g., thinning, restoration projects, prescribed fire, etc.), consider designing and conducting experiments to better understand how these different actions influence the development of spotted owl habitat, spotted owl prey abundance and distribution, and spotted owl demographic performance at local and regional scales" (USDI-FWS p. III-47). In support of this recommendation, the Forest proposes a small-scale monitoring effort to assess the effects of underburning treatments in suitable NSO habitat (DEIS p. 92; Draft BA pp. 11, 33, 87).

The effects of underburning treatments in thinned and unthinned stands would be evaluated periodically to assess if treatments are meeting the levels of acceptable mortality determined by the interdisciplinary
team and FWS (described in the Draft BA at Tables 8 and 9; and DEIS at Tables 27 and 28). If monitoring indicates that modified protection measures are needed, either due to unintended effects or changed environmental circumstances, an analysis would be completed through a Chapter 18 NEPA review prior to additional entries (Draft BA p. 87). This would contribute valuable information on the effects of underburning. The implementation of a NSO habitat development study is outside the scope of the project (see DEIS pp. 9-10 that discuss the purpose and need). Impacts of project activities on NSO and NSO habitat and prey are discussed in the DEIS and FEIS; and in the Draft and Final BA. Within nesting/roosting and high-quality foraging habitat, no mechanical treatment is proposed; only low-intensity prescribed fire, which is expected to benefit both critical habitat and suitable habitat in the project area (DEIS, pp. 103, 106, 109, 171-174).

The U.S. Fish and Wildlife Service addresses active management in its Final Rule for Revised Critical Habitat for NSO, which states that in fire-prone regions, there is a potential benefit to habitat through active management of Forest lands (DEIS, pp. 7-9, 176-179). The Forest will continue to explore opportunities that can support the goals of Recovery Action 11. Annual surveys of NSO activity centers on the McCloud Flats show successful reproduction in varying years (USDA-FS 1989-2015) and the Forest works with private landowners to band young owls as opportunities arise. The commenter's claim that the NSO is disappearing along with its habitat on NFS lands is not currently supported by these survey results.

Concern# 65 - NSO, RRP

4-68 - Please note that implementation of Alternative 3 would not likely adversely affect NSO critical habitat in the LSR. Hence the Alternative better meets the intent of the land use allocation and the NSO Recovery Plan.

13-2 - The management direction for this project is at odds with STNF FOREST PLAN and the Revised Recovery Plan (RRP) for the Northern spotted owl (NSO).

13-65 - The DEIS at pp. 176-177 speaks to suggestions in the RRP for active management. They include focusing on young stands; focusing on lands outside LSRs; avoiding activities in NSO territories; ensuring transparency so the public knows what is being done; and incorporating new information into future actions. In the comments outlined here we can state with certainty that ALL of these recommendations have been violated. The Elk LSR project fails to follow the RRP and fails to achieve any of the recovery actions.

13-98 - STNF FOREST PLAN 4-30 Wildlife (Threatened, Endangered and Sensitive [TE&S] Species)* Maintain and/or enhance habitat for TE&S species consistent with individual species recovery plans. While the STNF likes to claim the RRP is a regulatory document and not enforceable we would note the above standard in the FOREST PLAN. The STNF is obligated under law to follow its FOREST PLAN and therefore it must also follow the RRP. On the STNF, the RRP is enforceable under law.

147. Response

The comment expresses support for Alternative 3, which would not treat any natural stands in designated critical habitat for the NSO, and does not return a natural, frequent fire regime within designated critical habitat for the NSO. See also Responses 64, 115, and 135 that address Recovery Actions 10 and 32. The project was designed based on recommendations from the Recovery Plan for Recovery Actions 10 and 32, through consultation with the FWS (DEIS p. 171; consultation is described at DEIS Appendix E and BA Appendix C).

The project was designed to meet management direction for LSRs under the Forest Plan, NWFP and 1999 Forest-wide LSRA (DEIS pp. 4-9). Refer also to the Compliance Section of the EIS (Appendix H). As described in the DEIS (p. 6) “Late-Successional Reserves (LSRs) were established in the Forest Plan and are intended to provide old-growth forest habitat, provide for populations of species that are associated with late-successional forests, and to help ensure that late-successional species diversity will be conserved. Management direction in LSRs is to protect and enhance conditions of late-successional forest ecosystems, which serve as habitat for late-successional and old-growth related species, including the northern spotted owl (NWFP, 1994 p. 8) (Forest Plan pp. 4.37 to 4.43) (LSRA, 1999 p. 1). Protection of LSRs includes reducing the risk of large-scale disturbance, including stand-replacing fire, insect and disease epidemics, and major human-caused impacts (LSRA p. 1). Both protection and enhancement can
include application of silviculture and other treatments designed to reduce the risk of loss and/or accelerate development of late-successional stand characteristics (Forest Plan pp. 4.37 to 4.39), (LSRA, 1999 pp. 174-203). The [1999 Forest-wide] LSRA further describes that the overriding goal of management in LSRs is not only to maintain and protect, but also restore, conditions of late-successional forest ecosystems. Inherent in meeting this goal is the contribution towards the recovery of listed and petitioned late-successional associated species and treatments designed to provide these habitat conditions through time support the objectives for LSRs (LSRA, 1999 p. 174).”

Guidance under the Recovery Plan and Final Critical Habitat Rule is summarized in the DEIS (pp. 7-8) and in the project-level Biological Assessment. To clarify the comment’s statements regarding the discussion of Active Management in the DEIS at pp. 176-177, the DEIS states the following:
“Suggestions regarding active forest management within critical habitat include: 1. Focusing active management in younger forest and lower quality owl habitat, or where ecological conditions are most departed from the natural or desired range of variability; 2. In dry forests, following the NWFP guidelines and focusing on lands in or outside reserves most “at-risk” of experiencing uncharacteristic disturbance, and where the landscape management goal is to restore more natural or resilient forest ecosystems; 3. Avoiding or minimize activities in active NSO territories (or high-quality habitat in these territories); 4. Ensuring transparency of process, so the public can see what is being done, where it is done, what the goal of the action is, and how well the action leads to the desired goal; and 5. Practicing active adaptive forest management by incorporating new information and learning into future actions to make them more effective, focusing on how these actions affect NSOs and their prey (pp. 71882-71883). To ensure the treatments proposed in critical habitat are consistent with recommendations for management described in the Final Rule, several field reviews were conducted with the FWS and Forest Service personnel to the majority of natural stands designated as critical habitat, and some of the older plantation units in critical habitat (see Appendix E that describes the consultation to date). The specific treatments in unit 153 (oak release, radial thinning of pine, small gap creation), and other units proposed for thinning and prescribed fire were reviewed by both agencies and deemed consistent with management objectives within the East Cascades Province (p. 71907).” This is also summarized in the DEIS at page 8.

The project is consistent with this guidance. Refer to the Public Involvement section of the EIS; the BA that describes where, what type and when treatments would occur in the ST-215 core, home range and project area; and the FWS Biological Opinion for the project.

The Revised Recovery Plan (and Final Critical Habitat Rule) also state that in drier, more fire-prone regions within the NSO's range, active management may be required to preserve essential habitat features (DEIS pp. 176, 179; Draft BA pp. 104-USDI-FWS 2011 p. III-20; USDI-FWS 2012 p. 71908). The project is also consistent with the applicable dry forest restoration principles from the Recovery Plan (DEIS p. 175):

- **Conserving older stands containing conditions that support NSO occupancy/high-value habitat** - Habitat quality and suitability in the project and treatment area was evaluated closely, particularly in the 60-120 year-old natural stands proposed for mechanical thinning and other restoration treatments, or underburning-only (DEIS p. 166). There are no mechanical treatments proposed in nesting/roosting habitat, or high quality foraging habitats in the project area and reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function, but benefit it over time and would not exacerbate any competitive interactions between NSO and barred owl (DEIS p. 171).

- **Emphasizing vegetation treatments outside of NSO cores highly suitable habitat** - The proposed actions will not reduce nesting, roosting or foraging habitat in a home range with a reproductive pair. Treatment types and locations have been prioritized within the unoccupied ST-215 core and home range, based on existing habitat levels, occupancy (or lack thereof), the current habitat levels that are <40% in the home range recommended values and the ability to effect meaningful structural change in a <30 year timeframe (DEIS p. 175).
148. Response

The comment supports the no action alternatives, expressing that the treatments would not provide suitable habitat post treatment or for NSO short-term survival. The Project is designed in accordance with NWFP and Forest Plan management direction for Late-Successional Reserves, as described in Response 140. The Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS 2011) is not considered a regulatory document (USDI-FWS 2015, 2011 pp. I-3 to I-4) and is not required to be addressed as a part of Section 7 consultation under the ESA. However, the Forest Plan states that “T &E species will continue to be managed under existing recovery goals identified in individual species recovery plans” (USDA-FS 1995 p. 3-28). The Forest Plan Standards and Guidelines require the Forest to “[M]aintain and/or enhance habitat for TE&S species consistent with individual species recovery plans” (Forest Plan p. 4.30). See Responses 64, 115, 135 and 147 that also address the relevance of the Recovery Plan’s most pertinent Recovery Actions (10 and 32) to the project.

The DEIS summarizes effects to Critical, suitable and dispersal habitat for NSO in DEIS Chapter 2, relative to the Issue Indicators and Purpose and Need for the project (Table 29; pp. 101-104, 105-107). The DEIS also summarizes short and long term effects of project activities to NSO and its habitat in Chapter 3 (pp. 168-180).

The recovery objectives in the Revised Recovery Plan for dry forests include maintaining sufficient NSO habitat in the short-term to allow NSOs to persist in the face of threats from barred owl expansion and habitat loss from wildfires (DEIS p. 170). The project was designed in accordance with recommendations from the Recovery Plan for Recovery Action 10 and 32, through consultation with the FWS (DEIS pg. 171). The Recovery Plan recommends forest management to improve stand conditions and forest
resiliency, which should benefit long-term recovery of NSO. While there will be short term adverse effects to a portion of foraging habitat in the CH unit, there will be long-term beneficial effects from creating higher quality, more resilient habitat that could better support territorial pairs (DEIS p. 179).

Dugger and others (2015, 2011) and the Recovery Plan suggest that in environments where NSO and barred owls compete directly for resources, maintaining larger amounts of older forest (nesting/roosting habitat) may help NSOs to persist in the short term. Through project design and field/habitat review, no NSO nesting/roosting or high quality foraging habitat would be subject to any mechanical treatment. Foraging habitat would be degraded through variable density thinning; or downgraded by variable density thinning combined with radial release of black oak or predominant legacy pine. A total of 697 acres of foraging habitat would be degraded, and 98 acres would be downgraded project-wide (DEIS p. 106; Draft BA p. 73). When habitat is degraded, this signifies when treatments have a negative influence on the quality of habitat due to the removal or reduction of NSO habitat elements but not to the degree where existing habitat function is changed. Habitat that is degraded maintains its pre-treatment function post-treatment (DEIS p. 171; Final BA p. 46; Draft BA p. 71).

Where NSO foraging habitat is treated and degraded (function maintained), the DEIS (p. 173) describes that “…it will continue to provide foraging opportunities post-treatment. This determination is based on the post-treatment condition of basal areas ranging from 125-200+ sqft/acre (when combined with the roost and rest clump retention and unthinned patches), 40-60 percent or more canopy cover, a patchy mosaic of burned and unburned areas, including unburned piles where fuels are piled, and mid and understory layering. The group selection and small gap creation in white fir (2 to <0.25-acre openings in homogenous white fir) would result in increased vertical and horizontal heterogeneity from a younger age class and species diversity. These conditions are well within the range of foraging habitat conditions frequently used by NSO (Irwin et al. 2007, 2012). Additionally, the retained species diversity, residual large trees, snags and down wood would contribute to habitat functioning as foraging post-treatment.”

Page 174 of the DEIS describes that “These combined treatments represent 7 to 9 percent of the foraging habitat available in the project area for NSO and NGO respectively, and are not expected to result in a significant negative effect to individuals or overall habitat function. This determination is based on the: 1) small scale of habitat affected, 2) position of the treatment within the outer portion of the ST-215 [NSO] home range and being outside the ST-205 [NGO] territory, and 3) the long-term benefit of increased stand and prey species diversity.”

No suitable habitat would be downgraded or removed in the ST-215 core (including critical habitat). Approximately 46 acres of foraging habitat would be downgraded over the short and long term to dispersal in the ST-215 home range due to: 1) oak release and 2) radial thinning around late-successional, predominant legacy ponderosa and sugar pine. This effect represents 4% of the total suitable habitat in the home range, and 4% of the total suitable habitat in the project area (Note that 59% of the home range is on private lands outside the project area). These 46 acres would continue to provide for NSO dispersal (minimal foraging opportunities and protection from predators).

The Final Rule for NSO Critical Habitat discusses active management and there are special management considerations that were taken into account for the project (DEIS pp. 176-177; and in the Draft and Final BA in the Critical Habitat section for NSO). DEIS (p. 177) describes that “To ensure the treatments proposed in critical habitat are consistent with recommendations for management described in the Final Rule, several field reviews were conducted with the FWS and Forest Service personnel to the majority of natural stands designated as critical habitat, and some of the older plantation units in critical habitat (see Appendix E that describes the consultation to date). The specific treatments in unit 153 (oak release, radial thinning of pine, small gap creation), and other units proposed for thinning and prescribed fire were reviewed by both agencies and deemed consistent with management objectives within the East Cascades Province (p. 71907).”

The analysis found that there would not be significant or adverse effects to critical habitat Primary Constituent Elements of nesting/roosting (PCE2; Final BA p. 62), dispersal (PCE4; Final BA p. 85) or
Elk LSR Enhancement Project

Concern# 161 - NSO, Survey Protocols, Detections
14-11 - The potential for NSO to remain undetected in the Project action area may be a very distinct possibility, with evidence found in the 2011 NSO stand search, where a probable NSO feather was observed and noted. Additionally, in the early afternoon of August 29, 2013, during a field trip to the Project area, we visually observed a single adult NSO perched in a small cluster of trees approximately 20 feet up in a 45 cm dbh Jeffrey Pine while performing evaluations of the habitat in Unit 152-1. This habitat was classified as "foraging" based on Map 4 - NSO Habitat in the NSO Action Area of the biological assessment. The observation was recorded at 13:00 on August 29, 2013; GPS Coordinates: N 41° 22' 16.9"; W 121° 59' 35.5" (±37 ft.). The location can be viewed in the GoogleEarth image in figure 1. Photographs of the NSO, a feather, and white wash found on the ground below the roost tree are included in figures 2-.6. Despite the biological assessment survey data, indicating 'no detections' after three stand searches and 6 night time visits, we did find an NSO in the Project area. Although the revised protocol increases the likelihood of detecting NSO in the presence of BO, it may still fail to identify NSO in the area.

149. Response
See Response 108 to Concern 41. The Forest does not dispute the comment in that there is a potential for NSO to remain undetected, but as described in this Response - the 2-year, 6-visits per year surveys establish a reasonably high likelihood of detecting spotted owls in a survey area (USDI-FWS 2012 pp. 4-5, 17).

Concern# 111 – Wildlife/NSO Fisher, Large Tree Retention
4-14 - The analysis contained in the DEIS regarding the effects of large tree logging on wildlife species of concern is misleading and incorrect. On page 175 of the wildlife analysis in the DEIS the Forest Service claims that implementation of logging Alternative 1 will benefit spotted owls and pacific fisher because that alternative facilitates the "most acreage towards larger trees classes." In fact, as disclosed on page 132 of the DEIS, the LSR logging project will in fact reduce the number of large trees in both the short and long term.

150. Response
See also Response 104 to Concern 112 regarding tree growth in thinning units and the limitations on the modeling data. This is also explained in the BA (Draft BA p. 72; Final BA pp. 47, 56-58) and in the preliminary Biological Evaluation (pp. A1-A3).

Page 132 of the DEIS includes Tables 35 and 36, which display the modeled number of 24” and larger DBH trees in thinning units pre, post and 20-years post thinning; and the average DBH of trees pre, post and 20-years post thinning. While the number of trees in the 24-inch and larger size class (per acre) would be less post-thinning when compared to no action, the average diameter of all trees would be higher than
under no action. As described in the BA, “where thinning occurs, there would be fewer, more resilient, larger and wider-spaced trees per acre and an overall increase in total diameter classes in the dominant, codominant and intermediate tree size classes from reduced density and reduced inter-tree competition. It is important to understand that these modeling results were derived from the 11 natural stands assessed during the 2007 CSEs [Common Stand Exams], plantation data from FACTS and field reviews, and then extrapolated to other similar stands. The inventory data and modeling of thinning treatments over the 20-year timeframe reflects trends in tree growth, and not necessarily absolute numbers (Payne 2015; USDA-FS 2016)” (Final BA p. 58).

Neither the no action modeling nor the thinning modeling take into account the ongoing mortality in the project area, including that within the tree size classes larger than 24 inches (DEIS p. 132). Conversely, the BA also describes, “…it is important to understand that the FVS modeling does not take into account the project’s deferred high value RA32 habitat areas, unthinned patches in older plantations (~mixed conifer stands) or the 60 to 120-year old natural stands. Nor does it take into account the tree selection criteria that maintains predominant trees, dominant trees with late-successional characteristics, healthy dominant trees, and retention of habitat roost/rest clumps. The modeling only shows the results of the thinning activities and is a reference model that allows for comparing trends across alternatives. With the unthinned patches and deferred high value habitat areas, there would be a higher proportion of 24” DBH trees (and larger size classes) per acre in about 25 percent of the project area where these trees are retained in an unthinned condition. When considering only suitable NSO habitat [which is a proxy for fisher habitat], approximately 40 percent of the total suitable habitat in the project area would not be thinned and is expected to have a higher proportion of 24” DBH and larger trees per acre. The FVS modeling shows that the number of large trees (>24” DBH) per acre in the 3b and 3c seral stages would increase over time with thinning…Under the thinning scenario when compared to no action, it is also important to understand there would be an increase in overall larger average tree size classes with thinning. Also with thinning, there would be a higher amount project-wide of 24” DBH and larger trees, but trees in these size classes would be more widely spaced on a per-acre basis in the thinned portions, resulting in fewer modeled number of trees per acre in this size class” (Final BA pp. 56-57).

Large diameter trees are largely retained, as described in the tree selection criteria (Appendix A, Draft and Final BA Table 5), and the likeliness of their survival over time is improved, by removing excess density, primarily in smaller size classes.

Post-thinning, there would be approximately 77 to 80 percent of trees over 24 inches DBH. By year 20, trees over 24 inches DBH will return to 89 to 96 percent of the pre-treatment stocking levels. Thinning will increase nutrients, water and sun uptake of residual trees, bolstering tree growth, health and vigor (DEIS p. 132). The effects of density-related mortality are not documented in these Tables, but this is also discussed in the Preliminary Forest Health Biological Evaluation (Snyder 2012). It is clearly stated throughout the DEIS, silviculture report and Forest Health Biological Evaluation that density-related mortality is having an undesirable effect to individual trees and stands as tree cover is being lost. Alleviating moisture stress and reducing tree density in terms of trees per acre increases the long-term viability of trees that are left growing on the site; this is well documented in the DEIS, resource analysis reports (Payne 2015b, Snyder 2012) and relevant scientific literature referenced in the DEIS (Oliver 1995, Agee and Skinner 2005, Cochran 1998, Fettig et al. 2007, Kolb et al.1998).

The DEIS does state that treatments under Alternative 1 would “facilitate the most acreage toward increased resiliency and larger tree size classes, with a corresponding reduced risk of habitat loss and increased connectivity for late-successional associated species.” The treatments reduce the risk of losing, and accelerate the development of, late-successional habitat. The DEIS and Preliminary Wildlife Reports show there is a net positive benefit from treatments, further supported by the project silviculture and fuels analysis and the Forest Health Biological Evaluation.

Concern# 68 – Wildlife - NSO/Goshawk, Habitat Availability
6-5 - if studies have proven that the northern spotted owl and/or the northern goshawk inhabit the area, then fine, put aside stands for their habitation, but if not proven, then these proposed “refuges” should be treated, there are lots of potential areas for them to inhabit

151. Response

The project’s thinning prescriptions were specifically developed to reduce the risk of losing habitat for late-successional species, improve NSO habitat, increase conifer species diversity in plantation areas and natural stands (DEIS pp. 47, 138, and 139). Also, contrary to the comment, there are not "lots of potential areas" for NSO and northern goshawk to inhabit in or near the project area, given the stand types (primarily ponderosa pine) and private lands management that typically removes suitable habitat surrounding the project area. These factors contribute heavily toward the project's purpose and need, and the developed treatments, to protect and enhance the LSR.

There is one known NSO activity center (historic ST-215) in the project area, which was analyzed in the Draft and Final Biological Assessment (DEIS, pp. 169-171, 175; Draft BA, pp. 67-68, 93-102; Final BA). Based on survey and stand search data, the ST-215 AC has not been occupied by a verified territorial or reproductive pair, or a verified resident single NSO since 2003 (Draft BA, p. 46; Final BA NSO Direct Effects section and Survey section in Appendix D). As described in Response 108, the 2-year, 6-visits per year surveys (2012 protocol) do establish a reasonably high likelihood of detecting spotted owls in a survey area. Negative NSO survey results are not conclusive that NSOs are or are not present however, as has been shown with surveys where barred owls are on the landscape. It is possible that NSOs may be present but non-responsive (Final BA pp. 42-43, 105; BA Appendix D pp. D2, D26).

There are no mechanical treatments proposed in nesting/roosting habitat, or high quality foraging habitat for NSO and reintroducing low-intensity prescribed fire in these areas is not expected to degrade, downgrade or remove habitat function (DEIS p. 171). Vegetation treatments were emphasized outside of the highly suitable habitat and in accordance with recommendations and prioritization under Recovery Action 10 of the Revised Recovery Plan for NSO. The proposed actions will not reduce nesting, roosting or foraging habitat in a home range with a reproductive pair. The project is designed in accordance with recommendations from the Recovery Plan for RA 10 and 32, through consultation with the FWS (DEIS p. 171) and Forest Plan Standard and Guideline 25-h (Forest Plan p. 4.30).

There is one known northern goshawk territory in the project area (DEIS, p. 107; Prelim. BE, pp. 6, 26-54). Approximately 289 acres (inclusive of the territory, past nest sites, and areas of observed use) will have no mechanical treatments, no new temporary roads, and no new landings (Prelim. BE, pp 27, 29).

The project’s design and RPMs are intended to protect these species and protect and enhance their habitat over the short and long term.

Concern# 31 – Wildlife - Poaching Enforcement

3-7 - We recorded elk, deer, and blue grouse. What will the project do to protect these species from poaching by ORV and SUV drivers? Close roads, sign them, and enforce rules.

152. Response

Thank you for the information on these wildlife detections in the project area. The project-level surveys and point counts for migratory birds also detected sign and vocalizations of these three species (elk tracks, foraging deer/scat, sooty grouse). Protection of game and non-game species from poachers of any kind is beyond the scope of the Forest Service's mission and mandate however. Hunting regulations are enforced at the state level by the California Department of Fish and Wildlife's game wardens. Forest Service system road status is published in the Forest's Motor Vehicle Use Map, which is available to the public through the Forest's website and at the Supervisor's Office in Redding, and the Ranger District offices in Mount Shasta, McCloud, Mountain Gate, Weaverville and Hayfork. Forest Service law enforcement officers enforce travel management regulations on National Forest System lands and roads. Road
management actions associated with the project, including route closures and decommissioning, are discussed in the DEIS (DEIS pp. 55-56; A-40-A-47) and the relevant resource reports.

Concern# 7 – Wildlife - Road Impacts

4-54 - Attached to our scoping comments was a peer-reviewed article by Trombulack and Frissell (2000) detailing some of the negative impacts of road construction and use on Terrestrial and Aquatic ecosystems. The Forest Service must address and avoid the harmful impacts detailed in this study.

4-55 - Various studies (e.g., Ortega and Capen 1999; Marsh and Beckman 2004) show that the negative impacts of roads to wildlife habitat are not limited to the road prism - there is a zone of influence that extends into the adjacent habitat. For example, Marsh and Blackman (2004) found that some terrestrial salamanders decreased in abundance up to 80 meters from the edge of a forest road due to soil dessication for the edge effects. Ortega and Capen (1999) found that ovenbird (a forest-interior species) nesting density was reduced within 150 meters of forest roads. This study suggests that even narrow forest roads fragment habitat and exert negative effects on the quality of habitat for forest-interior species.” -Deadman’s Palm EA III-110, Ashland Resource Area, Medford BLM. The Ortega and Capen (1999) and the Marsh and Beckman (2004) articles referenced by the Ashland Resource Area were submitted to the Administrative Record for this project.

153. Response

There is no new, permanent FTS road construction proposed under any alternative considered in detail, and road construction effects to forest health, wildlife and soils were identified as a key issue (DEIS pp. 44-46). The open road density in the Elk Flat LSR would also remain the same post-project (DEIS p. 231). In matrix allocation, it would increase slightly from the addition of an existing route (0.10 mi) to the System (DEIS p. 231). This would increase open road density in the project area from 2.72 to 2.74 miles per square mile. This addition to the System was analyzed in the project-level Transportation Analysis Process (TAP (Bonivert 2015a; DEIS pp. 55, 231-232). This is an administrative action so that the present use of an existing unauthorized route would be authorized under Travel Management. This addition does not reflect an increase in existing fragmentation from roads or general accessibility as this route is 'in place' and is already used frequently.

Alternative 2 (considered in detail at DEIS pp. 64-70) and Alternative 9 (not considered in detail at DEIS pp. 121-122), were developed in response to issues raised during project scoping regarding new temporary road construction for the project. A detailed analysis of where temporary roads may be needed was undertaken (DEIS pp. A-44 to A-46, Table Appendix A-6). They will only be constructed where the existing system of authorized and unauthorized routes cannot facilitate implementation of project activities; totaling approximately 2.9 miles (DEIS, pp. 63-64, A-46). Temporary roads, landings, and existing routes that will be used as temporary roads, would be decommissioned after project activities are concluded. Given the generally flat terrain, temporary road construction will be minimal and the extent of decommissioning activities will be determined by the construction of the road. Typically, the entrance will be blocked, drainage patterns will be restored and the temporary road surface will be disturbed to break down compaction and allow the reestablishment of vegetation (DEIS pp. 55-56, A-44).

The new temporary roads are proposed to reduce soil and other resource impacts from long skidding and per RPM No. 16, new temporary roads would be kept to a minimum and routed through non-late-successional or low quality late-successional habitats, as feasible (DEIS p. 84). Best Management Practices will be used to minimize or eliminate soil or hydrologic impacts. Similarly, resource protections for air quality, noxious weeds (invasives), fisheries, and wildlife minimize or eliminate impacts to those resources. A detailed analysis of effects from temporary road construction was also undertaken for the wildlife resource, and other resources and these effects would be short term and temporary. New temporary roads will not be constructed in unthinned patches, the ST-215 NSO core, NSO critical habitat, Recovery Action 32 areas set aside for NSO, or in Riparian Reserves (Draft BA pp. 122-123). They are assumed to be 14 feet wide or less (Draft BA pp. 24, 122; Final BA pp. 27, 98; Prelim. BE pp. 22-35; MIA Report p. 15). They will also not be constructed within any known northern goshawk territory (Prelim. BE, p. 27). New temporary roads in hardwood areas are not expected, but may be adjacent to oak and aspen stands or trees (Management Indicator Assemblage report p. 15).
The potential impacts from new temporary road construction were considered in the DEIS for the comparison of Alternative 2 and Alternative 3 effects where miles of new temporary road construction differ from Alternative 1. Temporary road effects for wildlife, soils, and hydrology were considered (see DEIS pp. 169, 180, 181, 182-183, 198, 200, 201, 202, 204, 206-207).

The potential impacts of new temporary road construction and use on threatened and endangered species and their habitats are also considered (Draft BA, pp. 27, 68, 71, 120-123). There are no identified needs for new temporary roads in NSO critical habitat (Draft BA p. 110). Effects to Forest sensitive species and management indicator assemblages were assessed (Prelim. BE - for northern goshawk at pp. 28, 35 and 36; for Pacific marten at pp. 55 and 64; for bats at p. 79; and for western bumble bee at p. 85; MIA report p. 15).

The project analysis considered the effects to connectivity overall, as summarized at DEIS p. H-22. Trombulack and Frissell (2000) was considered (see DEIS, p. B-33; Discussion for Comment-85), which included various studies such as Ortega and Capen 1999 and Marsh and Beckman 2004.
Letters from Federal, State and Local Agencies

David R. Myers
Shasta-Trinity National Forest Service
3644 Avtech Parkway
Redding, CA 96002

Subject: Draft Environmental Impact Statement for the Elk Late-Successional Reserve Enhancement Project, Shasta-Trinity National Forest, California. (CEQ# 20160008)

Dear Mr. Myers:

The U.S. Environmental Protection Agency has reviewed the Draft Environmental Impact Statement for the Elk Late-Successional Reserve Enhancement Project, Shasta-Trinity National Forest, California. Our review is provided pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

EPA recognizes the ecological significance of the Shasta-Trinity National Forest and the importance of improving forest health and sustainability. We support the Forest Service’s goals of decreasing fuels and reintroducing fire on the landscape to reduce the risk of catastrophic fire, promote biodiversity, and restore natural ecological processes within the forest.

EPA has rated the DEIS and Preferred Alternative 1 as Lack of Objections (LO; see enclosed “Summary of Rating Definitions”). We support the best management practices and resource protection measures and monitoring included in the project design. The remainder of this letter provides recommendations for your consideration as you prepare the Final EIS.

In the discussion of compliance and consistency with California Assembly Bill 32 in Appendix H, the Forest Service states that the project “will have a negligible effect on climate change” because greenhouse gas emissions from the project “would mix readily into the global pool of GHG”. EPA recommends avoiding comparisons of a project’s GHG emissions to total global or U.S. GHG emissions, as this approach does not provide meaningful information for a project level analysis. Rather, we recommend the Forest Service further consider providing a frame of reference, such as applicable Federal, state, tribal or local goals for GHG emission reductions, and discuss whether the projected emissions levels would be consistent with such goals.

The DEIS includes a brief discussion of climate change, which notes that “trees retained or planted as part of this project will likely compose much of the forests in the project area over the next century” and that “[e]xisting species or genotypes may be poorly adapted to future climate conditions during all or various parts of their life cycles”. It states that the reduction of stand density that would result from the proposed treatments “may increase the resilience of the stands to climate change”. The Reforestation discussion on page A-33 notes that a mix of species would be selected for planting that would promote
diversity and include non-host trees for specific diseases. It is unclear to what extent resilience to climate change would also be a factor in selecting species for replanting. EPA suggests that the Final EIS include a discussion of the increased vulnerability of certain species under a reasonably anticipated climate change scenario, and any projected shift of forest species to new range elevations that may occur under such a scenario. We recommend that the FEIS disclose any additional climate change adaptation measures that may be appropriate, such as the selection of certain species for replanting of decommissioned roads and landings.

Lastly, we note that the project location may contain areas of potential importance historically, culturally, and/or spiritually to local tribes. We recognize that tribal consultation is an important component of the decision-making process associated with this project, and encourage the Forest Service to continue meaningful consultation, throughout the NEPA process, with all potentially affected tribal governments. We recommend that the results of consultations with tribal governments and with the Tribal Historic Preservation Office/State Historic Preservation Office be included in the FEIS.

Thank you for the opportunity to review this DEIS. When the FEIS is released, please send one hard copy and one CD to the address above (mail code: ENF-4-2). If you have any questions, please contact me at (415) 972-3521, or have your staff contact James Munson, the lead reviewer for this project. James can be reached at (415) 972-3852 or Munson.James@epa.gov.

Sincerely,

Kathleen Martyn Goforth, Manager
Environmental Review Section

Enclosure: Summary of the EPA Rating System
Cc: Cindy Diaz, Natural Resource Planner, Shasta-Trinity National Forest
SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency’s (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)  
The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)  
The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)  
The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)  
The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)  
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)  
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)  
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment
United States Department of the Interior

Office of the Secretary
Office of Environmental Policy and Compliance
Pacific Southwest Region
333 Bush Street, Suite 515
San Francisco, CA 94104

Filed Electronically
29 February 2016

Cindy Diaz
3644 Avtech Parkway
Redding, CA 96002
(530) 226-2500
cindydiaz@fs.fed.gov

Subject: Draft Environmental Impact Statement (DEIS) United States Department Of Agriculture Forest Service (USFS) Elk-Late-Successional Reserve Enhancement Project, Shasta-McCloud Management Unit, McCloud Ranger District, Shasta-Trinity National Forest, Siskiyou County California District

Dear Ms. Diaz,

The Department of the Interior has received and reviewed the subject document and has no comments to offer.

Thank you for the opportunity to review this project.

Sincerely,

[Signature]

Patricia Sanderson Port
Regional Environmental Officer

cc: OEPC Staff Contact: Lisa Treichel (202) 208-7116, Lisa_Treichel@ios.doi.gov
Final Environmental Impact Statement

Index
Alternative 1 - Modified Proposed Action, i, vi, vii, viii, ix,
x, xi, xii, xiii, xiv, xv, xvi, xvii, xviii, 1, 39, 40, 44, 45,
46, 47, 49, 59, 60, 61, 63, 64, 65, 66, 67, 69, 70, 71,
72, 73, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 87, 88,
91, 93, 94, 97, 98, 99, 100, 101, 102, 103, 104, 105,
106, 107, 108, 109, 110, 111, 112, 113, 114, 115,
116, 117, 118, 119, 121, 122, 123, 124, 125, 127,
132, 133, 135, 136, 137, 138, 139, 140, 141, 142,
143, 144, 145, 146, 147, 148, 151, 156, 157, 158,
159, 160, 161, 167, 174, 175, 177, 182, 184, 186,
187, 188, 189, 190, 191, 192, 199, 205, 209, 211,
212, 213, 214, 215, 216, 217, 226, 230, 231, 233,
234, 235, 240, 241, 242, 243, 244, 253, 254, 255,
258, 259, 283, 284, A-31, A-40, B-1, B-11, B-12, B13, B-14, B-18, B-22, B-24, B-28, B-29, B-32, B-33,
B-35, B-36, B-37, B-38, B-39, B-41, B-43, B-45, C-2,
Alternative 2 - No New Temporary Road Construction
Other Than Those Required for Landing Access, i, vi,
xiv, xv, xvi, xvii, xviii, 46, 59, 66, 67, 69, 70, 71, 72,
79, 81, 82, 83, 97, 99, 100, 101, 103, 104, 106, 107,
108, 109, 112, 113, 114, 115, 117, 122, 140, 141,
142, 143, 144, 151, 158, 159, 162, 190, 191, 199,
200, 201, 213, 214, 215, 216, 230,231, 234, 242,
244, 254, 255, 258, 259, A-31, A-40, D-4, D-5, G-4,
G-5, H-14, H-29, I-88, I-171, I-172
Alternative 3 - No Treatments of Natural Stands within
Designated Critical Habitat for the Northern Spotted
Owl, i, vi, xiv, xv, xvi, xvii, xviii, 46, 59, 72, 73, 75, 76,
77, 78, 79, 81, 82, 83, 97, 99, 100, 101, 103, 104,
107, 108, 109, 112, 113, 114, 115, 117, 144, 145,
146, 147, 148, 151, 159, 160, 191, 192, 199, 200,
214, 215, 216, 231, 232, 233, 234, 243, 244,254,
G-4, G-5, H-1, H-29, I-126, I-164, I-166, I-172
Alternative 4 - No Action, i, xiv, xviii, 59, 78, 79, 81, 82,
97, 99, 100, 101, 103, 104, 107, 108, 109, 112, 113,
114, 115, 117, 120, 136, 137, 148, 149, 151, 160,
161, 192, 194, 200, 214, 215, 231, 232, 234, 243,
248, 257, H-14, I-55, I-106
Alternatives
Alternative 4, 137
American Indian Religious Freedom Act, 248
Animals
Northern Spotted Owl, 9, 40, 175, 176, 189
Pacific Fisher, 163, 168

Annosus Root Disease, viii, 16, 41, 43, 50, 51, 52, 54,
88, 134, 139, 169, 175, 269, A-16, A-21, A-24, A-25,
Aquatic Conservation Strategy, xvi, 1, 6, 7, 35, 36, 101,
102, 103, 120, 202, 203, 204, 211, 213, 214, 215,
Ash Creek, vi, ix, 4, 9, 35, 36, 37, 38, 57, 84, 85, 86, 91,
92, 99, 101, 102, 103, 127, 154, 171, 172, 173, 205,
206, 207, 208, 209, 210, 211, 213, 214, 215, 222, A2, A-33, A-34, B-22, B-34, B-35, B-38, B-44, F-1, F-2,
I-121, I-140
Aspen Clones, 42, A-21, I-16
Barred Owl, 8, 90, 170, 175, 176, 177, 183, 275, 279,
Best Management Practices, 40, 55, 59, 84, 85, 96,
118, 119, 120, 121, 123, 201, 202, 207, 210, 212,
213, 218, 225, 228, 237, 249, 258, A-29, A-30, A-35,
B-7, B-25, B-26, B-31, B-33, C-1, C-2, C-3, C-4, C-5,
Blackstain Root Disease, 41, B-12, B-42, I-24, I-47, I-71,
I-86, I-105, I-143, I-144, I-152
Boletus, xiii, xv, xviii, 47, 107, 115, 120, 123, 125, 194,
Boron, 175
California Air Resources Board, H-1, H-4
California Natural Diversity Database, 163, 170, 189,
274, I-113, I-114
California Wildlife Habitat Relationships, viii, 3, 4, 20,
130, 274, A-1, B-11, H-25, I-72
Clean Air Act, H-2, H-3, I-43
Clean Water Act, 118, H-11, I-43
Climate Change, 8, 9, 11, 117, 139, 144, 148, 157, 183,
Coarse Woody Debris, 17, 18, 21, 22, 27, 36, 88, 89,
92, 166, 167, 194, 227, 267, 268, A-28, B-21, B-25,
B-26, B-35, G-3, I-5, I-13, I-88, I-89
Conifer Encroachment, ix, 30, 32, 42, 100, 129, 131,
Critical Habitat, vi, ix, xiii, xiv, xv, xvi, xvii, xviii, 1, 8, 45,
46, 47, 51, 59, 72, 73, 76, 77, 82, 97, 99, 100, 101,
103, 104, 105, 106, 107, 108, 109, 110, 112, 113,
114, 115, 116, 117, 121, 124, 128, 144, 159, 162,

Index-I


Index-4
142, I-144, I-145, I-146, I-150, I-152, I-153, I-156, I-
158, I-160, I-161, I-162, I-163, I-165, I-166, I-167, I-
168, I-169, I-170
Thinning from below, x, 41, 136, B-17, B-23, B-25, H-29,
I-23, I-55, I-61, I-79, I-81, I-145
Threshold of Concern, 203, 205, 209, 213, 215, 282
Timber Harvest Plans, 188, 189, B-15, B-28, B-36, B-
37, B-39, F-2, F-6, F-8
Timber Stand Improvement, 7, 188, I-74
Transportation Analysis Process, 38, 124, 234, 235, B-
31, B-33, I-48, I-171
Travel Management Rule, 123
Universal Soil Loss Equation, 218, 221
Unthinned Patches, x, xi, xii, xviii, 41, 50, 52, 60, 63, 64,
66, 68, 70, 73, 74, 76, 79, 82, 87, 89, 100, 101, 107,
119, 122, 125, 128, 132, 133, 134, 137, 138, 140,
144, 145, 156, 157, 158, 178, 180, 182, 196, 198,
A-31, A-33, A-34, B-8, B-13, B-16, B-21, B-22, B-29,
B-37, B-42, G-2, G-5, H-16, H-19, H-20, H-22, H-24,
I-16, I-18, I-34, I-36, I-37, I-61, I-64, I-66, I-67, I-69, I-
74, I-79, I-80, I-87, I-108, I-150, I-152, I-153, I-163, I-
167, I-169, I-171
Vegetation Treatments
Thinning, 53, 60, 62, 67, 68, 69, 73, 74, 75, 80, 137,
Vehicles
Over snow vehicle, 86
Visual Quality Objectives, 46, 122, H-32
Water Erosion Prediction Project, 113, 219, 221, 228,
230, 232, 233
western bumble bee, 163, I-101, I-172
Wetlands, vii, 7, 36, 202, 203, H-12, H-13, H-14, H-15, I-
36, I-39
Wild Turkey, I-101
Wildland/Urban Interface, vii, 7, 28, 154, 267, 272, B-2,
B-4, B-5, I-87
Wildlife Habitat Relationship, viii, 3, 19, 20, 31, 130,
274, A-1, B-11, H-25