1st 48 Roadside Fuelbreak Collaborative Project
Draft Environmental Assessment
Cover photo: Densely growing young trees along Forest Road 2S48. US Forest Service photo by Christy Prescott.

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1st 48 Roadside Fuelbreak Collaborative Project
Draft Environmental Assessment
Trinity County, California

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Chapter 1. Purpose and Need

Introduction
The US Forest Service (USFS or Forest Service) and the Trinity County Collaborative (TCC)\(^1\) prepared the 1st 48 Roadside Fuelbreak Collaborative Project Draft Environmental Assessment (1st 48 Project) to determine if the Proposed Action on Mad River Ranger District (RD) of the Six Rivers National Forest (SRNF or forest), could significantly affect the quality of the human environment warranting an environmental impact statement per the National Environmental Policy Act (NEPA).

The Proposed Action would establish roadside fuelbreak networks (both tree shaded and unshaded where open forest conditions occur) over approximately 823 acres within the wildland urban interface (WUI)\(^2\).

All proposed treatments would occur at varying widths up to 300 feet along either side of Forest Service Roads (FSR) 01S23 (Route23), 02S02, 2S47, 2S48, 2S49, 2S50, 2S51, 2S52, and 2S53 and one motorized trail (8E20).

All proposed treatments are designed to reduce and breakup continuous, while maintaining sufficient tree shade to curb brush response, benefiting forest health and resiliency. The Proposed Action involves thinning of intermingled densely growing ladder and crown fuels, hand cutting, chipping, mastication, machine- and hand- piling debris, manually lopping and scattering surface and small ladder fuels, prescribed jackpot burning, and underburning in oak woodlands.

Additionally, the proposed treatments would thin entire plantations bordering roadways (which extend beyond 150 feet of the road), along with an additional 150-foot flank or buffer around their outer perimeter. In addition, oak woodlands within fuelbreak segments featuring high-density conifer encroachment with high fuel concentrations would be enhanced and maintained by removing competing conifers, followed by application of prescribed underburning to stimulate oak regeneration.

Trinity County Collaborative (TCC)
The 1st 48 Project is designed to aid the protection of dispersed private property, residents and the at-risk community of Ruth\(^3\), in alignment with the National Cohesive Wildland Fire Management Strategy. The Cohesive Strategy seeks to ensure that the values and concerns of the public and all governments are accurately understood and reflected. This demands a more comprehensive understanding of the diverse perspectives that underlie this situation—encompassing both the social/human and science dimensions.

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\(^1\) **Trinity County Collaborative (TCC):** The collaborative is composed of 55 diverse stakeholders including landowners, business owners, local and regional conservation groups, timber industry representatives, fire safe councils, local non-governmental organizations, federal and county government agencies.

\(^2\) **Wildland Urban Interface (WUI):** The wildland urban interface (WUI) zone is an area where human habitation is mixed with areas of flammable wildland vegetation. It extends out from the edge of developed private land into federal, private, and state jurisdictions. The WUI boundaries generally extend approximately 1/4 miles out from the defense zone boundary; however, actual extents of threat zones are based on fire history, local fuel conditions, weather, topography, and natural barriers to fire.

\(^3\) The community of Ruth, population 195 (US Census 2010) is located in southern Trinity County. The State of California in 2001 in accordance with the 2001 Federal Register (FR 66:3) designation of “communities at risk” adjacent to federal lands that are at high-risk from wildfire, identified Ruth as a community at risk. In 2010, the Trinity County Community Wildfire Protection Plan was updated. Federal, state and local organizations convened information to refine the spatial designation of the WUI.
The TCC’s vision is to build on the success of earlier initiatives to bridge organizations and gain traction to address environmental, economic and social concerns identified during the development of the Weaverville Community Forest Strategic Plan (2010). With seventy-six percent of land-base in Trinity County under the jurisdiction of federal agencies (USFS and BLM), the Trinity County Collaborative (TCC) was formed in response to controversy over the management of national forest lands, wildfire risks and impacts, water use and rights and the decline of the natural resource-based economies.

In 2013, the TCC brought forward a “proof of concept” proposal seeking collaboration with forest leadership, to take action now and establish a network of linear, roadside shaded fuelbreaks on national forest lands to facilitate safe evacuation, firefighter access and landscape fire management. An integral component of the proposal is to learn by doing, so incremental adaptive adjustments can be incorporated into future projects, accelerating planning and on-the-ground work attainments.

Project Location

The project area (Figure 1. Project area vicinity map) is located in Trinity County, California on the Mad River Ranger District of the SRNF lies within T2S, R8E, Sections 6, 7, 8, 18, 19, 20, 21, 28, 29, 30, 31, 32, 33; and T2S, R7E, Sections 11, 12 and 13, Humboldt Baseline and Meridian. The Proposed Action is near the community of Ruth, ranging in elevation from 2,700 feet to 5,800 feet at the top of South Fork Mountain.

Purpose and Need for the Proposal

The purpose and need of this project is to provide rural communities and residents travel zones that allow for safer evacuation during wildfires; allow greater, faster wildland firefighter response and suppression; and reduce the risk of roadside fire starts traveling into high-value landscape-level forest resources.

There is a need for establishing, developing and maintaining shaded fuelbreaks along either side of public access and egress roads serving both firefighters and residents living in the WUI. The proposed treatments target reducing surface fuel accumulations (forest woody debris), and thinning thickets of ladder and crown fuels associated with high tree densities, in order to lower the threat of large-scale high-intensity fire behavior. Citizens rely on effective wildfire suppression to safeguard them and their assets during a wildfire. Since the 1940s, wildfire suppression activities intended to protect urban growth prevented these isolated forested areas on public lands from burning, contributing to the high levels of fuel accumulations existing present-day.

This project capitalizes on the benefits that roads and trails provide in respect to rapid deployment of firefighters, making the most suppression tactics. By establishing a break in the continuity of the forest canopy and lowering fuel loading, firefighters would have defensible space from which the flame front could be contained. The ability of local residents living in and around the town of Ruth to evacuate quickly and safely along a road or trail is at the forefront for the proposal. The Proposed Action is designed to influence fire behavior and facilitate safe fire suppression and containment underlining the need for 1) reducing hazardous fuels, 2) increasing forest canopy base height and, 3) lowering tree densities to separate intermingled forest understory and overstory tree crowns.

4 Overstory refers to forest canopy made up of the tops of trees. The understory is made of trees that are growing to reach the canopy.
1. Reduce hazardous fuels.  
Between 2006 and 2011, about 600 assessments were completed by the Forest Service on wildfires that burned into areas where hazardous fuels reduction treatments had previously been conducted (USDA Forest Service 2011a). These assessments evaluated the effects of prescribed fire, as well as mechanical and chemical treatments, on fire behavior and fire suppression actions. The data indicates 90 percent of treatments reported in the database have helped to reduce wildfire intensity, allowing better control by firefighters. In most of these cases, as fires moved from untreated locations to areas treated by thinning, mastication and/or prescribed burning, the fire behavior changed from active crown fires (burning an entire upper story of the forest), to passive crown fires (where only a single tree or small group of trees
burned), or from passive crown fires to surface fires (burning only dry grass, shrubs, pine needles, and other flammable materials on the ground) (DellaSala et al. 2004, USDA Forest Service 2011a).

2. *Increase height of live crown or forest canopy base height (CBH).*

The Forest Canopy Base Height (CBH) describes the average height from the ground to a forest stand's canopy bottom. Specifically, it is the lowest height in a stand at which there is a sufficient amount of forest canopy fuel to propagate fire vertically into the canopy. CBH is an effective value that targets ladder fuels such as shrubs and understory trees (Scott and Reinhardt 2001).

3. *Lower tree densities separating intermingled tree crowns.*

Intertwined tree crowns provide a route for fire to spread from tree crown to tree crown. This potential for fire to burn from the ground into the forest canopy in a wind driven event, creates unsafe conditions for evacuations and firefighter suppression. Thinning functions to increase the spacing between individual trees and their crowns to lower the probability for active crown fire behavior (Figure 2) and flame lengths exceeding six (6) feet, while retaining shade to minimize growth response of understory brush species. Adequate tree shade minimizes loss of surface fuel/soil moisture from solar heating, which can dry out down woody material and logs increasing flammability. Without thinning, self-pruning of densely growing trees can preclude development of healthy tree crowns that provide shade over the long term.

![Figure 2](image.png)

*Figure 2. In 2015, the TCC and SRNF visited the area burned by the Lassics Fire, about 12 miles north/northwest of the 1st 48 Project. As illustrated by forest conditions after the fire, all agreed the visible impacts of active crown fire behavior is the primary concern.*

Numerous fires have occurred within and around the project area and the community of Ruth. The size of the fires, as illustrated by Figure 3, are influenced by the distribution and size of fuels, topography, wind speed, air temperature and the amount and moisture content of forest floor debris.
Where forest conditions within the proposed roadside fuelbreaks feature pole-size trees, dead trees (snags) and debris scorched by the Ruth Fire, the treatment objective is to “grow” trees large enough to provide for shaded fuelbreaks in the future.
**Desired Condition.** The desired future condition is continuous roadside shaded fuelbreak networks have been established, featuring vigorously growing trees with healthy, full live crowns; spaced to promote sustainable, fire resilient crown and bole growth over time. The amounts and distribution of surface fuels, ladder and crown fuels with head-high tree limbs would promote low to moderate fire intensities and rapid containment. Desired canopy closure would vary considerably, with sufficient canopy closure to inhibit the growth of brush and other ladder fuels to sustain long-term shaded fuelbreak effectiveness. Oak woodlands are healthy and ecological processes restored.

**Principle Laws & Regulations that Influence the Scope of this EA**

This section presents land management direction and regulations relevant to the *1st 48 Project*, which provided the legal framework for determining the environmental effects to the human environment analyzed in this draft EA. The Proposed Action was designed to be consistent with the standards and guidelines linked to spatially designated management area prescriptions identified in the SRNF Land and Resource Management Plan (LRMP or forest plan) and the federal agency’s Record of Decision (ROD; USDA 1995), described in Table 1 and displayed in Error! Reference source not found.. In some cases, several management areas spatially overlap the same land-base. In these cases, the proposal was designed to apply the most restrictive prescription-related standards and guidelines.

**Table 1. SRNF forest plan management areas within the project area.**

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<tr>
<th>Management Area</th>
<th>Prescription</th>
<th>Acres</th>
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<tr>
<td>Riparian Reserves</td>
<td>Riparian reserves are specified for five categories of streams or waterbodies. The categories within the project area include fish-bearing streams; permanently flowing non-fish bearing streams; intermittent streams, and unstable or potentially unstable areas. The prescribed width of riparian reserves apply until a watershed analysis is completed, and site specific analysis is conducted and describes the rationale for the final riparian reserve boundaries in the NEPA decision making process. The project area is within the Upper Mad River watershed analysis area. Particularly relevant standards includes: identify and attempt to secure instream flows needed to maintain riparian resources, channel condition and aquatic habitat; Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy (ACS) objectives, and to minimize disturbance of riparian ground cover and vegetation; Design prescribed burn projects and prescriptions to contribute to attainment of ACS objectives.</td>
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<tr>
<td>General Forest / Matrix Lands</td>
<td>This management area includes forested land where commercial timber management would occur. All of these lands are within the Forest matrix. Particularly relevant standards and guidelines includes wildfires would be suppressed. Management related fuels would be treated to be consistent with wildlife habitat needs as described in Forest-wide standards and guidelines. Design management operations to maintain the existing productivity of the site. Design and implement best management practices to meet State water quality criteria. Silvicultural prescriptions shall follow the Forest-wide standards and guidelines for vegetation management and matrix lands as described in chapter 4 of the LRMP.</td>
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<tr>
<td>Retention (Visual Quality Objective)</td>
<td>Timber harvest may occur in retention areas to create visual diversity and enhance the visual resource. Silvicultural methods would include salvage, individual tree selection, small shelterwood units, and group selection. Where visually evident from a viewpoint, stumps would be flush-cut. Slash would be cleaned up and areas with evidence of equipment operation would be rehabilitated to a natural state. Existing Recreation Opportunity Spectrum (ROS) designations would be maintained.</td>
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<td>Partial Retention (Visual Quality Objective)</td>
<td>Timber harvest may occur in partial retention areas. A wide range of silvicultural methods may be used. Regeneration harvest would be shaped to appear as natural openings common to the characteristic landscape. Harvest activities may be visually apparent to the Forest visitor but would not dominate the viewed landscape. Generally a near natural-to natural landscape would appear. Manage to ROS classes of Rural, Roaded Natural, Semi-Primitive Motorized, and Semi-Primitive Non-Motorized.</td>
<td>235</td>
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Management Area | Prescription | Acres |
---|---|---|
Special Habitat / Late Successional Reserve (LSR) | Management assessments are prepared for each large LSR before habitat manipulation are designed and implemented. LSR assessments are subject to Regional Ecosystem Office (REO) review. Thinning or other silvicultural treatments inside reserves are subject to review by the REO to ensure that the treatments are beneficial to the creation of late-successional forest conditions. The REO may develop criteria that would exempt some activities from review. The REO review of the Forest Wide LSRA for the Shasta Trinity National Forest, which includes the LSR within the project area clarified that thinning in early and mid-successional stands for hazard related treatments is consistent with Standards and Guidelines of the Northwest Forest Plan on page C-12 to C-13 “Guidelines to Reduce Risks of Large Scale Disturbance”. Stand attributes include cutting large older trees, generally over 150 years for any purpose would be the exception, not the rule. Diameter limits are not set, but treatments would follow “Guidelines to Reduce Risks of Large-Scale Disturbance” at C-12 to CC-13 in the Northwest Plan ROD. Individual trees exceeding 150 years should not be harvested except for the purpose of creating openings, providing other habitat structure such as downed logs; elimination of a hazard from a standing danger tree, or cutting minimal yarding corridors. Where large old trees are cut, they would be left in place to contribute toward meeting the overall CWD objective. An exception would be in situations where leaving the material would exceed the prescribed large woody debris amounts necessary for the target fuel hazard level and putting portions of the LSR at risk to a catastrophic event. (REO to Haywood, October 18, 2009) | 75 |
Recreation Opportunity Spectrum (ROS) | Roaded Natural: An area characterized by predominantly natural appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonize with the natural environment. Interaction between other users may be low to moderate but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities. The recreation opportunity experience level provided would be characterized by the equal probability for experiencing affiliation with individuals and groups and for isolation from sights and sounds of humans. Opportunities for both motorized and non-motorized forms of recreation may be provided. | 823 |

National Forest Management Act of 1976
The National Forest Management Act (NFMA) is the primary statute governing the administration of National Forest System (NFS) lands. The Act requires the maintenance of productivity of the land and the protection and, where appropriate, improvement of the quality of the soil and water resources. The Act specifies that substantial and permanent impairment of productivity [not defined] must be avoided. Further, activities must be monitored to ensure that productivity is protected. This law led to subsequent regulation and policy to execute the law at various levels of management.

The National Environmental Policy Act (1969)
The National Environmental Policy Act of 1969 (NEPA) requires that all major federal actions significantly affecting the human environment be analyzed to determine the magnitude and intensity of those impacts, the results be shared with the public, and the public given opportunity to comment. The regulations implementing NEPA further require that to the fullest extent possible, agencies shall prepare EAs concurrently and integrated with environmental analyses and related surveys and studies required by the Endangered Species Act of 1973 (ESA), the National Historic Preservation Act of 1966 (NHPA), and other environmental review laws and executive orders. Principle among these are the Multiple Use and Sustained Yield Act of 1960 (MUSYA); NFMA, as expressed through forest plans; the Clean Air Act of 1955; the Clean Water Act of 1948; and the Forest and Rangeland Renewable Resources Planning Act of 1974.

National Cohesive Wildland Fire Management Strategy
Wildland fire management response in the United States has evolved into an increasingly complex and multifaceted system. Climate change, fuels management, expanding WUI and associated infrastructure, budgets, along with mission differences are some of the challenges facing wildland fire managers today. The National Strategy (April 2014) is the final phase in the development of the National Cohesive
Wildland Fire Management Strategy, which seeks to ensure that the values and concerns of the public and all governments are accurately understood and reflected. This demands a more comprehensive understanding of the diverse perspectives that underlie this situation—encompassing both the social/human and science dimensions.
Managers and natural resource experts recognize that the creation of a truly national cohesive strategy would include not only the seven elements identified in the FLAME Act, but must also envision a broader, overarching and comprehensive consideration of all lands and fire programs. Therein lies the primary challenges facing wildfire managers, land managers, and communities in developing a strategy that meets local, regional and national needs.

A national cohesive strategy must recognize the differences and tensions that exist among the partners and stakeholders and why those differences exist (e.g., different priorities, planning processes, legal mandates, values and resources) and seek to resolve them. It must build stronger relationships based on the successes of intergovernmental agreements for mutual response; incorporate cost and data sharing; include community protection planning (CWPPs or their equivalent), regional fire risk assessments, state and forest resource assessments and strategies; and encourage increased use of partnerships, grants and other funding opportunities. Each of these tools can be used to build stronger collaborative processes and move toward shared understandings that resolve conflicts and enhance partnerships among multiple landowners across all lands and jurisdictions.

Forest and Rangeland Renewable Resources Planning Act (1974)
The primary purpose of the Forest and Rangeland Renewable Resources Planning Act is to protect, develop, and enhance the productivity and other values of NFS lands. This was the first Act to name soil as a fundamental resource, recognizing the fundamental need to protect and, where appropriate, improve the quality of soil, water, and air resources and harvesting timber only where soil, slope, or other watershed conditions would not be irreversibly damaged.

Forest Service Manual 2550 – Soil Management (Nov. 2010)
Forest Service Manual (FSM) 2550 provides a national directive to maintain or restore soil quality on NFS lands, and establishes the management framework for sustaining soil quality and hydrologic function while providing goods and ecosystem services outlined in forest and grassland land management plans. The FSM defines soil productivity and soil quality, and describes soil functions that may be used in evaluating soil quality. The FSM outlines programmatic requirements for assessments, analyses, and monitoring pursuant to management activities, and outlines general requirements that S&Gs be developed and implemented at regional and forest levels.

Standards and guidelines are intended to prevent substantial and permanent damage or degradation that affects inherent ecosystem processes. Substantial and permanent soil impairment is defined as detrimental changes in soil properties (physical, chemical, biological) that result in the loss of the inherent ecological capacity or hydrologic function of the soil resource, over the mid-term (substantial, beyond the duration of the project) to long-term (permanent, beyond a land management planning period), respectively.

Forest Service R5 FSM Supplement – Soil Quality Mgmt (R5-2500-2017-1)
Soil management direction is applied to lands dedicated to growing vegetation; it is not applied to areas dedicated to other uses, such as roads, trails, administrative and recreation sites, etc. The Supplement specifies three (3) key soil functions to be used in the Pacific Southwest Region (Region 5 or R5) for assessment and analysis of soil quality: support for plant growth function, soil hydrologic function, and filtering-buffering function. Indicators and desired conditions for indicators are outlined for each soil function. Soil condition is rated as good, fair, or poor for each indicator relative to the desired condition. This approach is intended to help determine the status and trend of soil management, determine whether
ecosystem health and long-term soil productivity is being maintained, and better determine needs and priorities for restoration activities.

Upper Mad River Watershed Assessment (1998)
Watershed analyses are required by the forest plan in Key Watersheds, for inventoried roadless areas in non-Key Watersheds, and riparian reserves prior to determining how proposed land management activities meet the Aquatic Conservation Strategy (ACS) objectives. The project area does not overlap with a key watershed, or inventoried roadless areas; however, the project area does propose limited treatments in the outer portion of riparian reserves and would designate this area as an equipment exclusion zone. The 1st 48 Project was developed in alignment with the ACS reflected in the ROD and standards and guidelines of the Northwest Forest Plan (NWFP; USDA and USDI 1994), as incorporated into the SRNF LRMP (USDA 1995) described below.

The upper Mad River Watershed Assessment contains relevant information about the project area for consideration in this environmental analysis. The assessment characterized the watershed attributes, framed key questions, assessed vegetative and watershed conditions at the time of the assessment and reference conditions, and identified recommendations based on key findings. Key findings and recommendations of particular relevance to this project are presented in an abbreviated version below.

Vegetation Management

**Key Finding (1.3):** Individual black oaks and white oaks are important components of the conifer forest within this watershed. These trees provide valuable habitat for wildlife as well as both rare and common non-vascular plant species (mosses and lichens). Pure white oak and black oak stands are ecologically valuable plant communities in this watershed.

- **Recommended Action:** Maintain black oaks and white oaks in stands while harvesting conifers. Priority leave trees would be those covered with lichens and mosses. Avoid disruption of pure white oak and black oak stands during road and landing construction.

Fire Risk/Hazard and Air Quality

**Key Finding (6.1):** Human-caused fire risk has increased in the watershed since the 1960s with the growing number of private residents and forest visitors. Lightning risk is also high in several areas of the watershed, especially towards the headwaters of the Mad River.

- **Recommended Action:** Strategically placed fuels treatments should target areas of potentially high hazard and risk. To deal with the urban wildland intermix, a strategically placed fuelbreak system could provide defensible locations to stop wildfires from entering the National Forest from fire starts on private lands and reduce the threat to private lands from fires originating on NFS lands.

**Key Finding (6.2):** The hazardous fuels situation in the Upper Mad River Watershed present the possibility of high to extreme fire behavior, especially under late summer conditions. Mapping of potential August rates-of-spread and flame lengths show large, contiguous areas of extreme fire hazard from the valley floor to the ridgetops. This is a major concern since the majority of human-caused fires have been started alongside roads on the valley floor. In addition, stand density has increased, resulting in ladder fuels that create the potential for crown fires and resulting tree mortality and habitat destruction.
Chapter 1. Purpose and Need

- **Recommended Action:** Combinations of fuelbreaks, vegetation mosaics, and project-level treatment would be more cost effective than project-level treatment alone. Strategically placed shaded fuelbreaks could be used to help reduce the impacts of wildland fires along heavily used roads, mountain ridges, plantations, and oak woodlands to deter conifer encroachment.

**Mad River Watershed Assessment (2010)**

In 1992, the US Environmental Protection Agency (EPA) added the Mad River to California’s Clean Water Act §303(d) impaired water list due to elevated sedimentation/siltation and turbidity. The North Coast Regional Water Quality Control Board (RWQCB) identified water temperature as an additional impairment to the watershed in 2006. The watershed assessment is a part of the *Mad River Watershed Management Plan* (MRWMP), which sets forth a strategy to protect and restore the beneficial uses of the Mad River, particularly as they relate to sediment and temperature effects. This assessment focuses on potential sediment influences on instream salmonid habitat and channel processes.

Principal tributaries to the Mad River include South Fork Mad River, North Fork Mad River, Barry Creek, Pilot Creek, Deer Creek, Bug Creek, Graham Creek, Blue Slide Creek, Boulder Creek, Maple Creek, Canôn Creek, Lindsey Creek, and Mill (Hall) Creek. Matthews Dam impounds Ruth Lake and releases water that serves the industrial and residential customers of the Humboldt Bay Municipal Water District.

**Shasta-Trinity’s Forest-Wide Late-Successional Reserve Assessment (1999)**

The *Record of Decision on Management of Habitat for Late-Successional and Old-growth Forest Related Species within the Range of the Northern Spotted Owl* established a network of Late Successional Reserves (LSR), to include 100-acre core areas located around northern spotted owl activity centers known to exist in 1994, and larger, landscape-level Managed Late Successional Areas. Accompanying this was a set of management S&Gs. The network of reserves is 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.

This direction was incorporated into the Shasta-Trinity National Forest’s (STNF’s) LRMP. Standards and guidelines for management of LSRs are detailed in the LRMP and can be found in several sections of the document, including forest-wide S&Gs and Management Area 7 direction. The purpose of this forest-wide LSR Assessment (August 26, 1999) 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. In brief, the assessment covers: inventory of vegetative conditions, a list of late successional forest-associated species, a history and description of current land uses, fire management plan(s), criteria for developing appropriate treatments, identification of general treatment conditions, a proposed implementation schedule, and proposed monitoring and evaluation components.

The LSR assessment evaluated approximately 389,982 acres of LSRs in federal ownership. The South Fork LSR encompasses 80,451 acres, with the majority being located on the STNF. Of that, 1,057 acres are situated and administered by the SRNF. The 1st 48 Project proposes to manage 73 acres within the South Fork LSR.
Federal and State Permits, Licenses, and Certifications
A burn permit from the North Coast Unified Air Quality Management District (NCUAQMD) is required for all prescribed burns.

Compliance with the Clean Water Act and limits set by the Total Maximum Daily Load (TMDL) established in 2007 is achieved via application of project design, mitigations and application of BMPs in adherence to the terms and conditions of the Waiver of Waste Discharge Requirements for Nonpoint Source Discharges Related to Certain Federal Land Management Activities on National Forest System Lands in the North Coast Region (Order No. R1-2015-0021; The Waiver). Enrollment in The Waiver under Category B shall be granted before project activities commence. No additional federal, state or county permits, licenses, or other entitlements were identified as requirements for implementation of the Proposed Action.

Collaboration, Public Involvement and Tribal Consultation

Collaboration
In 2016, the Forest Service and TCC working group conducted a field trip to discuss the bounds of the project area and potential treatment methodology within zones of agreement. The TCC working group participated in interdisciplinary team meetings and discussions beginning in 2017. On-going informal communications (emails and telephone calls) and small group meetings involved interactive conversations about refining the Proposed Action and progress updates.

Tribal Consultation
On April 11, 2017, the forest initiated formal tribal consultation pursuant to §106 of the NHPA (36 CFR 800.2(c)(2)) with the Bear River Band of Rohnerville Rancheria, Round Valley Indian Tribe and the Wiyot Tribe. The forest understands that the local tribes continue to play an important role in this and other undertakings on the SRNF. Tribal knowledge of the area and potential concerns about the natural and cultural resources management within their ancestral territory is an important part of the project design and analysis. A comment submitted stated, “We hope that the proposed 1st 48 Project and the joint participants be allocated the revenue and resources to achieve the goals of this project, a healthy, clean area of forest, managed to prevent high severity fires, waterways that are healthy and able to sustain our local wildlife”.

Scoping
The project was initially listed on the forest Schedule of Proposed Actions on April 1, 2017. The forest initiated the 30-day Scoping period on April 14, which ran through May 5, 2017. The Scoping letter and Proposed Action map was sent to 120 recipients including individuals government organizations, such as the Humboldt Bay Municipal Watershed District and US Fish and Wildlife Service (USFWS); elected officials, such as Congressional Representative Jared Huffman and the members of the County Board of Supervisors for Humboldt and Trinity counties; timber industry organizations, such as the American Forest Resource Council; non-governmental organizations, such as the Environmental Protection Information Center (EPIC) and Conservation Congress; non-federally recognized tribes, such as the Lassic Band of Wylacki-Wintoon Family Group and the Eel River Nation of Sovereign Wylacki; and local businesses, such as the Journey’s End. The complete scoping list is available upon request.
On April 25, the Forest Service and TCC hosted a public meeting at the Ruth Lake Community Center in the Town of Mad River to invite the public to participate in the development of the project, solicit public comment, and present the project area and proposed treatment methods. A representative from the TCC and ten members of the community attended the public meeting. The public interests and comments submitted during the Scoping period influenced the design of the Proposed Action and the mitigation measures incorporated. Appendix A of this EA discloses a detailed account of the public comments received during the Scoping period and the Forest Service responses. Some public comments were considered non-significant issues and others were deemed relevant issues.

Non-significant Issues
Non-significant issues were defined by the interdisciplinary team (IDT) as those 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; 4) conjectural and not supported by scientific or factual evidence; or 5) the comment could not be phrased as a cause-effect relationship. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in §1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review… (§1506.3).”

The evaluation for determining if an issue was not significant is disclosed in the EA section Finding of No Significant Impact. This section discusses the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b), relative to the definition of significance established by the CEQ regulations (40 CFR 1508.13). Appendix C of the EA presents Best Management Practices (BMPs), which are considered standard operating practices applied on the SRNF.

Relevant Issues
For the purposes of this environmental analysis, two relevant issues were identified by the IDT in response to public comments received during the Scoping period that influence project design—mitigation measures required prior and during implementation, and post-implementation monitoring of the Proposed Action disclosed in Chapter 2 (Alternative 2). Chapter 3 presents the analyses of the relevant issues, in context of the potential effects of no action, compared to the potential effects of implementing the Proposed Action.

Wildlife Habitat Quality
- The reduction of forest ladder and select crown fuels may lower habitat quality for the northern spotted owl (NSO).

Soil Erosion
- Tree removal and associated operations (i.e., skidding, temporary road and landing construction), coupled with phased initial and maintenance prescribed burning, may increase soil erosion and elevate sedimentation/siltation and turbidity contributing to cumulative effects for the Ruth Lake-Mad River (180101020203) and Barry Creek-Mad River (180101020202) watersheds (EPA-listed: Clean Water Act §303(d) impaired 1992).
Chapter 2. Alternatives Considered in Detail

The Agency is required to study, develop, and describe alternatives to the Proposed Action in any proposal that involves unresolved conflicts concerning alternative uses of available resources (40 CFR 1501.2(c)). The No Action Alternative (Alternative 1) and the Proposed Action (Alternative 2) are designed to meet the purpose and need for action, as described below.

Alternative 1 – No Action

The No Action Alternative provides a baseline for comparing predicted effects of the Proposed Action. Under the No Action alternative, proposed treatments under Alternative 2 would not occur. The probability of a fire burning over a landscape is based on factors such as the chance of ignition, potential rate of spread, historical and predicted weather conditions, topography, and length of the fire season (Miller 2000). Recent fire events show that continued fire exclusion and barriers to managing fire within its historic regime perpetuates risk to the public and fire management personnel.

As reflected by the 2014 letter of intent from US Forest Service Chief Tidwell, “We do not accept unnecessary risk or transfer it to our partners or future generations.” Enabling fire to be managed at an acceptable level of risk now would mitigate unacceptable consequences and reduce risk to future generations”.

Fire Suppression

Within the project area, the appropriate response for a wildland fire on the Six Rivers National Forest (SRNF or forest) would continue to be direct and indirect suppression tactics per the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy). The US Forest Service (USFS or Forest Service) policy for fire suppression is to conduct fire suppression in a timely, effective, and efficient manner with a high regard for public and firefighter safety. It is the objective of the Forest Service to respond to each wildland fire ignition in a timely manner with appropriate forces. Firefighting resources would continue to focus strategies and tactics to aggressively suppress wildfires near at-risk, parcels of private property in the wildland-urban interface (WUI) as the highest priority, necessary due to the current and continued accumulation of flammable forest vegetation likely to contribute to high intensity fire behavior that could threaten communities, infrastructure and natural resources.

Fire Prevention

Wildland fire prevention activities would continue to occur under the No Action Alternative. Wildland fire prevention is the informing, educating, and regulating of human behavior or activities that influence the various types of potential ignition sources within flammable vegetation. Analysis of human-caused fire indicates that these fires are most likely to occur near inhabited areas or heavily used areas such as campgrounds or along forest roads or trails (USDA 1995). Most escaped fires have required only minimal suppression response and have generally been suppressed at less than 0.1 acres per incident (USDA 1990a). Efforts to educate the public on safe fire use would continue through personal contacts, interpretive programs, interagency fire prevention cooperatives, the use of posters and signs, radio and press releases. Continuation of public neighborhood fire-prevention meetings, discussions of defensible space, fire apparatus access, education about home construction materials (flammability) design, etc., would continue to take place.
Alternative 2 – Proposed Action

The Proposed Action represents an opportunity for the Forest Service and members of the Trinity County Collaborative (TCC) to co-develop, establish, and maintain shaded roadside fuelbreaks along Forest Service roads (FSRs) classified as Maintenance Level (ML) 2 and 3, open to the public, visitors, and firefighters during a wildfire.

The Proposed Action would alter live and dead surface, ladder and crown fuels on approximately 823 acres on national forest land over the next 15 years. Implementation would be phased beginning with application of mechanical treatments (thin from below and mastication), following by manual (hand) cutting and piling, pruning, and/or lopping and scattering woody debris, periodic prescribed jackpot burning and underburning in oak woodlands between three (3) to five (5) years apart. Fuelbreak maintenance using primarily mastication would occur as needed to cut and shred vegetative sprouting, accumulated forest litter, and natural regeneration (tree seedlings).

The fuelbreak treatments would primarily occur within 150 feet on each side of National Forest Transportation System (NFTS) roads (02S02, 2S47, 2S48, 2S49, 2S50, 2S51, 2S52, and 2S53) and one motorized trail (8E20); and within 300 feet of FSR 1S23 on the SRNF side of South Fork Mountain, the boundary between the SRNF and Shasta-Trinity National Forest (STNF). Width of the buffer on either side of the road may vary based on topography, vegetative types and distribution and recent fire history, but generally would not exceed 300-feet total width (e.g., if conditions lend to a wider treatment on the uphill side, the uphill side may be treated up to 275 feet from the road and the downhill side would be treated 25 feet from the road). The minimum treatment area along either side of the road would be 25 feet.

In areas where the roadside fuelbreaks intersect plantations and oak woodland stands, treatments would be applied to the entire oak woodland and plantation stands. As high tree densities in plantations tend to torch at high intensities, an additional 150-foot fuelbreak buffer or flank treatment would be established around them.

In the areas burned by high-intensity wildfire in 2011, proposed treatments target hazardous fuels reduction to decrease post-fire, jackstraw snags and dead woody material.

The proposed treatments considered in this project are designed in accordance with the TCC’s “proof of concept” criteria as follows:

- Thin existing stands to retain the best, healthiest trees that have a high canopy capacity (those with the strongest crown to bole ratio, have the highest needle or leaf cover and provide the most shade to the forest floor), capable of maintaining those objectives for a long period of time.
- Designate for removal suppressed, intermediate, and codominant conifer trees that compete with the best, healthiest trees that have a high canopy capacity, retaining trees per acre (TPA) objective by stand type.
- Reduce fuel loading to consistent with the Six Rivers National Forest (SRNF) Land and Resource Management Plan (LRMP or forest plan), including brush and down logs, maintaining largest downed wood to meet soil and terrestrial wildlife standards and guidelines incorporated into the project design features (PDFs).
- Outside the dripline of larger trees designated for retention, provide for crown separation to prevent torching, while retaining vigorous clumps of healthy intermediate mixed conifer trees to provide for more complex stand diversity and a source of future mature trees.
Retain hardwood trees. Thin hardwood clumps to one to three dominant stems where appropriate.

Trees that provide valuable wildlife structures would be considered as part of the shade retention objective.

No new temporary road construction is permitted. Reuse of existing skid trails, temporary roads and Forest Service roads classified ML 1, closed roads opened temporarily to expedite operations, would be prioritized.

Directional tree felling and cable end lining would occur in areas requiring limited skidding.

Where fuel reduction prescriptions result in utilizable material, products such as sawlogs, post and poles, commercial and personal firewood would be offered.

Roadside decking and reuse of existing landings and turnouts would occur. New landings on roads would be considered on a limited basis, but would not be located in riparian reserves.

Retain all snags greater than 20-inch dbh (diameter at breast height), unless the snag would jeopardize the effectiveness of the fuelbreak or could be considered a hazard tree. Hazard trees that meet the Region 5 Hazard Tree Guidelines (April 2012 Report # RO-12-01) would be felled and removed or, if unmerchantable, would be left on-site for coarse down wood retention. Snags not considered a hazard that are located greater than 100 feet from a road may be left standing to be utilized by wildlife, or felled and left onsite limbed with bole unbucked.

**Developing, Establishing and Maintaining Shaded Fuelbreaks**

The proposed treatments apply to a diverse range of fuel conditions associated with variable fuel profiles, vegetative types, tree densities and age, and crown classes. The following presents the proposed treatment methods under two overarching categories—shaded fuelbreaks and unshaded fuelbreaks.

**Shaded Fuelbreaks (SFB)**

A shaded fuelbreak is defined as a wide-strip or block strategically located where fuel volume and forest flammability have been reduced and some forest canopy is retained to affect fire behavior, so that fires burning into them can be more readily controlled. In addition to reducing ground and understory ladder fuels, and increasing crown spacing, a shaded fuelbreak should maintain effective shade to subdue understory re-growth. It is recognized tree species is relevant to the trees potential to provide shade, as conifers maintain live tree crown year-round, whereas hardwoods lose their leaves seasonally. Slope steepness can affect the width of the area that provides effective shade. As slope steepness increases the width of the area providing effective shade will be narrower; as slope steepness increase, the width of the area producing effective shade will increase. The sun’s position throughout the day and the topographic characteristics influence the angle and timing of maximum shade, as depicted in Figure 5.

Shaded fuelbreaks would be created where existing live-tree overstory canopy closure of roadside forest stands is greater than 60 percent. These forested stands are predominately Douglas-fir dominated, intermixed with incense cedar, ponderosa and sugar pine and hardwoods. These conditions are referred to as natural stands, although most have experienced some level of land management such as individual tree selection and sanitation. Treatments within shaded fuelbreaks would be implemented as follows:

- **Initial Entry:** Thin from below (TFB), treating crown fuels and larger ladder fuels.
Chapter 2. Alternatives Considered in Detail

- Secondary Entry: Hazardous fuels reduction (HFR) treating smaller ladder fuels and surface fuels using mechanical, manual and prescribed jackpot burning (see HFR section below for the treatment description).

- Maintenance: Hazardous fuels reduction accomplished primarily using mastication, unless slope or resource protection prohibits mechanical ground-disturbance, whereby manual treatments and jackpot burning would occur.

**Thin from Below (TFB)**

Thin from below (TFB) is the removal of trees when forest conditions are overly dense, with high crown density and ladder fuels. Thin from below treatments are designed to retain sufficient tree canopy to provide shade to suppress brush response, while separating intertwined crowns that would likely carry flames from tree-top to tree-top. The fuels material not removed by TFB treatments would be treated during a second entry, as described under the HFR section below.

**Crown Class**

Crown class is a method to identify leave trees in the field by its tree height relative to other trees around it (Table 2; Helms 1998). Crown class can be correlated to the trees potential to provide shade, tree health and growth rate. Thin from Below (TFB) treatment prescriptions would leave the largest trees with the fullest crowns (see Live crown ratio discussion below) at or above the average canopy height. The trees selected for retention would have sufficient vigor to respond to thinning release to sustain healthy live crowns and shade for the long-term. In order to achieve the desired density, thinning would begin with the smallest diameter trees and move up in size class until the desired canopy base height, spacing between trees, and spacing between live tree crowns is achieved. The live crown is the top part of a tree, the part that has green leaves (as opposed to the bare trunk, bare branches, and dead leaves).
Table 2. Crown class definitions.

<table>
<thead>
<tr>
<th>Crown Class</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-dominant</td>
<td>A tree whose crown has grown above the general level of the upper canopy.</td>
</tr>
<tr>
<td>Dominant</td>
<td>A tree whose crown extends above the general level of the main canopy in even-aged stands, or in uneven-aged stands, above the crowns of the tree’s immediate neighbors and receiving full light from above and partial light from the sides.</td>
</tr>
<tr>
<td>Co-dominant</td>
<td>A tree whose crown helps form the general level of the main canopy in even-aged stands, or in uneven-age stands, the main canopy of the tree’s immediate neighbors, receiving full light from above and comparatively little from the sides.</td>
</tr>
<tr>
<td>Intermediate</td>
<td>A tree whose crown extends into the lower portion of the main canopy of even-aged stands, or in uneven-aged stands, into the lower portion of the canopy formed by the tree’s immediate neighbors, but shorter in height than the co-dominants; receiving little direct light from above and none from the sides.</td>
</tr>
<tr>
<td>Suppressed (overtopped)</td>
<td>A tree whose crown is completely overtopped by the crowns of one or more neighboring trees.</td>
</tr>
</tbody>
</table>

**Live Crown Ratio**

Live crown ratio (LCR) provides a measure of tree vigor and crown shading potential. The LCR is used to determine tree health and the level of competition with neighboring trees, in terms of ratio of crown length relative to total tree height, or the percentage of a tree’s total height that has foliage as illustrated in Figure 6.

![Figure 6. Live Crown Ratio: the ratio of live crown to total tree height; expressed as a percentage.](image)

Tree-level productivity is largely determined by crown size and aboveground vigor, but light availability ultimately controls growth. Thin from below involves the selective cutting, disposal or removal of some trees within a stand, in order to reduce over-topping and provide space between tree crowns to promote tree bole and crown growth. Lowering tree densities reduces competition of underground root systems for limited resources (water and soil nutrients) between the remaining trees. The proposed treatments are designed to:

- Maintain and enhance the existing vegetative diversity, including hardwoods.
Retain pre-dominant and dominant trees that provide the healthiest shade producing canopy and leaf density, while removing suppressed, intermediate, and some codominant trees that interfere with the health or canopy of the designated retained trees.

First priority for removal would be the smaller suppressed and intermediate crown classes, as these smaller diameter trees have the poorest crown and tend to grow below the forest canopy. They are at the highest risk for tree mortality as a result of competition for light, water and nutrients.

Some codominant trees would also be removed to improve the function of the fuelbreak, increase growth of adjacent trees and to meet the desired residual stand density. The following conditions for removal of codominant conifers include where:

- Codominant conifers do not have growing space in the canopy for further crown development, or removal of codominant trees is needed to reduce stand density to desired levels.
- Removal of codominant conifers adjacent to dominant and predominant conifers and hardwoods, or pockets of smaller diameter hardwoods, would facilitate the survival of these trees.

Treatment Descriptions

**Thin from Below (TFB)** – *Treatment Descriptions by Vegetative Stratum*

The TFB treatment prescriptions are described to retain variable tree canopy spacing and trees per acre, as presented in Table 3.

**Table 3. Treatment crown spacing and trees per acre by seral type.**

<table>
<thead>
<tr>
<th>Seral Stage&lt;sup&gt;5&lt;/sup&gt;</th>
<th>Age</th>
<th>Dominant Tree Species</th>
<th>Trees per Acre</th>
<th>Proposed Treatment Spacing between Trees Crowns (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>35-45</td>
<td>DF</td>
<td>120-180</td>
<td>5-10</td>
</tr>
<tr>
<td>EM</td>
<td>70-100</td>
<td>DF-BO</td>
<td>55-80</td>
<td>5-15</td>
</tr>
<tr>
<td>EM/MM</td>
<td>70-120</td>
<td>DF-PP-BO</td>
<td>45-60</td>
<td>5-15</td>
</tr>
<tr>
<td>MM</td>
<td>100-120</td>
<td>DF-BO</td>
<td>45-55</td>
<td>5-10</td>
</tr>
<tr>
<td>EM</td>
<td>60-100</td>
<td>WF</td>
<td>90-105</td>
<td>2-5</td>
</tr>
</tbody>
</table>

As linear roadside treatment units feature multiple stratum and seral stages, tree canopy spacing and number of trees per acre would vary in response to stratum types discussed below and micro-site conditions.

**White fir dominated – Thin from Below**

White fir dominates the higher elevations, generally above 4,600 feet and down to 4,000 feet on northerly slope aspects. Douglas-fir is a component of these stands at lower elevations, with the higher elevations stands primarily composed of white fir. Ponderosa pine, sugar pine, incense cedar, black oak and white oak are minor components, dispersed throughout the strata.

Below 4000 feet, natural stands are dominated by Douglas-fir, inter-mixed with cedar, pine and hardwoods with varying structural complexity and age classes.

The priority consideration for identifying desired shade trees to be retained for the long term are those tree with healthy, full, live crown characteristics. Tree crown separation would be variable (hardwood canopy would not be taken into account for crown spacing).

<sup>5</sup> Pole (P), Early Mature (EM), Mid-mature (MM)
Oak dominated woodlands – Thin from Below and Prescribed Burning

The early and mid-mature stands dominated by hardwoods and grasses include black oak, white oak and big-leaf maple. Through restoration activities, the oak woodlands within 150 feet of the roadside would also contribute to the function of the shaded fuelbreaks. Fire exclusion has allowed vegetation such as shrubs and Douglas-fir to encroach upon the oak woodlands. Forage value for wildlife species has declined, choked out by competing, decadent brush. Regeneration of oak has waned, as thick dead and matted grass is preventing seedling germination, establishment and survival.

The following criteria define healthy black oaks to be retained:

1. Greater than 6-inch dbh (in the case of groups of trees or in stands with very little hardwood component).
2. Relatively straight (lean is less than 20 degrees from base to top of crown).
3. Live crown ratio of at least 20 percent
4. Basal portion of bole of trunk mostly sound with less than 50 percent noticeable rot or large cavity present.

Thin from below treatments in oak woodlands would:

1. Remove conifers (suppressed, intermediate and co-dominant trees) competing with hardwoods, that would respond favorably to increased sunlight, as depicted in Figure 7.
2. Retain pre-dominant and dominant conifers.

Figure 7. Competition between suppressed and intermediate trees growing underneath and around a healthy predominant black oak with a full, healthy live crown, being measured by a forester.
In areas of extensive brush, pre-treatment (hand piling and burning) of shrubs and small diameter trees may be necessary prior to underburning to promote low-intensity fire behavior. In some cases, debris would be manually raked back from the base of predominant trees to protect surface roots and trees from scorching and to buffer a Forest Service Sensitive-listed lichen species to protect habitat.

The project would restore the grassy areas through pre-treatment to allow for application of prescribed fire to rejuvenate and reinvigorate the grass and other grassland species and to remove encroaching vegetation. Low intensity fire would be allowed to creep into brushy areas, killing the brush and small diameter trees, maintaining approximately 10 to 20 percent of the small trees in these areas. Not all areas of brush would be burned; some would be retained as cover areas for wildlife. Some post treatment piling and burning may also occur in areas where brush was killed but not completely consumed during burning operations. The project area may initially be burned more than once in order to achieve the desired results. Burning the area more than once would allow the use of low intensity fire, which would maintain 80 to 90 percent of the overstory trees while reducing the amount of brush and small trees.

Understory burning would be prescribed in the oak woodland to help maintain the desired species composition and retard conifer encroachment in these units. Maintenance burns would be implemented every 5 to 15 years or as the need is identified.

**Unshaded Fuelbreaks**

Unshaded fuelbreaks (USFB) occur where current overstory forest canopy closure is less than 60 percent. These conditions are associated with forest stands managed using even-age land management practices such as clearcutting (existing plantations), shelterwood and seed tree harvesting, and moderate and high severity burn areas within the Ruth Fire perimeter where isolated live tree canopy exists.

The HFR treatments in USFB would implemented as follows.

- **Initial Entry**: Hazardous fuels reduction treating small and mid-size ladder fuels and surface fuels using mechanical and manual treatments, and prescribed jackpot burning.
- **Maintenance**: Hazardous fuels reduction accomplished primarily using mastication, unless slope or resource protection prohibits mechanical ground-disturbance whereby manual treatments and jackpot burned would occur.

**Hazardous Fuels Reduction (HFR) Treatment Methods**

A combination of the following HFR treatment methods may be applied, depending on the variability of fuel concentrations, distribution and size of hazardous material.

**Hand Cutting of Trees and/or Shrubs**

This treatment is the manual cutting of dense brush or small trees using chainsaws. This method entails the removal or rearrangement of forest understory vegetation and is often used in conjunction with lop and scatter.

Where large overstory trees are not present, a mosaic of smaller, vigorous trees and large shrubs such as old growth manzanita would be maintained to provide shade.

**Removal**

This involves removing cut material not utilized for sawlogs or to meet wildlife standard; generally small diameter trees made available for public firewood gathering and poles. Ground based equipment, such as a dozer or small excavator (equipped with a brush rake) are used on slopes less than 35 percent to remove
material to the roadside or nearby landings. On slopes greater than 35 percent, a block and tackle cable system is typically used to achieve one-end suspension.

**Tree and Large Shrub Pruning**
The objective of this method is to eliminate ladder fuels and raise crown base height by cutting branches from residual trees or mature shrubs. Large trees would be pruned above the ground and smaller trees to about 50 percent of the live canopy. Large shrubs would be pruned to remove dead limbs and lower branches. This is typically accomplished with chain saws or long-handled pole saws.

**Lop and Scatter**
Lop and scatter is a method of slash reduction where down fuel accumulations and concentrations are manually cut and dispersed to a maximum depth of 18 inches (with chainsaws and hand labor). This places woody material in proximity to the soil, where decomposition and soil building processes occur.

**Mastication**
Masticators are typically small tracked vehicles such as a skid steer with a forward mounted drum-like attachment with external masticating teeth that are used to cut and shred woody material and live vegetation. Excavators may also be employed, utilizing a smaller masticating head (drum or rotary), which attaches to the boom. Mastication within treatment units would occur on slopes less than 35 percent. Cutting brush and small trees within road prism cut and fill slopes greater than 35 percent may be accomplished by an excavator masticator (while positioned in the road) in lieu of cutting and chipping. Shrubs and trees generally less than 8-inch dbh may be masticated to achieve desired inter-tree (ladder fuel) spacing and be applied to treat re-sprouting brush, regrowth and fallen debris to maintain desired fuelbreak conditions.

**Chipping**
Roadside mechanical cutting and shredding of existing surface fuels and slash created from tree felling and yarding. Existing ground fuels, thinning and pruning residue, and cut brush would be pulled to the road and chipped into small pieces using a chipper. Chipping residue would be distributed back into the treatment unit, utilized for biomass, or utilized as a cover to reduce the risk of invasive plant establishment at landings.

**Machine or Grapple Pile**
This method would utilize equipment to pile slash and surface fuels into larger piles.

**Handpile**
Down fuel accumulations and concentrations are mechanically broken up (with chainsaws and hand labor) and manually piled in concentrations of 3 to 6 feet in diameter. Excessive existing forest debris, along with woody debris (slash) from tree felling and shrub cutting, would be manually gathered into small piles.

**Pile Burning**
Piles would be covered with kraft paper to allow woody debris to dry out prior to ignition, promoting rapid consumption of debris to minimize smoke production. Piles are usually burned after the area has received sufficient rainfall so that fire does not spread pile to pile.

**Jackpot Burning**
Jackpot burning is the burning of discontinuous, concentrated areas of slash created from vegetation treatments or natural fuel concentrations. Burning would typically occur following an extended period of
dry weather to allow the slash to cure for optimal consumption. Fuel concentrations would be burned just prior to or during wet weather conditions to ensure controlled fire.

**Underburning**
Prescribed underburning involves the controlled application of fire to understory vegetation and coarse woody material. This would occur when fuel moisture, soil moisture, and weather and atmospheric conditions allow the fire to be confined to a predetermined area and intensity can be managed to achieve the desired resource objectives. Where no local features are present to contain prescribed fire (roads, trails, streams), hand fire line or a wet control line would be established along the outside edge of treatment burn areas.

**Hand Fire Line Construction**
Hand constructed control lines (typically 18 to 20 inches wide), involving scrapping duff and debris to expose bare mineral soil, would be used to contain prescribed fire within burn plan specifications.

**Hazardous Fuels Reduction Treatment Descriptions by Stand Type**

**Plantations**
Treatments within plantations would be designed to improve tree vigor and fire resiliency of the stand. The goal is to retain the largest trees with the best crowns promoting bole and crown growth and tree vigor. The management of tree densities aims to reduce inter-tree competition for limited resources in overstocked, reforested stands (plantations), as environmental stressors can make trees prone to disease and insects, slowing growth or resulting in tree mortality. As the objective is to develop shaded fuelbreak conditions, maintaining sufficient live tree canopy becomes essential to achieve long-term goals.

Where trees of different species are clumped and any species would achieve desired canopy closure, preference for leave trees would be native species (over planted off-site pine). Residual overstory trees (dominant shade trees) scattered within plantations would be retained, except in the event it is highly infested with mistletoe (over 80 percent) and/or there are visible signs of imminent mortality. These overstory trees would be felled and left on-site.

Hazardous fuels reduction would increase inter-spacing to 5- to 20-foot spacing (15-plus-foot tall or more desired leave trees), depending on the size of trees growing within plantations. In addition, ladder and surface fuels would be treated in the 150-foot-wide buffer around them. One or more of the following treatments may be applied:

- Hand treatments would be by chainsaw.
- Mastication would occur in the ground-based units only (less than 35% average slope) and use low ground-pressure mechanical equipment to cut live vegetation.
- Material would be masticated to treat surface and ladder fuels above the ground surface. Approximately 48 acres may be masticated depending on cost and availability of equipment.
- If mastication does not occur, the units would be hand piled and burned. Two of the units, 409 and 615, have larger diameter boles with the potential to be removed and utilized commercially as poles.
- Remaining trees would have limbs pruned on the bole from the ground, maintaining at least 50 percent of the crown.
“Jeep” Trail 8E20 and Burned Forests – No Live Canopy
Hazardous fuel reduction would occur along the Jeep Trail 8E20, considered a strategic feature during fire suppression as a containment fireline. Along the 8E20 trail, overly stocked live early to mid-mature white fir stands exist. Dead snags would either be masticated, pushed over with a small dozer and/or machine piled and burned (10 percent of the handpiles would be left for wildlife).

- Hazardous fuels reduction treatments would include thinning ladder fuels and may involve cutting of understory vegetation, tree pruning, chipping and/or mastication of surface and small ladder fuels, lopping and scattering of fuel, hand or grapple piling of fuel, and jackpot and, or pile burning.
- In areas dominated by brush and grass, live trees would be maintained for shade at the appropriate spacing and limbed to six feet above the ground to increase the distance to the live canopy.

Mixed and high severity burn areas
Mixed and high severity burn areas within the 2011 Ruth Fire footprint are typically dominated by dead standing trees and areas of brush. Since sufficient live overstory crowns are not present to establish shaded fuelbreaks, the Proposed Action would treat these unshaded fuelbreaks as follows:

- In high severity burn areas dominated by snags, all green trees would be retained.
- In low or moderate severity burn areas, some green trees would be removed.
- Standing dead trees may be either masticated, pushed over with a small dozer and/or grapple piled and burned (10% of piles would be left for wildlife).
- Within riparian reserves, limit snag felling within 160-foot buffer using chainsaws only. Hand pull slash concentrations upslope to the outer 80-160 feet of riparian buffers.
- Handpile and burn.

A small meadow enhancement area on the south edge of the burn is primarily composed of off-site pine and standing, dead burned fir. All dead conifers would be removed. Oaks, madrone, and maples would be retained.

Maintenance of Fuelbreaks
Once initial treatments have been completed, maintenance would be performed as needed every 5 to 15 years. The areas may be retreated by utilizing a combination of aforementioned treatments (Table 4). On slope less than 35 percent, mastication would be the primary maintenance method. On steeper slopes, lop and scatter and/or handpiling and/or jackpot burning would be applied.

Understory burning would be the primary maintenance method applied in the oak woodland stand. This method would have mutual benefits to maintain the desired species composition and retard conifer encroachment. Site-specific review by a fuels specialist would be conducted prior to understory burning to assess fuel loading and necessity for manual pre-treatment to ensure that a low-intensity underburn can be achieved.
Table 4: Proposed Action treatment unit summary.

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⁶ Timber – potential commercial sale of sawlogs; Poles – potential for commercial forest products sale. Firewood – potential for commercial firewood sale or where roadside or on landings, potential for personal firewood cutting.
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**Total Acres – 823**
The Proposed Action is designed to establish a network of roadside fuelbreaks as displayed in Figure 8, most abut private lands and Ruth Lake and along Route 23.

Figure 8. Proposed Action treatment map.
Connected Actions

In addition to the aforementioned Proposed Action treatments, there are additional and inherent connected actions associated with off-site removal of fuels. According to Council on Environmental Quality (CEQ) Regulations, §1508.25, connected actions are closely related actions that automatically trigger (or are triggered by) other actions, cannot or would not proceed unless other actions are taken previously or simultaneously, and/or are interdependent parts of a larger action and depend on the larger action for their justification. The provisions to avoid, rectify or minimize adverse effects of connected actions are disclosed in the following project design features (PDFs) and mitigation measures section.

Road Decommissioning

The 1st 48 Project proposes to decommission FSR 2S54. This ML 2 road is 1.95-miles long, and has four low-water crossings and three culverted stream crossings. Two of the culverted crossings have small fills (150 and 318 cubic yards). One crossing is larger (800 cubic yards). There is a large landslide near milepost (MP) 0.65 that encompasses the entire road prism making it impassable for motor vehicles. This landslide would not be treated, nor would any other decommissioning activities take place beyond the slide.

Decommissioned NFTS roads are left in a maintenance-free condition (i.e., drainage structures are removed and natural drainage patterns restored). They are not drivable by motor vehicles and are not part of the NFTS. Decommissioning FSR 2S54 would require the following activities:

- **Waterbar.** Water dispersion treatments are designed to stop water from concentrating on the travelway surface, reduce the potential for stream diversions (i.e., prevent water from flowing down the road or trail), which reduces the potential for off-site sediment delivery to water resources.
- **Remove culverts and associated fill.** This action is aimed at eliminating the need for road maintenance, re-establishing pre-road construction drainage patterns, and placing the stream crossing road fill in stable locations, away from streams.
- **Culvert disposal.** Culverts, once removed, would be removed from government property and disposed.
- **Erosion control.** Newly excavated stream channel banks and fill disposal sites would be mulched to reduce surface erosion. Mulch would consist of locally available slash, wood chips, wood straw, or certified weed-free rice or barley straw.
- **Barricade.** This includes the placement of an earth mound barrier at the entrance to a road or route. The objective is to prevent motorized use and the promotion of passive restoration of the travelway.
- **Timing.** Work would occur after the limiting operation periods (LOPs) for wildlife are lifted and before the onset of winter weather.
- **Invasive Plant Species & Aquatic Organisms.** If there is a risk of spread of invasive plants from an existing occurrence on or along the road to be decommissioned into unoccupied wildland settings (e.g., in settings where the vegetative ground and canopy cover in the adjacent habitat is minimal), implement the following mitigations prior to decommissioning as per Best Management Practices: Invasive Plant Species & Aquatic Organisms, Six Rivers National Forest (2014), forest road-related projects (e.g., maintenance including storm-proofing, and road decommissioning):
  - Remove entire plant (including roots).
• Mechanically or manually remove any invasive plant occurrence (remove entire plant) at the intersection of the decommissioned road and forest system road.

• Apply ground cover in the form of native mulch/finely masticated material spread to depth of 6 inches over the area where plants were removed, or

• If feasible, de-compact/rip and revegetate area with suitable native planting stock that optimizes resistance to invasive plant establishment (e.g., tree stock, early-successional/disturbance tolerant shrubs).

**Hazard Trees**

Hazard trees are defined as any tree that is dead, dying, or showing signs of failure that has the potential to hit the area of operations (leaning toward the site and is within tree-height distance). If deemed a safety concern during operations, hazard trees would be felled and either left on-site to achieve LRMP minimum down wood standards and guidelines or removed and sold as a commercial forest by-product.

**Felled Tree and Slash Removal**

The removal of timber byproducts such as sawlogs, posts and poles, or firewood generated from implementing TFB treatments would accomplished through:

- Whole tree yarding and yarding tops to landings. Sawlog material would generally be removed at the time of felling operations; posts/poles and firewood may be removed at the time of felling operations, decked for future removal, or disposed of by chipping or burning. If these areas are not large enough to accommodate the volume of material, existing landings along haul routes that are not associated with proposed harvest units could serve as alternate sites for the excess material.

- Any remaining logging/skidding slash concentrations would be treated by one or more methods including:
  - Lopping and scattering slash to a maximum depth of 18 inches.
  - Hand or grapple piling and burning of piles, including jackpot burning.
  - Yarding materials to landings or disposal areas for future treatment by chipping, burning or firewood gathering.

**Landings**

The project would require one (1) to two (2) landings/disposal sites per unit. Existing landings, roadside turnouts and natural openings would be used to the extent they are safe and feasible. The majority of additional ground and cable landings would be located within the roadbed; however, some limited expansion may be needed. Landings are up to approximately 0.25 acres in size (1/3 acre for disposal sites).

Thirty-three (33) existing landings would be made available to expedite operations, and up to 20 new landings would be constructed. Existing and new cable and ground landings would be located either within, or adjacent to, treatment units. New landings are generally expansion areas that exhibit some previous ground disturbance located in natural openings within units or roadside turnouts. Anchor points above landings/unit would be needed for safety support of cable logging systems. Anchor points include 18- to 20-inch trees, sound snags, or heavy equipment parked above the landing. After landings have served operations, they shall be ditched and sloped to permit water to drain or spread. Unless agreed
otherwise, cut and fill banks around landings shall be sloped to remove overhangs and otherwise minimize erosion.

**Change in Road Maintenance Level**

Forest Service Road 2S02B (MP 0.0 to 0.2) is an ML 1 classified road closed to public and administrative uses. The maintenance-level classification correlates to how the agency administers the intended use—type of vehicle and season(s), closed or open for travel—and maintenance frequency and methods, based upon road design, surface conditions, intended vehicle speed, season and amount of motor-vehicle use.

Machinery access and log hauling would require this segment of road be upgraded to an ML 2 road, allowing for administrative uses. During operations, regular road maintenance would be applied; frequency would depend on road surface type and weather. The road would be downgraded to an ML 1 classification, placed in a hydrologically maintenance-free condition and barricaded to prevent motorized access upon completion of the TFB and HFR treatments.

**Road Maintenance**

In 2015, the forest supervisor authorized the Six Rivers Road Maintenance Project to implement road maintenance across the forest (ML 1 to 5), confined to previously maintained surfaces, ditches, culverts and cut-and-fill slopes within the road prism, not intended to substantially improve conditions above those originally constructed (i.e., did not change maintenance levels). The Forest Service would coordinate with the landowners to protect the waterline infrastructure during operations. The following maintenance would be completed as previously authorized to expedite operations:

- **2S02B**: Heavy brushing, blading, ditch cleaning, and removal of five (5) waterbars.
- **2S02C**: Pre-haul blading, moderate brushing, ditch cleaning, and removal of two (2) waterbars.
- **2S47**: Pre-haul blading, light brushing, culvert and ditch cleaning, berm removal and removal of two (2) waterbars. There is a low-water crossing at about MP 0.8 that would likely dry up during the normal operating season. If the road were needed for commercial log hauling a temporary crossing may be required, which involves layering coarse aggregate and removing it post-haul. The Forest Service would coordinate with the private land owner prior to operations to ensure protection of above ground waterline which supplies water to Ruth Mutual Water Company; recently moved in coordination with the permittee to just the outside of the road berm, roughly a foot or two from the edge of the road.
- **2S02**: The Forest Service would coordinate with the landowner to protect the waterline strung across Littlefield Creek near the low water crossing.
- **2S48C**: Pre-haul blading, light brushing, culvert and ditch cleaning.
- **2S49**: Pre-haul blading, light brushing, and ditch cleaning.
- **2S50**: Pre-haul blading, light brushing, culvert and ditch cleaning.
- **2S51**: Pre-haul blading, light brushing, culvert and ditch cleaning.

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7 **Maintenance Level (ML):** The Forest Service maintains NFS roads and NFS trails to meet user needs, protect natural resources and ensure public safety. There are five maintenance level classifications (FSH 7709.56), responsive to road or trail management objectives, design standards, quantity and types of traffic, and availability of funds.
Chapter 2. Alternatives Considered in Detail

- 2S52: Pre-haul blading, light brushing, culvert and ditch cleaning. The forest would coordinate with the landowner to protect the waterline that crossed under FSR 2S52 through a Forest Service culvert.
- 2S53: Heavy blading, ditch cleaning, removal of two (2) waterbars, and moderate brushing. There is a low-water crossing at MP 0.4 on Littlefield Creek, the same stream as the crossing on 2S02 downstream. If water is not present during operations, commercial log hauling may proceed. If water is present, a temporary low water crossing would be required:
  - Temporary vented ford. Install three (3) parallel 36-inch culverts, 30-feet long and build the road prism above them. A geotextile would be laid as the foundation of the structure and the road prism built on top of it.

Haul Routes & Temporary Trail and Road Closures

Operations occurring on or along forest roads and the existing SRNF system trail 8E20 would require temporary closures for public safety during logging operations (tree felling and hauling). There are inherent dangers associated with logging with heavy equipment working on and adjacent to the roads, log truck traffic, branches, and other debris falling from the canopy. These forest roads are single-lane roads with minimal turnouts and it would be difficult to provide for public safety during logging operations. These hazards to the public and logging operators would be mitigated through the implementation of temporary road and area closures. The following roads and trail (Table 5) would be affected by these temporary closures.

<table>
<thead>
<tr>
<th>Road / Trail</th>
<th>Maintenance Level</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2S47, 2S48, 2S49, 2S50, 2S51, 2S52, 2S53, 2S02</td>
<td>2</td>
<td>Tree removal and hauling</td>
</tr>
<tr>
<td>1S23</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8E20</td>
<td>Motorized Trail</td>
<td></td>
</tr>
</tbody>
</table>

Project Design Features and Mitigation Measures

This section discusses PDFs and mitigation measures to avoid, rectify or minimize adverse effects (or implement positive impacts) during implementation of the Proposed Action. These measures would be applied during implementation. Upon a final decision as documented in a Decision Notice, selected measures would become a requirement.

The Forest Service is required by CEQ Regulations for implementing the procedural provisions of NEPA to identify all relevant, reasonable mitigation measures that could improve the project. Mitigation, as defined in the CEQ Regulations (40 CFR 1508.20) includes:

- Avoiding the impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.
- Rectifying the impact by repairing, rehabilitating or restoring the affected environment.

In order to meet S&Gs, minimize impacts to resources and implement project objectives design features and mitigation measures were generated by the SRNF interdisciplinary team (IDT) and TCC:
Air Quality

- Dust abatement with water or other abatement material would be required during hauling operations.
- Burning would only be conducted on days approved by the North Coast Unified Air Quality Management District (NCUAQMD).
- To reduce negative effects to local air quality, handpiled material would be covered with Kraft paper to maintain dry conditions so that when burning does occur the material will be consumed and not smolder.

Aquatic Resources

- The forest would follow the guidance of the wet weather operation standards. The wet weather/winter season normally begins October 16 and ends around May 14, but wet weather conditions can happen anytime of the year. The Forest Service would monitor ground conditions and make a determination when wet weather conditions apply.
- Handlines would be constructed prior to burning operations. After operations are complete and before the wet weather season, waterbars would be constructed and the handline footprint would be covered (at least 50%) with mulch or duff.
- Riparian Reserves. According to the Northwest Forest Plan (NWFP) S&Gs, the Aquatic Conservation Strategy (ACS) was developed to improve and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The following design and mitigation measures would be applied to attain ACS objectives:
  - All riparian reserves would be buffered on both sides of stream channels. Perennial non-fish bearing, intermittent, and ephemeral with scour stream buffers are 160 feet, fish-bearing stream buffers are 320 feet, unless intersecting with road networks. The “inner” riparian reserve boundary generally extends from the stream channel to one-half the width of the total buffer or break-in-slope, with the “outer” riparian reserve boundary corresponding to the full width of the riparian reserve. In the case of Littlefield Creek, a fish-bearing stream, the “inner” riparian reserve south of the stream would extend to the edge of the road, which is less than 160 feet in many areas, but this buffer is still considered adequate to prevent impacts to the stream because the area is so flat.
  - Canopy closure in the outer riparian reserve buffers would be maintained at 60 percent or greater.
  - No tree removal is permitted within the inner riparian reserve buffers. Exceptions include hand-cut trees less than 6-inch dbh within 25 feet where riparian reserves intersect roads. Thinning and release work within riparian reserves would be accomplished with by hand tools (e.g., chainsaws, brush cutters).
  - Directional felling away from streams is required for all vegetation removal within the riparian reserves.
  - Ignition may occur within riparian reserves only when necessary to minimize prescribed fire behavior intensity and/or the potential for burning material to roll down into a riparian reserve. No fire line (scraped to mineral soil) would be constructed within riparian reserves; however, a hand-cut brush-only control line would be allowed for holding purposes on prescribed fires. Hand piling and pile burning may only occur within a riparian reserve if the hand piles are 6 feet or less in diameter, and less than 6 feet in height.
  - Best Management Practices (BMPs) would be followed for activities associated with the project to comply with the Clean Water Act.
**Water Drafting**

- Draft water only at designated water drafting sites.
- Conduct operations at water source developments in such a manner as to avoid, minimize or mitigate adverse effects to aquatic species and habitats from water drafting.
- Pumping rate would not exceed 350 gallons-per-minute or 10 percent of the flow in anadromous reaches. Otherwise pumping rate would not exceed 50 percent of surface flow.
- Make no improvements to drafting sites.
- Water drafting by more than one truck shall not occur simultaneously.
- Coordinate with district or forest fisheries biologists, to the extent practical, so any potential effects from water drafting are avoided.

**Botany**

- *Dendriscocaulon intriculatum* (Manage Known Sites) – in Unit 802
  - *Dendriscocaulon intriculatum* is a lichen that grows on the bole and branches of oak trees. Lichens exchange water and gases through their “skin” and thus is influenced by changes in atmospheric moisture. In light of these ecological variables associated with lichens, the 1st 48 Project includes design features to reduce potential negative effects of heat and smoke as well as maintain residual substrate for *Dendriscocaulon intriculatum*.
  - A 0.25-acre buffer (radius approximately 50 feet) was established at the detection in Unit 802. This buffer area is considered a no-disturbance buffer. Trees shall not be fallen into the buffered area.

- *Cypripedium montanum* (Pre-disturbance Surveys and Site Management) – Adjacent to Unit 421
  - Potential habitat disturbing activities related to *Cypripedium montanum* known sites pertain to mechanical disturbance that removes plants, disrupts upper soil horizons, triggers a shift in associated species composition, and opens the canopy beyond the tolerance threshold of mountain lady’s slipper. To reduce the potential for edge effects to known sites, buffers, their size and dimension, would be established considering aspect, slope position, and proximity to riparian areas in mind.
  - A 0.5-acre buffer would be established around the occurrence in the riparian zone adjacent to Unit 421, in order to account not only for protection of the plants but to account for habitat elements associated with *Cypripedium montanum*, specifically overstory shading and existing canopy layers, existing moisture conditions, maintenance of coarse woody debris, maintenance of existing tree, shrub and forb diversity, and adequate habitat around the existing plants for short-range dispersal of seeds and rhizome. Trees shall not be fallen into the buffered area.

- *Ptilidium californicum* (Pre-disturbance Surveys and Site Management) – Within Units 412 and 805
  - Dead and down woody debris may be hand removed from the buffered area. No understory burning or pile burning would occur within 50 feet of the occupied tree to protect plants.
  - Potential habitat disturbing activities related to *Ptilidium californicum* pertain to extent of canopy opening and vegetation manipulation in the vicinity of the documented occurrence.
which could increase drying effects of solar radiation and wind, removal of mature trees around the occupied tree which would remove sites for future dispersal opportunities, and broadcast burning that could result in torching the base of the occupied tree.

- Two occurrences of *Ptilidium californicum* were detected, one in Unit 419 and the other in Unit 805, both on the base of a 36-inch-diameter white fir in a mid-mature stands.

- A no-disturbance buffer of approximately 0.5 acres was established around the occupied trees to ensure the retention of the existing vegetation and stand structure, which provides the shade to the forest floor surrounding the occupied tree. The buffer incorporated mature trees for future dispersal opportunities. Trees shall not be fallen into the buffered area.

**Peltigera gowardii** (PEGO, veined water lichen – Sensitive) in Dashield Creek – Unit 421, Outside Unit 418

- PEGO sites found in units 421 and 418 are afforded protection based on their locations in the creek.

- The no-disturbance buffer would be established around sensitive plant sites in Unit 421 and the one outside Unit 418 to protect them from damage.

**Ramaria rubrievanescens** (Equivalent Effort Surveys and Site Management) – Immediately adjacent to Unit 402

- *Ramaria rubrievanescens*, a Category B Survey and Manage fungi effects are linked to potential habitat disturbing activities such as removal or severance of mycelial components (which comprise the fungal organism) residing in the organic or topsoil layer for mycorrhizal fungi, reduction in canopy shade and organic forest floor cover, reduction in the abundance of host trees and refuge species to sustain inoculum through periods of successional change in the stand, removal or reduction of forest floor organics and coarse woody debris which form the primary micro-habitat for saprobic species, and breakdown of soil structure (e.g., compaction) which not only affects the mycelia therein but also damages fine root tips to which the mycelia attach (Amaranthus et al. 1996).

- A no-disturbance buffer would be established.

- Soil porosity would be maintained to at least 90 percent of its natural condition over at least 85 percent of the unit area.

- Skid roads and trails would be limited to no more than 15 percent of the harvest area. At the end of project activities, a layer of litter and duff would occur over at least 50 percent of the activity area.

- Retain at least five logs per acre of existing coarse woody debris (at least 20 inches in diameter and 10 feet long) on the ground.

- All existing large snags (20 inches or greater in diameter) would be retained in units unless they pose a safety concern.

- Trees shall not be fallen into the buffered area.

**Invasive Species**

In keeping with Forest Service policy on Invasive Species Management (USDA/USFS 2011), the following project design features are identified to reduce the risk of introduction and spread of *Centaurea solstitialis* (yellow star thistle) from its current risk rating of high to a low risk. Priority areas for treatment
along 2S50 and 2S48 would be flagged in the field prior to treatment. All mechanical equipment used in the project, including equipment related to road maintenance, shall be pressured washed prior to operating on the forest (USDA/USFS 2014).

- All mechanical equipment used in the project shall be washed after operating if moving from an infested to an un-infested area.

- Treatment of mechanical units shall follow a progression of work schedule, whereby treatment occurs first where invasive plants are limited to non-existent before moving to heavily infested areas (e.g., the lower infested stretch of 2S48). If progression of work is not feasible, equipment operating in infested road segments shall be cleaned before relocating (USDA/USFS 2014). Progression of work applies to road maintenance associated with this project as well (see Appendix C).

- Avoid yarding/skidding through yellow star-thistle infestations.

- Immediately before using existing landings occupied by yellow star thistle, mechanically remove the plants to the edge of the landing, away from where equipment would be operating; then pile and subsequently burn. Use native material (e.g., wood chips produced on site) to mulch landings following their use.

- Avoid masticating sections of 2S50 and 2S48 occupied by yellow star thistle.

- Where yellow star-thistle infestations are present, surface blade 2S48 in such a way that bladed material in not reincorporated into the road travel way but rather is push completely off the travel way to prevent it from re-establishment. At landings, use equipment to blade localized invasive population to an area where it would not be disturbed.

- In the Fall, following surface blading, manually pull or use tools to remove individual plants, removing as much of the roots as possible.

- Pile treated plants and burn where treated, or if plant numbers are few, incorporate plant material into a nearby burn pile.

- Include treated areas in the prescribed burn footprint.

- If practicable, stockpile wood chips generated on site for application to treated yellow star-thistle sites.

**Progression of Work**

Successful control of yellow star thistle would necessitate periodic monitoring and evaluation of treatment efficacy. If present after initial treatment, manually pull or use tools to remove individual plants in the late spring of the year (before fruiting/seeding) ensuring removal of the roots as much as possible. Pile treated plants and burn where treated or if plant numbers are few, incorporate plant material into a nearby burn pile. The following units occur near yellow star-thistle infestations and, as such should be treated last in order to reduce the risk of introduction and spread: 308, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 418 and 421. If this progression of work cannot be implemented, equipment shall be cleaned operating in any of the units associated with the section of road identified above, before operating elsewhere.

**Heritage**

- Standard Resource Protection design/mitigation measures as defined in the *Programmatic Agreement among the USDA 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) would be applied to archaeological sites within the APE as follows:

- All known sites would be flagged and heavy equipment would be excluded from working within site boundaries.
  - FS Site 05-10-54-384, located in a hazardous fuel reduction unit, shall be flagged as an equipment exclusion zone prior to implementation.
  - FS Site 05-10-54-385 was located in a hazardous fuel reduction/shaded fuelbreak unit, but was excluded from the unit after discussions between district archaeologist, district foresters, and District Ranger concluded it would be best for the protection of the resource.
- No landings shall be located within fifty feet of archaeological sites FS Site 05-10-54-384 and FS Site 05-10-54-385.
- No roadwork shall be done within the boundary of archaeological site FS Site 05-10-54-384.
- No firelines shall be constructed within the boundary of archaeological sites FS Site 05-10-54-384 and FS Site 05-10-54-385.
- In the event any cultural resources are discovered during implementation, all work in the area shall cease and the forest heritage program manager shall be notified immediately. Work shall not continue at the location until authorized by the forest heritage program manager.
- Should inadvertent effects to or unanticipated discoveries of human remains be made on Region 5 lands, the county coroner (California Health and Safety Code 7050.5(b)) shall be notified immediately. If the remains are determined to be Native American or if Native American (Indian) cultural items pursuant to NAGPRA are uncovered, the provisions of NAGPRA and its regulations at 43 CFR 10 and ARPA at 43 CFR 7 shall be followed on federal lands (Stipulation 7.9 (a)).

Range
The southern half of the project area is an active allotment (Van Horn Allotment, Barry Creek sub-unit), which includes the upper half of FSR 2S48 road, including all of the jeep road, and the portion of 1S23 south of jeep road, all of FSRs 2S47, 2S53 and 2S54, along with the portion of FSR 2S02 in project area. Prior to operations, the Forest Service would coordinate with the permittee to ensure cattle are protected from harm.

Recreation and Public Safety
- Utilize temporary trail closures during periods of log hauling operations to minimize the potential for accidental injury to recreationists during operations. Utilize advanced notice of closures, signing at appropriate locations, and notification of various user groups to keep users safe when operations are being implemented.
- Identify recreational features (trails, trailheads, signs) on the ground for protection during project implementation.

Soils
Minor modifications of PDFs may be allowed with mutual concurrence of the project soil scientist, hydrologist, silviculturist, and sale administration staff.
Heavy equipment operations shall occur when soils are dry enough to avoid deep rutting or puddling; operate over a duff and slash “cushion” if possible.

Limit heavy equipment operations to slopes 35 percent or less.

Limit temporary roads, landings and skid trails collectively to less than 15 percent of the unit area; this is the 15 percent of the area with allowable soil disturbance.

Maintain 50 to 70 percent soil cover in all units at all times; duff and fine litter less than 3 inches diameter are the most desired soil cover components, but rock and larger wood also technically count as cover.

Re-utilize old temporary roads and landings and equipment trails to the maximum extent possible, thus minimizing new ground disturbance and avoiding cumulative effects.

Avoid soil displacement: do not blade topsoil from skid trails, or landings when possible; full bench skid trails shall not be constructed.

Feller-buncher, masticator, and excavator routes are generally NOT restricted to 15 percent of the area; however, these are limited to dry soil conditions as with all heavy equipment, and effort should be made to minimize turning-related (skid-steer) soil displacement.

Fuels piling operations (hand and machine): seek a balance between size, number, and distribution of piles to maintain overall soil cover requirements and keep bare areas separated by filter strip areas. Do not place burn piles adjacent to streams or wet areas to avoid sediment delivery. Place burn piles away from existing large woody material.

Machine piling operations: equipment shall operate from existing skid trails wherever possible to limit trafficked area, except where a dozer is necessary for larger material in the burn scar; minimize soil to disturbance in order to leave duff in place and keep piles free of topsoil to the extent practicable.

Burning operations: include in the burn plan specific means to achieve residual soil cover requirements of greater than 50 percent cover on slopes less than 50 percent and greater than 70 percent on slopes greater than 50 percent; preference is for duff and fine litter cover; monitor fuel/duff moisture content prior to ignition so that duff will not be consumed over too much area. Protect existing large woody material to the extent feasible.

Cable and end-lining operations: maintain at least one-end suspension of the butt-end of the tree when possible so the top canopy end is dragged on the ground; linear gouging of the soil where it occurs shall require hand-waterbars and raking of duff and slash back onto the bare area in a timely manner with other erosion control measures.

Rehabilitate temporary roads and landings upon completion of a unit, consider de-compaction by ripping with conventional rock rippers (or “dibbling” using an excavator bucket), followed by re-contouring if benched or constructed (created using cut and fill), and mulching with native materials and/or seeding using Forest Service-approved seed mix. Exceptions may be applied where the project soil scientist determines erosion risk is low.

Erosion control measures shall be kept concurrent with operations, and shall be in place: 1) prior to any shutdown for anticipated storm events, 2) prior to weekend shutdown if storm events are expected, or 3) prior to seasonal shutdown.

Sale administration staff should request a site visit by the project soil scientist for units where soil disturbance appears severe or excessive (>15% area), for the soil scientist to assess possible rehabilitation needs for LRMP compliance.
• Bare soil areas: larger areas (>1/5 acre, not including landings) rendered bare by mechanical operations or burning should be monitored for adequate and timely natural revegetation; areas that do not revegetate naturally over one (1) winter should be prescribed for mulching and/or seeding with Forest Service-approved seed mix to stabilize soils, particularly if signs of erosion are present.

**Wildlife**

• Shaded fuelbreak construction may occur in suitable threatened, endangered and sensitive species habitat. No predominant or dominant trees would be removed. Canopy closure would be maintained at 60 percent or greater in all treatment areas.

• The project would not remove potential threatened, endangered, and sensitive species nest trees (predominant trees) or affect the canopy around potential nest trees in suitable nesting/roosting habitat.

• Directional falling would be used to protect all predominant trees.

• Snags and logs would be retained as per SRNF LRMP, S&Gs Table IV-8, and Appendix L. Treatments within Late Successional Reserves (LSRs), riparian reserves, units within Critical Habitat, and suitable northern spotted owl habitat (regardless of land allocation) would maintain snags (20-inch dbh and greater or the largest available in younger seral stages) and downed logs (20 inches and greater and at least 10 feet long or the largest available) at the 80 to 100 percent level, unless they pose a safety hazard or would not meet fuel treatment objectives.

• Surveys for the northern spotted owl (NSO) have been conducted to determine occupancy and nesting status. Prohibit all timber harvest, heavy equipment use, chainsaw use, and smoke producing activities within 0.25 miles of known NSO activity centers (AC) from February 1 through July 31. Surveys to protocol would continue for the life of the project or additional seasonal restrictions would be imposed on any treatment in or within 0.25 miles of nesting/roosting habitat. A September 15 LOP would be used in occupied or Nesting/ Roosting habitat if no surveys are conducted.

• One mapped NSO AC within this project occurs near FSR 2S48, where a nest tree is located approximately 75 feet outside the treatment unit. Although no NSO detections have been recorded since 1992, in order to protect the nest tree and maintain the effectiveness of the fuelbreak, hazardous fuel reduction treatments would limited to within 50 feet of the road, following the standard fuelbreak prescription described above.

• Surveys for goshawk in the project have been conducted, with no detections. If nesting goshawks are subsequently found within 0.25 miles of any treatment units, prohibit all timber harvest, heavy equipment use, chainsaw use, and smoke producing activities within 0.25 miles of the occupied site between March 1 and August 31.

• Surveys for fisher, marten and wolverine have been conducted and fishers have been detected in three (3) areas. Although no den sites have been located, prohibit all timber harvest activities including heavy equipment use, chainsaw use, and smoke producing activities within 0.25 miles of fisher suitable denning habitat around detection areas from February 1 to May 31.

• In early seral-stage stands lacking downed woody debris (shrub and pole seral stages), small diameter slash would be piled and left on site to provide cover for small mammals, birds, reptiles and amphibians. The size of the piles would vary depending on the availability of slash; however, the preferred size is at least 6 feet in diameter and 4- to 6-feet tall. Small diameter debris decomposes quickly, so large piles may have greater longevity. The number of piles per acre would be dependent on the location and potential fire risk. In high public-use areas, only one (1) or two (2) piles per acre
would be left in the stand. In other areas, three (3) to four (4) piles per acre would be left in the stand. No piles would be left within 100 feet of roads.

Monitoring
This section discusses the monitoring strategy linked to proposed management activities under the NEPA process.

**Implementation and Effectiveness Monitoring**
Monitoring is important for tracking the implementation of a project; ensuring activities are implemented as planned, as well as to measure success in meeting the purpose of required mitigation. Monitoring and evaluation are separate, sequential activities that provide information to determine whether programs and projects are meeting forest plan direction. Monitoring collects information, on a sample basis, from sources specified in the forest plan. Evaluation of monitoring results is used to determine the effectiveness of the forest plan and the need either to change the plan through amendment or revision, or to continue with the plan. Overall direction is found in FSM 1922.7, FSH 1909.12 (Chapter 6), and 36 CFR 219.12(k).

Project activities would be monitored during and after implementation of management actions to ensure that mitigation measures are implemented as specified. Monitoring is also proposed to evaluate the effectiveness of planned activities, including standard practices and mitigation measures, in achieving desired project outcomes. Lessons learned from monitoring and evaluation would be incorporated into future project planning efforts. A full spectrum of techniques and methods may be used including:

- Formal joint management and collaborative field reviews.
- Site-specific observations by on-site resource specialists.
- Field assistance trips by other technical specialists.
- On-going accomplishment reporting processes.
- Discussions with other agencies and various public users.
- Interdisciplinary team reviews of monitoring results.

**Best Management Practices**
Apply and monitor relevant national best management practices (BMPs), associated with all project activities, including timber harvest and road activities and development. The following BMPs from the USDA Forest Service National Core BMPs would apply to soil and water-quality protections and protection of unstable or potentially unstable areas within or adjacent to units.

Best management practice sites would be identified on the ground and recorded on a by-unit, site-specific basis. Best management practices would be subject to 100 percent implementation monitoring post-harvest, by means of a checklist and maps and cards (standard waiver provision), and to effectiveness monitoring following one or more post-harvest winters. Effectiveness monitoring results, and any follow-up corrective measures taken, would be reported to the Water Board by July 15 in the year following operations. Effectiveness monitoring results would be scored and reported using Best Management Practices Evaluation Program (BMPEP) methodology. A complete listing of BMPEPs is included in Appendix C of this EA.
**Invasive Plants**
Successful control of yellow star thistle would necessitate periodic monitoring and evaluation of treatment efficacy. If present after initial treatment, manually pull or use tools to remove individual plants in the late spring of the year (before fruiting/seeding) ensuring removal of the roots as much as possible. Pile treated plants and burn where treated, or if plant numbers are few, incorporate plant material into a nearby burn pile. Monitor annually and retreat as necessary until no plants persist. A complete listing of BMPs is included in *Appendix C* of this EA.
Chapter 3. Environmental Consequences

This chapter describes the legal framework, analytical basis and best available science used to determine the predicted environmental effects of the Proposed Action, as compared to the No Action Alternative, presented in Chapter 2: The Alternatives. Each resource topic section provides a summary of the project-specific reports, assessments, consultation and input prepared by US Forest Service (USFS or Forest Service) specialists. Information from these ‘specialist reports’ (fish and botanical biological evaluations, noxious weed risk assessment, biological assessment/biological evaluation (BA/BE) for wildlife, soils, geology and heritage resources reports are incorporated by reference into this draft environmental assessment (EA). These reports or memoranda are part of the project record on file at the Six Rivers National Forest (SRNF or forest), in Eureka, California.

Resources that were not impacted or incur minor effects not influencing the decision are not further analyzed. These resources include:

**Air Quality:** The North Coast Unified Air Quality Management District (NCAQMD) regulates the air in Humboldt, Del Norte and Trinity counties, considered to be in “in attainment” of state and federal ambient air quality standards. The two pollutants of greatest concern in the region are ozone and particulate matter. The county’s sunny climate, pollution-trapping mountains and valleys, along with the growing population, all contribute to the problem.

Particulate matter (PM) is fine mineral, metal, soot, smoke and dust particles suspended in the air. Primary sources of particulate matter. The most concerned is associated with PM less than 2.5 microns in diameter (PM$_{2.5}$). Particles of this size and smaller can permanently lodge in the deepest, most sensitive areas of the lungs, and cause respiratory and other health problems.

The Proposed Action would generate PM during operations from increased off-road vehicles use (engine exhaust and dust from paved and unpaved roads), and jackpot burning and underburning of vegetation and slash. However, the application of dust abatement during log hauling, limited amounts of burning annually, covering handpiles with kraft paper to maintain low-moisture conditions minimizing smoke production and only burning on days approved by the NCAQMD would maintain local air quality.

**Recreational Resources:** The National Visitor Use Monitoring (NVUM) report identified driving for pleasure as one of the top recreational activities for visitors to the National Forest. Roads and trails within the project area provide such recreation opportunities, as well as scenic viewing opportunities. This project proposes one change to the National Forest Transportation System (NFTS) by decommissioning 1.9 miles of a Maintenance Level (ML) 2 road, Forest Service Road (FSR) 2S54, which is currently unpassable by passenger and high-clearance vehicles due to a landslide. The road has limited recreational driving opportunities, as it does not connect to other roads or trails.

The entire project area falls within the recreational opportunity spectrum (ROS) of Roaded Natural. Roaded Natural is defined as an area characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Given that the Proposed Action would only slightly modify the visual resources, but not to such an extent as to fundamentally change the dominant form, color, pattern, or texture of the visual resources, the Proposed Action would meet the visual quality objectives (VQO) and maintain the Roaded Natural character of the project area.
**Visuals Resources:** There are 275 acres within project area that fall within the VQO Retention management area and 234 acres within partial retention management area, while the remainder of the project area occurs within the Modification VQO category. The Retention management area is identified as having a high level of scenic integrity where the landscape appears intact. Partial Retention lands have a moderate level of scenic integrity where the landscape appears slightly altered, while lands classified as Modification have a low level of scenic integrity and deviations to the landscape’s shape, pattern, color, or form are readily apparent. The majority of the project area has experienced alterations in visual quality from road and log landing construction and even-age timber harvest management. The 1st 48 Roadside Fuelbreak Collaborative Project (1st 48 Project) would retain variable forest canopy closure over 60 percent, limits new landing construction to existing flat openings and does not involve new road construction. The removal of boundary flagging and placing stump marks away from viewpoints would ensure the Proposed Action complies with land and resource management plan (LRMP or forest plan) standards and guidelines (S&Gs).

The Proposed Action would implement project design features (PDFs) in the mixed-conifer stands to reduce stand density, while maintaining a closed canopy at or greater than 60 percent canopy closure. Such treatments would only slightly modify the pattern of tree density in the foreground and would maintain the form, color, and texture of the visual resources in the mid to distance ground views. Similarly, oak woodland maintenance treatments would slightly modify the existing pattern of meadow openings by removing understory conifers and restoring the pattern of oak woodland meadow openings historically characteristic of the landscape. The proposed treatments would blend well with adjacent lands not proposed for treatment and would conserve the scenic quality and integrity of the project area.

Trail 8E20 (or Wiregrass) commonly referred to as the “Jeep Trail” is a Special Vehicle Designation trail (i.e., four-wheel-drive non-highway legal vehicle wider than 50 inches/all-wheeled vehicles 50 inches wide or less) that is 1.29 miles long, located in T. 2S, R. 8E. The USFS, national resource management (NRM database) indicates that the 8E20 trail was added to the NFST (National Forest System trails) under the Lower Trinity/Mad River Motorized Travel Management Record of Decision in April 2010. This trail is displayed on the revised motor vehicle use map (MVUM) for that area. The trail would be graded within its existing footprint and temporarily closed to public use during logging operations to ensure public safety. Other than the short-term disruption in public use, grading and constructing waterbars would be visually evident in the short-term, likely one season.

**Threatened, Endangered, Sensitive Botanical Resources:** No federally listed plant species are known to occur, nor does suitable habitat exist in the project area. Two Forest Service Sensitive botanical species were found to occur within the project planning area, the mountain lady’s slipper orchid (Cypripedium montanum) and the waterfan lichen (Peltigera growardi). The mountain lady’s slipper orchid is also managed under the Survey and Manage (S&M) S&Gs (USDA/USDI 2001).

Forest Service Sensitive species policy is to manage rare species to avoid a trend toward federal listing or a loss of viability. Although both occur in the planning area, they both occur within the riparian reserve established for Dashield Creek where no treatment is proposed. Hence, similar to Alternative 1 (No Action), there are no effects to these species under Alternative 2 (Proposed Action).

**Threatened, Endangered and Forest Service Sensitive Aquatic Species:** Three species of Threatened and Endangered (TE) salmonids are found in the Mad River watershed. Northern California steelhead trout (Oncorhynchus mykiss) are found in the mainstem Mad River up to Matthews Dam with Critical Habitat being designated up to County Line Creek. Chinook (California Coastal ESU; O. tshawytscha) and coho (Southern Oregon/Northern California ESU, O. kisutch) are found in the in mainstem Mad
River up to “Bug Creek Falls” (approximately 27 miles downstream from Matthews Dam). As the proposed roadside treatment areas are located upstream of the Ruth Lake Dam, Threatened, Endangered and Forest Service Sensitive (TES) anadromous fish species cannot reach the project area, and therefore, the Proposed Action would have no effect on the anadromous TE species and their habitats. Matthews Dam also blocks upstream migration for the Pacific lamprey (*Entosphenus tridentatus*). Neither the western brook lamprey (*Lampetra richardsoni*) nor the California floater (*Anodonta californiensis*) are present above Matthews Dam. The project would have no effect on these Forest Service Sensitive species.

**Range:** An active allotment (Van Horn Allotment, Barry Creek sub-unit) exists in the southern half of the project area, which includes the upper half of FSR 2S48, including all of the jeep road, and the portion of 1S23 south of jeep road, all of FSRs 2S47, 2S53 and 2S54, along a portion of FSR 2S02. This allotment is leased to Travis Ranch LLC. There are 357 cow calf pairs allowed and the season runs from June 1 to October 15.

As canopy cover in forested areas would remain high, secondary range condition would experience minor improvement. Cattle would continue to use the area to travel through, but probably not stay since available forage is minimal. In oak woodland areas that would be enhanced from thinning release and prescribed burning, secondary range would be improved and cattle grazing would expect to occur in slightly higher frequency than before implementation. Plantations with thinning would have a brief improvement in secondary range, but improved growth would shade out forbs and grass in less than 5 years. Conditions in the white fir stand would be similar to those occurring in the lower elevation Douglas-fir dominated forested stands, considered too dense to support much of an increase in secondary range conditions.

**Key Terms**
The following key terms are used in the following section, acting to frame the spatial and temporal analysis methodology and effects discussion by resource topic, as defined below:

- **Direct effects** are caused by the action and occur at the same place and time as the action.
- **Indirect effects** are caused by the action and are later in time, or further removed in distance, but are still reasonably foreseeable.
- **Cumulative effects** are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.
- **Short-term effects** address environmental consequences, which could occur during operations and/or that arise immediately and/or several years post implementation.
- **Long-term effects** address environmental consequences, which are delayed, periodic, and/or arise post implementation and continue over many years.

**Fire, Fuels and Vegetation**

**Introduction**
This section presents the predicted effects of the Proposed Action as compared to the No Action Alternative on fire, fuels and vegetation resources. The project area elevation varies from approximately 2,700 feet near the Mad River to 5,800 feet at the top of South Fork Mountain, along FSR 23. The majority of the proposed treatments lie between 3,500 and 4,500 feet. The area is highly dissected,
creating huge variation in slope orientation, which along with soil type has a major influence on vegetation. Annual precipitation at Ruth Reservoir is 40 inches, and average precipitation for the Upper Mad River Watershed is 60 inches.

Environmental Consequences

Methodology

Potential Fire Behavior

Fireline intensity is commonly used as a measure to relate visible fire characteristics and interpret general suppression strategies. There are several ways of expressing fireline intensity. A visual indicator of fireline intensity is flame length (Rothermel 1983). Fire types (categorized by surface fire, passive crown fire, and active crown fire) are also widely used to determine strategies and tactics to maximize the safety of both fire fighters and the public.

A fire modeling assessment using the Fire and Fuels Extension (FFE) of the Forest Vegetation Simulator (FVS) was conducted to evaluate the existing potential of fireline intensity and relative hazard rating (expressed in flame length) and existing potential crown fire ratings for the proposed project area under severe and moderate fire conditions.

Based on the fire modeling assessment, approximately 31 percent project (treatment) area currently could generate flame lengths over 4 feet making it necessary to utilize mechanized equipment, including aircraft, for suppression activities. Additionally, the FFE modeling showed approximately 37 percent of stands in the project area would have surface fire move into crown fire conditions.

Stand Structure

Under the 1995 LRMP, the distribution of seral stages by vegetative series is evaluated relative to Recommended Management Ranges (RMRs) at a landscape scale. For this project, the scale of the landscape is the south zone of the forest, which consists of the Mad River Ranger District (RD). The distribution of seral stages across the analysis area is quite variable, but most of the stands are early seral. Disturbance patterns and events play a large part in determining the existing landscape. Stand types are defined by six seral stages, based on stand attributes and conditions. These stages are defined as follows:

- **Shrub/Forb (S):** Generally open to dense stands dominated by shrubs and/or grasses (depending on location within the zone) with the top layer of conifers smaller than 6-inch dbh (size class 0 to 1). Shrub/forb stands resulting from natural disturbances such as wildfire, mass soil movement, or flood are classified as shrub natural (SN); stands resulting from regeneration harvesting or salvage after a natural disturbance would be classified as shrub harvest (SH) or shrub salvage (SS).

- **Pole (P):** Generally dense, single-layer stands, dominated by trees with the top layer of conifers between 6- and 11-inch dbh (size class 2). Pole stands resulting from natural disturbances are classified as pole natural (PN); stands resulting from regeneration harvesting (i.e., 10- to 30-year-old plantations) or natural pole stands that have been thinned are classified as pole harvest (PH).

- **Early Mature (EM):** Generally, dense, closed canopy, single-layer stands dominated by trees with the top layer of conifers between 11 and 21 inches dbh (size class 3). Early mature stands are further characterized by the presence of large scattered predominant conifers.
generally greater than 36-inch dbh (size class 5) in the overstory (EA), evidence of past harvest such as thinning or individual tree selection (EH), or both the presence of large scattered predominant conifers and past harvest (EB).

- **Mid-mature (MM):** Generally dense, closed canopy stands, with one or two layers dominated by trees with the top layer of conifers between 18 and 30 inches dbh (size classes 3 and 4; 11- to 21-inch and 21- to 36-inch dbh). As with early mature stands, the mid-mature seral stage can also be further categorized as MA, MH, or MB.

- **Late-mature (LM):** Generally dense, closed canopy stands, with two or more layers present, dominated by trees within the top layer of conifers that are 30-inch dbh or larger (size classes 4 and 5; 21- to 36-inch and 36-inch dbh and larger). Late mature with evidence of past harvest is classified as late harvest (LH).

- **Old Growth (OG):** Generally open to dense stands, with multiple layers and trees of various size classes, the top layer of which is generally larger than 30-inch dbh (size classes 4 and 5). Old growth with evidence of past harvest is classified as old growth harvest (OH).

**Alternative 1 – No Action**

**Direct Effects – Vegetation**

There are no direct effects of choosing the No Action Alternative. The current stand structure (tree sizes/ages, species composition, and spatial distribution) is the result of growth over time and past disturbances. Seral stages can be thought of as a time sequence, although disturbances such as fire, wind, and disease can result in alterations to this sequence. Vegetation composition is largely determined by climate, along with local aspect, elevation, and precipitation patterns. Both upland sites as well as riparian reserves are considered in the discussion, as vegetation found within riparian reserves often does not differ from areas outside riparian reserves.

The distribution of seral stages across the analysis area is quite variable, but most of the stands are early seral. Disturbance patterns and events play a large part in determining the existing landscape. The available data and imagery along with field review shows the seral stage distribution (Table 6) within the planning area is heavily skewed towards early seral stands. The current seral stage distribution across all species occurrence within the planning area is shrub/forb (6%), pole (9%), early-mature (43%), mid-mature (29%), late mature (3%) and old growth (2%).

<table>
<thead>
<tr>
<th>Seral stage</th>
<th>Douglas-fir Series</th>
<th>White fir Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas-fir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrub/forb</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Pole harvest</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Early-mature (EM)</td>
<td>32</td>
<td>59</td>
</tr>
<tr>
<td>Mid-mature (MM)</td>
<td>37</td>
<td>14</td>
</tr>
<tr>
<td>Late-mature (LM)</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Old growth (OG)</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

White fir dominates the higher elevations, generally above 4,600 feet and down to 4,000 feet on more northern aspects. Douglas-fir is a component of these stands at lower elevations, and higher elevations
stands are almost exclusively white fir dominated. Ponderosa pine, sugar pine, black oak and white oak are other tree species growing within this type (Table 7).

<table>
<thead>
<tr>
<th>Series</th>
<th>Acres</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black oak</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>497</td>
<td>60</td>
</tr>
<tr>
<td>Gray pine</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>68</td>
<td>8</td>
</tr>
<tr>
<td>Shrub</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>White fir</td>
<td>195</td>
<td>24</td>
</tr>
<tr>
<td>No Data</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>823</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

While conifer forests account for most of the trees across the analysis area, they are interspersed with oak woodlands, other hardwood forests, and grasslands. This combination of vegetation types contributes to a mosaic of seral stages across the landscape. Natural and human caused disturbance also influence seral stage progression. Developing stands can be set back to shrub/forb stage at any time by stand-replacing disturbances such as high severity fire, high wind events, occasional flooding, or regeneration harvest. In the analysis area, many of these stands are thought to be the result of large stand-replacing fires during the late 1800s and early 1900s (USDA Forest Service 1998).

**Black Oak**
The amount of black oak in stands varies greatly. In many stands, black oak has been relegated to a subordinate position in the canopy, likely due to the reduction in fire and competition from Douglas-fir. Opportunities for maintaining black oak through cultural practices exist in many places.

**White Oak**
White oak generally grows on drier sites, such as southern aspects, shallow or very rocky soils and convex locations. Within the analysis area, they are often associated with meadows, south slopes and ridge tops. White oak generally grows on drier sites, such as southern aspects, shallow or very rocky soils and convex locations. Within the analysis area, they are often associated with meadows, south slopes and ridge tops. White fir dominates the higher elevations, generally above 4,600 feet and down to 4,000 feet on more northern aspects. Douglas-fir is a component of these stands at lower elevations, and higher elevations stands are almost exclusively white fir dominated. Ponderosa pine, sugar pine, black oak and white oak are other tree species growing within this type.

**Stand Densities**
Stand density in most stands was high enough to result in competition-induced mortality. Many white fir stands have high numbers of dead trees, probably due to dense growing conditions. Basal area density measures are above recommended stocking levels for optimizing individual tree and stand growth. These higher stand densities indicate that stand vigor and growth is declining. Once stands of a given species reach a certain density threshold that varies with different tree species, the likelihood of mortality increases significantly. Stand density can be measured in several way, such as basal area or trees per acre.

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8 Basal area is the cross-sectional area of a tree determined from the dbh or 4½ feet above ground level. The cross-sectional area of all stems of a species or all stems in a stand measured at breast height inclusive of the bark and expressed as per unit of land area. Basal area gives an idea of the stocking of trees in a stand.
However, because stands with the same basal area or same trees per acre may not be similar because the average size of trees may be very different, an index is often used to evaluate stand density. There are maximum stand density index (SDI) values used for different species that represent the densest conditions at which growth can occur over a given area, and beyond this, no growth can occur without mortality occurring.

Typically, mortality starts to occur before this maximum is reached. This typically occurs when the SDI value is around 60 percent of a biological maximum. The stand density index is based on the maximum number of trees per acre that can grow at any given average dbh. Often a management goal is to maintain stand densities well below 60 percent to minimize competition stress on trees, which also increase growth and reduces the risk of mortality. This is done by thinning trees so that there is sufficient growing space and available resources to maintain good growth.

**Douglas-fir Stands**

The Douglas-fir series is the major tree species growing in the proposed treatment area on elevations primarily below 4,600 feet elevation. Forest stands are mainly dominated by relatively even-aged 80- to 120-year-old Douglas-fir trees with varying amounts of pre-dominant Douglas-fir, ponderosa pine, and sugar pine. Many stands appear to have a mosaic of several age classes in them indicating regeneration over several decades with fire possibly contributing to this “patchiness”. These stands are thought to be the result of large stand-replacing fires during the late 1800s. It is the major early seral conifer tree species that establishes itself after disturbances. This series is found at mid-elevations on warm, moist inland sites of moderate productivity where frequent fire played a large role in the past (Jimerson et al. 1996). These sites lie between cooler and moister white fir series, and the ponderosa pine series, which often have less available moisture. The Douglas-fir/black oak subsersies is predominant here. The amount of black oak in stands varies greatly with most stands having black oak relegated to a subordinate position in the canopy. This is likely due to the reduction in fire and competition from Douglas-fir. Madrone is the most aggressive hardwood species after disturbance.

The maximum stand density index (SDI) value used for Douglas-fir was 547. Stand density indexes ranged from 139 to 707, averaging 349. A 60 percent SDI value is 328. Approximately 70 percent of the stands had an SDI that was over 60 percent.

Douglas-fir stands in the planning area were growing under dense stocking conditions. The basal area within the Douglas-fir series in the project area ranged from 71 square feet per acre to 545 square feet per acre, with an average of 229 square feet per acre. Typical average post-thinning target basal areas for early-mature Douglas-fir stands range between 120 square feet per acre to 160 square feet per acre. However, approximately 85 percent of Douglas-fir dominated stands had basal areas greater than 160 square feet per acre (Table 8).

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9 Stand Density Index (SDI) is an established (Reineke 1933) measure of stand-level inner tree competition. Designed to measure competition in even-aged, single-species conditions, it is used widely by forest growth models to describe how stand density affects stand development and growth even in uneven aged and mixed stand conditions. The average size of trees in a stand can be looked at and assessed in terms of quadratic mean diameter (QMD) and how it changes through time.
### Environmental Consequences

Table 8. Existing and post-treatment basal area in the 1st 48 Project area.

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Seral stage</th>
<th>Age</th>
<th>Dominant Species</th>
<th>Size Range in inches, DBH (Post treatment QMD)</th>
<th>Existing BA ft²/acre</th>
<th>Post-Treatment BA ft²/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PH</td>
<td>35-45</td>
<td>DF</td>
<td>10-14 (11)</td>
<td>180</td>
<td>80-120</td>
</tr>
<tr>
<td>2</td>
<td>EM</td>
<td>70-100</td>
<td>DF-BO</td>
<td>16-24 (18)</td>
<td>240</td>
<td>100-140</td>
</tr>
<tr>
<td>3</td>
<td>EM/MM</td>
<td>70-120</td>
<td>DF-PP-BO</td>
<td>16-32 (22)</td>
<td>200</td>
<td>120-160</td>
</tr>
<tr>
<td>4</td>
<td>MM</td>
<td>100-120</td>
<td>DF-BO</td>
<td>24-32 (26)</td>
<td>265</td>
<td>140-180</td>
</tr>
<tr>
<td>5</td>
<td>EM</td>
<td>60-100</td>
<td>WF</td>
<td>20-32 (24)</td>
<td>338</td>
<td>180-210</td>
</tr>
</tbody>
</table>

**White Fir Stands**

White fir stands within the project area currently exhibit high-density stocking conditions. Basal area values ranged from 107 square feet per acre to 521 square feet per acre, averaging 321 square feet per acre. The maximum SDI value used for white fir was 759. A 60 percent value is 455. Over 65 percent of the white fir stands in the planning area had SDI values greater than 60 percent, and 14 percent were just slightly lower than 60 percent maximum SDI.

The maximum SDI value used for white fir was 759. A 60 percent value is 455. Over 65 percent of the white fir stands in the planning area had SDI values greater than 60 percent, and 14 percent were just slightly lower than 60 percent maximum SDI.

**Ponderosa Pine**

Ponderosa pine often grows on drier sites within the area, mostly on ridge tops and south facing slopes. California black oak and Pacific madrone are the primary hardwood species, with occasional big leaf maple. Typical understory vegetation consists of hazel, poison oak, madrone, hawkweed, wild rose, snowberry, hawkweed, banchberry, and fescue. Hazel and banchberry typically indicate moister conditions, while snowberry, poison oak, madrone, hawkweed, and rose indicate drier sites. Douglas-fir stands grow on most of the NFTS roads within the treatment area, except for the upper portions of 2S48 and all of 1S23, on the top of South Fork Mountain.

**Indirect Effects – Vegetation and Fuels**

Indirect effects of the No Action Alternative to vegetation and fuels would occur as these young stands continue to grow at their current high densities. Stand density indicates that competition-related mortality is expected to increase as resources on the site become limiting, as shown by comparing the existing density to the desired basal area range based on stand density index (Table 9). This has the potential to lead to the development of high fuel loadings, increasing the hazard of stand-replacing fires, which would further exacerbate the age-class/seral stage gap in the project area with the loss of up to 100 years of growth in these stands.

Table 9. Existing and post-treatment retention basal area by strata in the 1st 48 Project area.

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Seral stage</th>
<th>Age</th>
<th>Dominant Species</th>
<th>Size Range in inches, DBH (Post treatment QMD)</th>
<th>Existing BA ft²/acre</th>
<th>Post-Treatment BA ft²/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PH</td>
<td>35-45</td>
<td>DF</td>
<td>10-14 (11)</td>
<td>180</td>
<td>80-120</td>
</tr>
<tr>
<td>2</td>
<td>EM</td>
<td>70-100</td>
<td>DF-BO</td>
<td>16-24 (18)</td>
<td>240</td>
<td>100-140</td>
</tr>
<tr>
<td>3</td>
<td>EM/MM</td>
<td>70-120</td>
<td>DF-PP-BO</td>
<td>16-32 (22)</td>
<td>200</td>
<td>120-160</td>
</tr>
<tr>
<td>4</td>
<td>MM</td>
<td>100-120</td>
<td>DF-BO</td>
<td>24-32 (26)</td>
<td>265</td>
<td>140-180</td>
</tr>
<tr>
<td>5</td>
<td>EM</td>
<td>60-100</td>
<td>WF</td>
<td>20-32 (24)</td>
<td>338</td>
<td>180-210</td>
</tr>
</tbody>
</table>
Without treatment now, many of these stands would likely eventually develop into the desired structure as 
natural disturbances and competition-related mortality open up the stand and trigger the understory re-
initiation stage of development. However, it is expected that this process would take substantially longer than 
under the proposed thinning regimes (Bailey and Tappeiner 1998). Thinning now would also broaden future 
management options by removing hazardous fuels and creating stands more resilient to fire disturbances.

No action would lose the opportunity to utilize approximately 3 million board feet of small to mid-sized 
poles and sawlogs that would be produced as a by-product from treatment. A large portion of this material 
would be in the form of trees in over-stocked stands that would die in the future from inter-tree competition.

Without the additional treatment of fuels corridors, suppression forces would have fewer options for safe 
access and containment strategies based on fuelbreaks. The ability to use the thinned and treated areas as 
anchor points for containment would be compromised.

**Cumulative Effects – Vegetation**
Within the project area, timber harvest and associated road construction and fire suppression have been 
the dominant management activities having a cumulative effect on vegetation. Selective harvest of 
predominant trees and regeneration harvest using the clearcut or clearcut with reserve trees systems has 
affected the distribution of seral stages. The No Action Alternative would have no effect on the current 
distribution of these stages in the next 30 years. After 30 years, it is expected that many of the mid-mature 
stands would begin to move into the late-mature stage (understory re-initiation), as a result of inter-tree 
competition-based mortality and natural disturbances.

**Direct Effects – Fire and Fuels**
There are no direct effects of choosing the No Action Alternative. The project area resides in a dry 
terrestrial physiographic province where fire has been the dominant natural disturbance factor (FSEIS 
1994). Fire frequencies have been highly variable, and wildfires did not always result in complete stand 
mortality. Evidence of past fire is common on pre-dominant trees having fire scars from old surface fires. 
Much can also be inferred from the dominance of early- and mid-mature seral stages found here. The fire 
regime within the planning area would generally be considered a moderate (mixed) severity regime with 
periods of stand-replacing fire (Jimerson et al. 1996). Tree ring and fire scar studies in the Douglas-fir 
series on the SFNF found that the mean fire return intervals varied from 13 years in the south to 21 years 
median fire return intervals of 11 to 16 years for Douglas-fir/tanoak sites near Hayfork, California, to the 
north of the planning area with lightning as a common occurrence. Stand-replacing fire events historically 
created large areas of young forest, during drought periods from 1860 to 1890 and 1915 to 1935. These 
events likely resulted in the current dominance of early (70- to 110-year-old) and mid-mature (110- to 
150-year-old) stands (UMRWA 1998).

Fire has been an important disturbance factor in the planning area. Evidence of past fire is common on pre-
dominant trees having fire scars from old surface fires. Much can also be inferred from the dominance of early- 
and mid-mature seral stages found here. Aboriginal and settler burning is thought to have been 
common up until the 1930s, and fire records since 1909 indicate that lightning started 38 percent of fires. 
During the 1930s, fire suppression forces were augmented by the Civilian Conservation Corps (CCC) and 
became more effective at preventing growth of fires. Continued growth in suppression forces, along with 
improved access roads and aerial suppression and surveillance, lead to decreases in the annual area burned.
The fire regime within the planning area would continue to be a moderate (mixed) severity regime with periods of stand-replacing fire (Jimerson et al. 1996). Tree ring and fire scar studies in the Douglas-fir series on the SRNF found that the mean fire return intervals varied from 13 years in the south to 21 years in the north (Adams and Sawyer 1980 In: Jimerson et al. 1996). Taylor and Skinner (2003) reported median fire return intervals of 11 to 16 years for Douglas-fir/tanoak sites near Hayfork, California, to the north of the planning area. Stand replacing fire events historically created large areas of young forest, with dry periods from 1860 to 1890 and from 1915 to 1935 thought to have resulted in the current dominance of early (70- to 110-year-old) and mid-mature (110- to 150-year-old) stands (USDA Forest Service 1998).

The fire regime-condition class is considered to be generally outside the natural/historic range of variation for the Douglas-fir series, white fir series (ponderosa pine is seral) and white oak/conifer types. At these elevations and latitude there is likely departure from historic conditions, since lower precipitation and the hotter and drier summertime conditions would have led to more ignitions from lightning and human sources than more mesic sites at higher elevations. These more frequent fires would indicate a mixed-severity regime with under-burning and creation of small patches of regenerating forest.

**Indirect and Cumulative Effects – Fire and Fuels**

The *Upper Mad River Watershed Analysis* (USDA 1998) found several trends thought to be related to the effects of fire suppression. Permanent forest inventory plots have revealed a continuing increase in stand densities over the previous 30 years, with a concurrent decrease in black oak representation. This finding is consistent with stand data from the project area, where Douglas-fir basal area is at or above maximum and black oak is declining. The Upper Mad River Watershed Analysis also noted the succession of white oak savannahs to conifers, a trend that is also occurring in the planning area.

The absence of recent mixed-severity fire has been a likely factor in the rather uniform, even-aged, single-layer structure of these Douglas-fir stands, as well as the continued loss of black oak through competition from Douglas-fir. Fire suppression since the early 1900s means that these sites have likely missed several fire events that would have created more horizontal and structural diversity in the early- and mid-mature stands (Weisberg 2004, Taylor and Skinner 2003).

In the northern part of the planning area, ponderosa pine and ponderosa pine/black oak stands are prevalent. Fire scar evidence indicates that these stands were historically maintained at low densities by frequent fire regimes. Many of these stands contain large, old specimens of both of these species. Stand densities and ladder fuels have increased to the point that there is a risk of losing them to a stand-replacing fire.

Stand structure and fuel arrangement is now such that stand-replacing fire would be expected to be a substantial, if not the dominant, type of fire severity during wildfires in the planning area. This condition differs from a mixed-severity regime, where fire would have multiple effects ranging from non-lethal surface fire to creation of small patches of high mortality that would lead to regeneration of early seral species. In the mixed-mortality areas, stand thinning by fire would typically have led to the creation of two-layered stands by creating conditions favorable to the establishment of early seral species in the understory.

The fire regime condition class is considered to be generally outside the natural/historic range of variation for the Douglas-fir series and white oak-conifer types. At these elevations and latitude there is likely departure from historic conditions, since lower precipitation and the hotter and drier summertime conditions would have led to more ignitions from lightning and human sources than more mesic sites at
higher elevations. These more frequent fires would indicate a mixed-severity regime with underburning and creation of small patches of regenerating forest.

In 2011, the Ruth Fire burned 1,460 acres of National Forest System (NFS) lands in the upper Mad River Watershed. There are 88 acres of 1st 48 Project units within the burned area of the Ruth Fire. Fire effects were variable according to onsite conditions at the time of burning. However, it demonstrates the potential for large fires in project area. With the onset of effective fire suppression in the planning area between 1930 and 1945, fire frequency has declined and changes to the vegetation structure have led to a denser, more homogeneous forest (Sugihara et al. 2006).

Timber Harvest
The project area was developed for timber production beginning in 1963 (Upper Mad River WA 1998). Much of the older timber harvest in the area had focused on removal of the larger fire resistant trees in selective cuts. Large predominant trees were selectively removed without thinning the remainder of the stand, which has created fuel conditions conducive to crown fire. This can be seen in many of the stands as evidenced by rotting stumps and downed logs that were not harvested. More recent harvests included clearcuts. The current plantations in the area are a result of this. Many of the dense plantations created after clearcutting or regeneration harvest have reached the pole stage and are very susceptible to damage from both surface and crown fire.

Planting of bare root seedlings was begun in the early 1960s after it became clear that natural seeding was not providing adequate stocking. At that time, the development paradigm was to build the long-term road system necessary for access to timber stands through the creation of 20 to 40 acre clearcuts spaced out along the road system (staggered-setting approach). This lead to the breaking up of larger areas of contiguous forest into patches of early- to late-mature forest with young stands interspersed throughout.

Tree Mortality and Snags
Dead trees in the project area are generally small diameter (less than 20-inch dbh), without the large snags found in older stands. Mortality from competition and physical damage is variable, and current snag densities are variable. Down wood data was also not available for the project area, but is similar to the snag population in that it is composed of small logs from competition-related mortality and large logs in advanced stages of decay.

Prescribed Fire
Due to the conditions noted above, the use of prescribed fire in Douglas-fir stands without reductions in stand density and fuels by mechanical means would be difficult, costly, and pose risks to firefighters and local communities. Many areas of oak woodland in the project area, especially along potential control lines, are in need of mechanical treatment prior to use of prescribed fire.

Late-Successional Reserve
A very small portion of the 1st 48 Project is located within the South Fork Late-Successional Reserve (LSR; RC-330). The entire South Fork LSR is 80,451 acres, with the majority located on the Shasta-Trinity National Forest (STNF). Of that, only 1,057 acres located on the SRNF, and the 1st 48 Project affects only 73 acres located on the westernmost boundary of the entire LSR. The South Fork LSR is a land allocation established in the Northwest Forest Plan (NWFP), incorporated into both the SRNF and STNF LRMPs, allocated to be managed to protect and enhance late-successional forest ecosystems through prescribed understory fire, and TFB. General management direction for LSR lands is found on pages 4-34 to 4-39 of the SRNF LRMP (USDA 1995). The STNF included the South Fork LSR in the 1999 Forest-Wide Late-Successional Reserve Assessment (LRSA; USDA 1999), which identifies general
current conditions, general desired conditions, and management recommendations that would move the
LSRs, including the South Fork LSR, toward desired conditions. One of these desired conditions is the
reduction of risk to large-scale disturbance.

In 2009, the STNF received a letter of clarification from the Regional Ecosystem Office (REO) related to
hazard reduction thinning activities proposed in LSR’s in order to reduce the risk of large-scale
disturbance. The REO had reviewed the LRSA for the STNF and concluded that fuel treatments proposed
in the LSRs that thin suppressed, intermediate and some co-dominant trees are consistent with the S&Gs
under the NWFP (USDA REO letter, October 18, 2009).

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. In the letter, the LSR work group also concurred with an upper 150-year age limit on trees
removed, as opposed to a 20-inch diameter limit, which could be cut to enhance development of late-
successional habitat. The LSR work group deemed it logical to assume that trees this old would be larger
than 20 inches in diameter.

*Alternative 2 – Proposed Action*

**Direct and Indirect Effects**

The Proposed Action would employ TFB (Tappeiner et al. 2007) in early and early/mid-mature Douglas-
fir/black oak stands ranging in age from 70 to 80 years, early mature white fir stands, and young Douglas-
fir or ponderosa pine plantations. These stands are generally single-layered and consist of even-aged
patches of varying age.

A positive response to thinning from below from implementing the Proposed Action is expected, since
subordinate trees (suppressed, intermediate and select co-dominant trees) would be removed to allow
trees of the upper canopy (which have more fully developed crowns) to utilize the additional growing
space. Thinning from below increases the residual size of trees left in a stand (Agee and Skinner 2005;
Smith et al. 1997). Crowns would expand into the desired shaded fuelbreak condition. Reducing stand
density at this time would allow these stands to quickly develop more resilience to disturbances such as
wind, heavy snow and ice, bark beetles, and fire. Thinning, whether from below or throughout the
diameter classes (with the exception of predominant and dominant trees), increases spacing and reduces
stand densities, resulting in less inter-tree competition, which increases individual tree vigor, resulting in
stands that are more resilient to insects, disease, wildland fire, and drought (Agee and Skinner 2005;

Similarly, retaining the trees with the largest crowns may initially stimulate growth response of some
brush species. However, the resulting increase in crown growth would reduce available sunlight from
reaching the forest floor within a few years, which would in turn, reduce understory vegetation growth,
including brush species that might contribute to ladder fuel development.

*White fir dominated – Thin from Below*

Thin from below (TFB) would retain residual basal area from 140 square feet per acre to 180 square feet
per acre, variable crown spacing and a minimum 60 percent canopy closure. The thinning treatment
would retain a slightly higher target residual basal area square feet per acre, compared to drier areas
dominated by Douglas-fir. Forest Vegetation Simulator (FVS) modeling (2018) of stand exam data
collected by the Forest Service between 2016 and 2018, predicted over 90 percent of the TFB treatment
area would exceed 180-plus square feet per acre residual basal area if left untreated.
Thin from below is a treatment in even-aged stands that would also produce types and quantities of material, such as sawlogs and poles that can be utilized to realize some economic gain, instead of generating a cost to be disposed of as slash. Treatments would reduce canopy bulk density, raise the canopy base height, and increase average stand diameters. In terms of fire resiliency, all of these factors would make these stands more able to withstand the effects of a fire (Graham et al. 1999). While there are always tradeoffs to stand manipulations in terms of fire behavior, it is expected that in the long term (10 years and beyond) the thinning conducted in this project would lead to reduced propensity towards crown fires and stand-replacing fire events. This conclusion is based on the expected rapid recovery of the upper canopy that would inhibit continued growth of tall shrubs that could contribute to extreme fire behavior. In addition, the species of shrubs involved are not known for being particularly volatile during a fire.

Although surface fuels in the form of shrub layers would increase, and dead and down fuels on the forest floor would increase even in units where tops are yarded and burned at the landing, post-thinning treatments consisting of piling, lop and scatter, and jackpot burning would further reduce surface fuels and reduce potential for tree torching and hot surface fires. Opening up these stands would increase potential wind speeds, which contribute to flame lengths, but this effect should be negated by the reductions in surface and canopy fuels (Graham et al. 2004, Agee and Skinner 2005).

Thinning would improve the ability of these stands to withstand the typical winter wind, ice, and heavy snow storms in the Coast Ranges and Klamath Mountains, although there may be a short-term increase in susceptibility to wind storms in the denser stands on exposed sites. Over time, thinning promotes a lower height-to-diameter ratio, which improves the ability of a tree to withstand heavy snow and ice loads, especially if they are associated with dynamic loadings associated with high winds (Oliver and Larson 1990). The thinning intensity and TFB prescription considers maintaining an average of 60 percent or greater canopy cover with a relatively uniform crown spacing so stands exposed to prevailing winds would not be opened up too much. However, some blow-down is still to be expected, and these events are expected to provide additional coarse woody debris (CWD) and diversity to stands, while still maintaining an adequate growing stock for future management objectives, including wildlife habitat.

**Late Successional Reserve**

The 1st 48 Project area was identified as a landscape where existing features and conditions give firefighters a good chance of keeping exterior wildfire from entering; or conversely interior wildfire from exiting the area. Under the LSRA and LRMP direction, proposed silvicultural activities are aimed at reducing risk (potential loss due to wildfire) in 59 acres of younger white fir stands adjacent to FSR 2S23 along the ridgetop within the South Fork LSR.

Project objectives are to reduce the stand density with a TFB of primarily white fir to reduce fuel and add space between crowns. The trees targeted for removal in the early mature white fir stands have a diameter range of 14 to 24 inches, and are less than 120 to 150 years old (Table 9). Some trees in this age class are larger than 24 inches dbh and may be removed to meet crown spacing objectives.

Additionally, there are approximately 14 acres of Douglas-fir or ponderosa pine dominated stands within the LSR that are early and mid-mature or are late mature stands, which have had previous entries of individual tree harvest. The trees targeted for removal in these stands are similar to the white fir stands in terms of age and diameter range. In the patches of mid-mature and remnant late-mature seral forest, (Table 9), trees range from 70 to 120 years in age, with diameters ranging from 12 to 32 inch dbh. As the Proposed Action targets those trees with under-developed crowns, which are typically suppressed and/or
intermediate trees less than 150 years old, and retains trees with the fullest crowns characteristic of co-dominant, dominant and pre-dominant trees, late seral characteristics would maintained

**Cumulative Effects**

As aforementioned, past timber harvest on the Mad River RD has resulted in an altered distribution of seral stages compared to 60 years ago, when active timber harvest began. The Proposed Action differs from past actions, in that historic timber harvest (pre-1990s) consisted of clearcut or shelterwood logging, broadcast burning, and planting with Douglas-fir seedlings. The actions proposed here are to reduce hazardous fuels and to construct shaded fuelbreaks to promote resiliency of stands from fire effects. These treatments would not detract or stall these stands in development of structure to mid-mature/late-mature and understory re-initiation and would not alter the current distribution of seral or development stages (also called structural stages) within the analysis area.

Similar thinning projects are being carried out within this watershed. The 2009 Beaverslide and the 2013 Kelsey Peak Timber Sale and Fuelbreak Project have portions recently implemented. Other foreseeable actions within the analysis area are additional hazardous fuel reduction projects and shaded fuelbreak construction and maintenance.

In terms of past, proposed, ongoing, and foreseeable actions, this project would have no cumulative effects to the vegetation structural stages within the South Zone. The current distribution has been molded by past activities, which removed older forest types, and by past wildfires. This project would improve the distribution of structural stages over the long-term for species needing older forest habitat for part or all of their life cycle.

**Wildlife Resources**

**Introduction**

This section summarizes the predicted effects of the Proposed Action as compared to the No Action Alternative on TES, disclosed comprehensively in the 1st 48 Project BA/BE; Smith 2018). The BA/BE contains the list of species considered, local population information, survey results, and suitable habitat descriptions on which effects of proposed projects are evaluated.

On June 28, 2011, the US Fish and Wildlife Service (USFWS) released the Revised Recovery Plan for the Northern Spotted Owl (Recovery Plan). The purpose of recovery plans is to describe reasonable actions and criteria that are considered necessary to recover a listed species. The Recovery Plan recommends increased conservation and restoration of northern spotted owl (NSO) sites and high-value spotted owl habitat.

The Recovery Plan represents the “best available science.” The forest has taken special steps to ensure that the 1st 48 Project is consistent with the recovery actions within the Recovery Plan.

The Recovery Plan recognizes the importance of maintaining, and restoring, habitat for the recovery and long-term survival of the spotted owl. “Long-term spotted owl recovery could benefit from forest management where the basic goals are to restore or maintain ecological processes and resilience. Therefore, we recommend application of disturbance-based principles to such decisions (Franklin et al. 2002, 2006, 2007; Drever et al. 2006; Noon and Blakesley 2006; Carey 2007; Long 2009; Swanson et al. 2010).” The Recovery Plan relies on federal lands to provide the major contribution for recovery (USDI Fish and Wildlife Service 2011).
On December 4, 2012, the final 2012 NSO Critical Habitat rule was published. Critical habitat consists of those areas that have physical or biological features essential to the conservation of the species. The 2012 NSO Revised Critical Habitat Rule states “we encourage land managers to consider implementation of forest management practices recommended in the Revised Recovery Plan to restore natural ecological processes where they have been disrupted or suppressed (e.g., natural fire regimes), and application of ecological forestry management practices ....”

The wildlife analysis area used for cumulative effects is the Upper Mad River Watershed (UMRW), which is a 5th-field watershed consisting of 102,926 acres. There are 25,178 acres of nesting/roosting and 24,762 acres of foraging in the Upper Mad River Watershed. The project area encompasses approximately 32,892 acres within these watersheds. Three affected NSO territories extend beyond the project area; therefore, the action area for wildlife analysis of direct and indirect effects is approximately 36,267 acres.

The plantations and natural pole-sized stands proposed for treatment are even-aged and lack the horizontal and vertical diversity components associated with late-mature habitat. These young stands have the potential to achieve rapid diameter and height growth with commercial thinning. As these stands develop, the acres suitable for NSO and other late-successional associated species should increase. By treating currently unsuitable habitat adjacent to existing late-successional habitat, larger patches would develop.

Currently, the planning area is considered as having a high risk of catastrophic or stands replacing fire (LSRA 1999). Existing late-successional habitat is at risk. Early seral vegetation is highly susceptible to loss in a fire (dense, interlocking canopy). Treatments that reduce the time stands are in early seral stages may reduce the risk of stand replacing fire. In addition, construction of the fuelbreaks would reduce the fuels along road systems bisecting the area and serve as a control point for suppression activities. Removal of the ladder fuels would reduce the potential of intense heat and crown fires continuing unabated into existing habitat. The creation of these shaded fuelbreaks would assist suppression efforts in several ways: it would provide safe access for fire suppression crews; it would reduce the chance of a human-caused roadside fire from spreading into existing habitat; and it would create a break in the continuity of fuels to slow down the progress of any fire that might start within the project area. Shaded fuelbreaks in strategic areas would provide greater protection to existing late-successional habitat. This project would reduce fuel loads that could result in high-intensity wildfires that could negatively impact suitable wildlife habitat.

The SRNF Forest Plan used computer growth models to determine the effects of thinning prescriptions designed to mimic natural disturbance on stand age. The results of this modeling showed that succession could be accelerated by as much as 30 years per seral stage, depending on site-specific conditions. Treatments of shrub, pole, and early mature stands could accelerate the development of late-mature and old growth stands by as much as 90 years. The No Action Alternative could delay the development of late-successional habitat by as much as 90 years, which in turn would delay the reduction of fragmentation and delay achieving larger habitat patch size.

The objective of the proposal is both short- and long-term in its aim. The short-term aspect is to manage for protection from stand-replacing fire. In addition to the objective of fuels reduction and fuelbreak construction, the project will provide both short and long-term benefits to wildlife by protecting current habitat and improving/restoring lower quality or non-habitat.
Environmental Consequences

Methodology
Known or suspected species occurrence is based on historic records, current sightings, field review, and formal surveys. Presence of suitable habitat is based on the SRNF Vegetation Layer, aerial photographs, and field reviews conducted by the wildlife biologist. The species considered are known to or are suspected to occur in the project area (Six Rivers National Forest Forest-wide Reference Document, January 2018).

Approximately 75 acres of the project occurs in an LSR, specifically LSR 330. The STNF LSRA (1999) determined that this area of the LSR was deficient in late-successional habitat. Portions of the LSR were previously harvested; therefore, extensive stands of dense plantations exist that not only create a fuels hazard, they also do not provide suitable habitat for late-successional species such as NSO. Plantations and young natural stands are even-aged and lack the horizontal and vertical diversity components associated with late-mature stands. Young stands have the potential to achieve rapid diameter and height growth with thinning treatments. Silvicultural prescriptions can be applied to younger stands in order to accelerate their development toward late seral conditions. These treatments could increase the amount of late seral vegetation sooner than would occur naturally. The LSRA indicated fuels treatments are needed to protect the LSR, as well as extensive habitat restoration. The project would maintain and improve habitat conditions within the LSR.

The NSO Recovery Plan recommends increased conservation and restoration of NSO sites and high-value NSO habitat.

Threatened Species – Northern Spotted Owl

Alternative 1 – No Action

Direct and Indirect Effects
There are no direct effects of choosing the No Action Alternative. Under the No Action Alternative, no thinning, shaded fuelbreak construction, or activity fuel treatments would occur. The No Action Alternative would not change the current conditions. No suitable or Critical Habitat for any TES species would be modified through thinning or shaded fuelbreak construction. There would be no disturbance to TES species during the breeding season. However, the No Action Alternative would not accelerate the development of late-successional conditions in younger stands throughout the planning area, Critical Habitat, or the LSR.

The No Action Alternative would also not help alleviate the fuels problem in the area. Plantations and young natural stands that are left untreated would be a greater fire hazard in the long run, because they are greatly overstocked (many trees per acre with dense, interlocking canopies). Treatments within these stands would reduce existing fuels. Thinning in plantations improves growing conditions for the remaining trees by reducing competition for light and nutrients. Without treatment, tree-to-tree competition may cause far greater mortality in the stand. Periods of competition-induced die-offs could generate large amounts of fuel in shorter timeframes.

There are heavy fuels along the roads in the planning area. Many of these areas contain a sufficiently dense fuel ladder (moving from the ground up to live limbs of a trees) to allow fire to easily make its way from the ground to the canopy. Under the No Action Alternative no treatment would occur along these
roads and the risk of a fire doing catastrophic damage to the existing late-successional habitat would remain high.

**Cumulative Effects**
There are no cumulative effects associated with no action.

**Alternative 2 – Proposed Action**

**Direct and Indirect Effects**
Implementation of Alternative 2 would protect and improve habitat conditions for numerous species including TES, management indicator species (MIS), S&M species and migratory bird species (MBS). The habitat conditions are considered low quality for the NSO throughout much of the planning area. Past management has removed large tracts of suitable nesting/roosting habitat and fragmented remaining patches. Extensive areas of 40-plus-year-old plantations and young natural stands occur throughout the planning area.

There are 530 acres proposed for TFB and 108 acres of plantation thinning that would be treated using conventional harvest systems. All thinning would occur in plantations (40-plus years old) and young natural stands. None of the thinning treatments occur in suitable high-quality nesting/roosting habitat for the NSO. Forest plan modeling showed that succession could be accelerated by as much as 30 years per seral stage, depending on site-specific conditions. Treatments of shrub, pole, and early mature stands could accelerate the development of late-mature and old growth stands by as much as 90 years. Treatments would change the stand structure and allow large trees to develop, accelerating the development of functional late-successional habitat. Silvicultural prescriptions for the 1st 48 Project would ensure retention of existing stand structure, species composition, snags, and downed logs.

Little true riparian habitat exists within the units along both Littlefield and Johnathan creeks. However, in the long-term project implementation has the potential to improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to riparian reserves. Project activities would not occur within riparian habitat. Implementation of the project would maintain and improve riparian habitat conditions.

**Recovery Plan**
The Recovery Plan recognizes the importance of maintaining, and restoring, habitat for the recovery and long-term survival of the spotted owl. The Recovery Plan relies on federal lands to provide the major contribution for recovery (USDI Fish and Wildlife Service 2011).

The USFWS found that due to “The continued decline of the spotted owl populations and low occupancy rates in large habitat reserves, and the growing negative impact from barred owl invasions of spotted owl habitats (Forsman et al. 2011, Dugger et al. in press), which is greater than anticipated in the NWFP. We recommend increased conservation and restoration of spotted owl sites and high-value spotted owl habitat to help ameliorate this impact” (emphasis added; Recovery Plan).

The Recovery Plan states, “This Revised Recovery Plan was developed using the best scientific information available and a “step-down” approach of objectives, criteria and actions. … Recovery actions are the Service’s recommendations to guide the activities needed to accomplish the recovery criteria. Recovery actions are recommended throughout the U.S. range of the spotted owl and are designed to address the specific threats identified in this Revised Recovery Plan”.
The 1st 48 Project was designed to meet the objectives of the Recovery Plan as follows:

- **Recovery Action 32 (RA 32)** states, “Maintaining or restoring forests with high-quality habitat would provide additional support for reducing key threats faced by spotted owls” and “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”.

Forsman et al. (2011) recommended that all potential NSO habitats should be considered, not just old growth. The Six Rivers definition of suitable nesting/roosting NSO habitat includes mid-mature (starting at 21-inch dbh), late-mature and old growth seral stages. All potential habitat was considered during project evaluation, and all high-quality habitat (no matter what seral stage) was dropped from treatment. Low-quality habitats were evaluated for habitat improvements measures. If the habitat could benefit from a silvicultural treatment, then it was considered for the project.

The definition of NSO nesting/roosting habitat used for this project was based on the definition found in the SRNF LRMP and field verified by wildlife biologists with extensive experience with the species. The LRMP definition was based on extensive published literature and represents the best available science for the Six Rivers’ habitat types.

The USFWS defines “habitat maintenance” as a reduction in stand density, but the current habitat function would be maintained immediately post project with the purpose of improving its quality for the species over time. “Removal” occurs when the habitat no longer functions as nesting/roosting or foraging habitat (e.g., clear cutting). Habitat maintenance treatments are treatments designed to maintain and enhance habitat. A “downgrade” is taking a higher habitat quality down to a lower habitat type, such as removing too much canopy and making a nesting/roosting stand only suitable as foraging habitat.

No habitat removal or downgrading would occur under the 1st 48 Project except for negligible amounts in any one area for landing construction. The most removal that would occur in any location is 0.25 acres for any given landing.

All high-quality stands were dropped from treatment on this project. Approximately 113 acres of moderate quality and 208 of low-quality nesting/roosting habitat would receive treatment (shaded fuelbreak construction and hazardous fuel reduction treatments) within 150 feet of a high-use road, but would remain suitable post-project. Treatment of these areas would help protect existing high-quality nesting/roosting/foraging habitat from human-caused fires. This project meets the intent of Recovery Action 32 and the need to reduce inter-specific competition between spotted and barred owls.

- **Recovery Action 10 (RA 10)** requires that agencies:
  - “Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population”.
  - “When planning management activities, federal and non-federal land managers should work with the Service to prioritize known and historic spotted owl sites for conservation and/or maintenance of existing levels of habitat.”
Because the Six Rivers strives towards recovery of the spotted owl, all activity centers (ACs) receive the same level of protection and are not prioritized with some ACs getting less protection as allowed by the Recovery Plan. This exceeds the requirement of the RA 10 of the Recovery Plan. In addition, the USFWS requires a 70-acre nest grove protection zone. In this project we exceeded 70 acres around each known AC (each AC has a minimum of 100 acres delineated for nest grove protection), which was incorporated into the project design (see the BA for the project for specific information relating to nest groves). No activities would occur within the nest groves.

- **Recovery Action 6 (RA 6)** states, “In moist forests managed for spotted owl habitat, land managers should implement silvicultural techniques in plantations, overstocked stands, and modified younger stands to accelerate the development of structural complexity and biological diversity that would benefit spotted owl recovery.”

The 1st 48 Project would restore and accelerate development of important habitat characteristic for the spotted owl. This includes plantations and overstocked stands that, if treated, would increase the available habitats for the spotted owl and help reduce interspecific competition between the barred owl and the spotted owl. Treatment of these stands would have an immediate benefit to the spotted owl.

The stands selected for treatment minimally met the definition of suitable nesting/roosting/foraging habitat, but had a lower likelihood contributing to survivorship or reproduction. The stands had one or more features of suitable habitat, but lacked other important characteristics that reduce their likelihood of occupancy or use. For example, a stand may have an average tree size of 21-inch dbh and 60 percent canopy cover, but lack large nest trees and multi-layered canopy conditions. The 1st 48 Project was designed to maintain current characteristics of nesting/roosting and foraging habitat but, more importantly, would create the currently lacking, critically important habitat characteristics for nesting/roosting and foraging habitat. It is expected that current habitat function would be maintained in all treatment areas immediately post-project (as was seen in the post-treatment review of the Beaverslide Project; however, approximately 90 percent of the nesting/roosting/foraging habitat in the action area would not have any treatment. Therefore, “adequate alternative habitat” as suggested by Forsman (2011) remains available in the action area for owl use. The project would develop functional habitat that is currently lacking in the stands.

This project has protected all high-quality habitat, all spotted owl territories (not just high priority sites, RA 10) and would restore and accelerate important habitat characteristic for the spotted owl (RA 6) in young overstocked stands. Such long-term protection of owl habitat is consistent with the recommendations in the Recovery Plan.

The Recovery Plan states, “Dugger *et al.* (in press) found an inverse relationship between the amount of old forest within the core area and spotted owl extinction rates from territories” when barred owls were present. The Recovery Plan also states due to the “growing negative impact from barred owl invasions of spotted owl habitats (Forsman *et al.* 2011, Dugger *et al.* in press) …, We recommend increased conservation and restoration of spotted owl sites and high-value spotted owl habitat to help ameliorate this impact” (emphasis added). Barred owls have been documented using a wider range of forest types (younger seral stages with more fragmentation) than spotted owls (Hamer 1988, Herter and Hicks 2000, Kelly *et al.* 2003, Hamer *et al.* 2007). Consequently, the loss of late-successional old-growth forest and
increased fragmentation of these forests would decrease the amount of suitable habitat for spotted owls. In other words, without treatment of non- or poor-quality habitats in deficit core areas we may lose these sites to barred owls. The Recovery Strategy of Recovery Plan supports “active forest management” and states, “In addition to describing specific actions to address the barred owl threat, this Revised Recovery Plan continues to recognize the importance of maintaining and restoring high value habitat for the recovery and long-term survival of the spotted owl”. The 1st 48 Project treatments within owl territories, including core areas, would accelerate the development of old forest characteristics, which would improve habitat conditions within spotted owl territories. The project meets the objectives of the Recovery Plan.

**Barred Owl**

Barred owls are recognized as a significant threat to the recovery of the NSO (USFWS 2011). The Recovery Plan addresses barred owls under RA 32 and RA 10, which are found under the “Barred Owl Recovery Actions”. The barred owl recovery actions were developed under the assumption that barred owls now occur at some level in all areas used now or in the past by spotted owls. This is true for the 1st 48 Project area as well. Surveys for this project found two barred owl sites. The Recovery Plan addresses the threat to the NSO from the barred owl through the preservation of existing high-quality habitat (RA 32) and preservation of high priority NSO territories (RA 10). The Recovery Plan also addresses the need to restore additional habitat for the owl in order to ameliorate the impact of the barred owl. While additional barred owls may or may not be present in the action area, implementation of RA 10 and RA 32 fully meets the best available barred owl mitigation measures by protecting, maintaining and restoring spotted owl habitat.

The Recovery Plan was informed by Forsman et al. (2011) and Dugger et al. (in press at the time, but subsequently published in 2011). The Recovery Plan states due to “The continued decline of the spotted owl populations and low occupancy rates in large habitat reserves, and the growing negative impact from barred owl invasions of spotted owl habitats (Forsman et al. 2011, Dugger et al. in press), which is greater than anticipated in the NWFP. We recommend increased conservation and restoration of spotted owl sites and high-value spotted owl habitat to help ameliorate this impact”.

Recovery Action 32 specifically states: “Maintaining or restoring forests with high-quality habitat would provide additional support for reducing key threats faced by spotted owls” and “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”. All high-quality stands were dropped from treatment on the 1st 48 Project due to this recovery action and the need to reduce interspecific completion of the owls and restoration activities are proposed for non-habitat or low-quality habitat stands.

Recovery Action 10 requires that agencies “Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population”. Maintaining all historic ACs is a standard SRNF protection measure. The Six Rivers database includes NSO ACs that predate the 1990 listing of the NSO. All historic ACs (currently occupied or not) that meet the criteria of an AC (described in the USFWS survey protocol) are considered during project evaluation. The 1st 48 Project had eight (8) historic ACs mapped. One AC was found to be active during first year of surveys to protocol (2017). All high-quality habitat, regardless if it was located within an active AC, was dropped from consideration
during project design. In addition, the USFWS requires a nest grove protection zone of a minimum of 70-acres around each known AC, which was exceeded for this project and incorporated into the project design. No activities would occur with the nest groves. The 1st 48 Project meets RA 10.

The 1st 48 Project has protected all high-quality habitats (not just old growth), all spotted owl territories (not just high priority sites) and would restore, maintain, and accelerate important habitat characteristic for the spotted owl. “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” (II-67 of the Recovery Plan). Protecting these forests should provide spotted owls high-quality refugia habitat from the negative interactions with barred owls that are likely occurring where the two species’ home ranges overlap. The 1st 48 Project would not exacerbate competitive interactions between the two species. Without the implementing the additional protection measures and recovery actions of the Recovery Plan, the barred owl may be successful in out-competing the spotted owl. It is imperative to the spotted owl’s recovery to take such actions. The 1st 48 Project is meeting the objectives of the Recovery Plan.

Fire

Another threat to the NSO addressed by the Recovery Plan is wildfire. The Recovery Plan identifies stand-replacing wildfire as one of the three top threats to the recovery of species stating,

- “Currently the primary source of habitat loss is catastrophic wildfire ….” The Recovery Plan further notes that wildfire size and frequency have been increasing in the western US and that acres burned are expected to continue to increase due to climate changes and past land management practices. This overall increase in acres burned translates to a corresponding increase in the acres of spotted owl habitat lost to fire. While the risk of habitat loss to wildfire varies by location, the Recovery Plan emphasized that the Klamath region is one of the main areas at risk:
  - “fire-prone provinces (including) California Klamath scored high on threats from ongoing habitat loss as a result of wildfire and the effects of fire exclusion on vegetation change.”
- “In view of the increasing risk posed to northern spotted owl habitat by wildland fire in the dry forests of the California Klamath Province, the Recovery Plan calls for management actions that result in forests that are more fire resilient and fire-resistant.”

The SRNF is within the Moist Forest zone of the spotted owl’s range as delineated in the Recovery Plan. However, the area’s dry, hot summers and extreme departure from its historic fire return interval mean that owl habitat within many areas of the Forest is at risk of being lost to, or significantly degraded by, severe fire. The 1999 Megram Fire (120,000 acres), 2002 Biscuit Fire (500,000 acres), the 2008 Lightning Complex (45,000), the 2013 Butler (14,600 acres), the 2013 Coral fire (12,500 acres), the 2015 lightning fires (100,000 acres forest-wide), the 2017 lightning fires (54,387 acres forest-wide) and many other, smaller fires all removed suitable NSO habitat on the Six Rivers, and demonstrates that the fire risk on the Forest is genuine. Active management to reduce the fire hazard and increase resilience, as well as to accelerate the development of higher quality NSO habitat, should contribute to the spotted owl’s persistence and recovery. Such long-term protection of owl habitat is consistent with the recommendations in Forsman (2011) as well as the Recovery Plan and 2012 Revised NSO Critical Habitat Rule.

Impacts to Pacific Northwest forests from wildfire appear to be increasing along with fire occurrence, size, and intensity. Although some researchers disagree on the magnitude of these changes and what to do about them (e.g., Hanson et al. 2009, Baker 2012), most researchers believe, as does the USFWS (USDI
Chapter 3. Environmental Consequences


**Northern Spotted Owl Habitat**

**Nesting/Roosting**
The average home range of the NSO is 3,398 acres in this portion of its range, which equates to a circle with a 1.3-mile radius from the center of the territory or AC. Research indicates that the most activity within a territory occurs within 0.5 miles of the nest tree. Northern spotted owl territories with at least 400 acres of suitable nesting/roosting/foraging habitat within 0.5 miles and 1,336 acres within 1.3 miles of the nest tree are generally thought to have a higher chance of occupation.

Suitable NSO nesting/roosting habitat, as defined by the Forest Service, is comprised of mature timbered stands having multi-layered conditions, an average canopy closure of 60 percent or greater (both conifers and hardwoods) and obvious decadence. The overstory should be comprised of conifer trees 21 inches or greater dbh. Conifer canopy closure should be 40 percent or greater. This habitat is used primarily for nesting/roosting. This definition shows its accuracy when compared to the actual nest locations on the SRNF where it is the predominant type used by nesting spotted owls.

Nests are usually in snag cavities or broken tops of large trees in mature/old-growth forest. Daytime roost sites in northern California are in dense, multi-layered canopy forests, and average 550 feet from water.

**Foraging**
Northern spotted owl forage in forested habitats with hunting perches and a stand structure that allows for flight in the understory and access to prey. The 1st 48 Project area includes a variety of habitats that provide the NSO with foraging opportunities.

In 2009, the USFWS Yreka office in northern California, prepared an unpublished white paper titled “Regulatory and Scientific Basis for US Fish and Wildlife Service Guidance for Evaluation of Take for Northern Spotted Owls on Private Timberlands in California’s Northern Interior Region”. In the paper, the USFWS stated, “The USFWS has conducted a thorough review and synthesis of published literature, unpublished data sets, and direct communication with NSO researchers in support of a rigorous process for evaluating the effects of habitat management on NSO.” The paper included information on the NSO across California with research specific to the SRNF.

In the white paper, the USFWS acknowledged that

- “Habitats used by NSO are highly variable, particularly in the diverse conifer-hardwood forests of the Klamath Province.”
- “Spotted owls also forage within intermediate (younger and/or more open) forest classes. One study (Zabel et al. 2003) found a positive association between NSO in the Klamath Province and moderate amounts of intermediate forest at the core area scale. This habitat class was based on conditions known to be used by foraging NSO.”
Foraging habitat encompasses nesting and roosting habitat but includes a broader range of structure and might not support successful nesting by NSO (Gutiérrez 1996, USFWS 2008). Foraging NSO generally use older, denser, and more complex forest than expected based on its availability, but they also use younger forest (Solis and Gutiérrez 1990, Carey et al. 1992, Zabel et al. 1993, Carey and Peeler 1995, Anthony and Wagner 1999, Irwin et al. 2007b).

Foraging habitat encompasses a broad range of structure, and low-quality foraging habitat includes younger and more open habitats that may be important for prey production.

Based on the extensive research review conducted, the USFWS went on to define “infrequently-used”, low-quality foraging habitat as having a minimum of 40 percent canopy cover and 11-inch dbh conifer trees. In the 2012 Critical Habitat Rule, the USFWS acknowledged that “Compared to other zones, (in the Klamath and Northern California Interior Coast Ranges) additional foraging habitat for this zone showed greater divergence from nesting habitat, with much lower canopy cover and tree size.”

In the NSO Recovery Plan, the USFWS stated, “Because the characteristics of the stands or patches targeted by this recovery action vary widely across the range of the species, the Service believes implementation and/or mapping of this recovery action is best left to interagency teams with localized expertise.”

As stated in the white paper (USFWS 2009) “Determination of the amount of suitable habitat that must be retained in order to avoid incidental take of NSO is strongly influenced by the range of forest conditions that are classified as suitable habitat.” Narrowly defining what constitutes suitable habitat can severely underestimate impacts to the NSO. The SRNF/USFWS Arcata office Level 1 Team conservatively and broadly defines low-quality habitat as having a minimum of 40 percent canopy cover and 11-inch dbh conifer trees.

Under the Proposed Action, the 1st 48 Project would treat 113 acres of moderate-quality nesting/roosting habitat, 208 acres of low-quality nesting/roosting habitat and 148 acres of moderate-quality foraging habitat, and 175 acres of low-quality foraging habitat. The 321 acres of nesting/roosting habitat and 323 acres of foraging habitat would be modified through the creation of a shaded fuelbreak and hazard fuel reduction (HFR) treatments.

**Prey Species**

In this area of the NSO’s range (below about 4,100 feet in southern Oregon and northern California), dusky-footed woodrats (*Neotoma fuscipes*), are the most important prey species of spotted owls, both in frequency and biomass (Forsman 1975, Barrows 1980, Solis 1983, Forsman et al. 1984, Ward 1990, Carey et al. 1992, Zabel et al. 1995, White 1996, Ward et al. 1998 Forsman et al. 2004 and Hansen and Mazurek 2010).

In a study conducted on the SRNF, Sakai and Noon (1993) found the highest abundance of woodrats occurred in 15- to 30-year-old plantations resulting from past clearcut timber harvest. The study used radio telemetry to track the movement of woodrats and found that although the woodrats inhabited younger stands, woodrats would often cross distinct ecotonal boundaries between forest types. Woodrats tracked during evening telemetry sessions made intermittent, short distance movements into adjacent old-growth forests occupied by spotted owls. A substantial number of radio tagged woodrats were killed by predators, with carcasses most often found in adjacent old forest. This is presumably because these younger, dense plantations are difficult if not impossible for the owl to forage in and must wait until the prey leave these refugia to be preyed upon.
Ward et al. (1998) found that owls foraged along late-seral forest edges where dusky-footed woodrats were more abundant. Woodrats living in or dispersing from adjacent shrub lands may be more available for owls hunting along the ecotonal edges between habitat types. Edge or transitional habitats appear to be more important to foraging spotted owls when woodrats dominate the diet (Zabel et al. 1995, Ward et al. 1998). Edges may provide cover to conceal owls from predators while making them inconspicuous to woodrats.

These results suggest that the infrequent use of younger stands by foraging spotted owls is not due to low abundance of prey. Simply increasing prey densities within a stand may not result in an increase in prey available to spotted owls if their foraging efficiency is low in these stands (Noon et al. 1994). High tree densities and homogeneous canopies in second-growth forests may reduce flight maneuverability and the ability of owls to capture prey (Rosenberg and Anthony 1992). However, silvicultural procedures that maintain or enhance woodrat populations adjacent to spotted owl habitat may benefit spotted owls (Sakai and Noon 1993, Irwin et al. 2007).

Stands occupied by woodrats gradually decline in suitability. Data from Sakai and Noon (1993) suggest that this occurs when the dominant trees (usually Douglas-fir) begin to over top and eventually suppress the low-to-mid-canopy level vegetation (<3 to 6 meters). In the inland forests of northwestern California, the decline in habitat quality occurs in regenerating stands at about 40 to 50 years after harvest. To enhance dusky-footed woodrat populations, Sakai and Noon proposed retaining brush patches during precommercial thinning and creating brush patches in younger stands. The existence of shrub fields or younger stands adjacent to older forest may increase the availability of woodrats to spotted owls that exploit prey from a variety of habitats but spend the majority of their time hunting in late seral stage forests (Sakai and Noon 1993).

The northern flying squirrel (Glaucomys sabrinus) is a smaller component of the biomass collected by the spotted owl in this portion of the province. In northwestern California, flying squirrels constitute only 9.3 percent of the biomass of NSO diet, while dusky-footed woodrats constitute 70.9 percent of the biomass of NSO diet (Ward et al. 1998).

Forsman et al. (1984) described potential negative impacts to flying squirrels through the timber harvest; however the conditions described by Forsman occurred in heavily thinned mature and old growth stands. No high-quality nesting/roosting habitat is being treated under the 1st 48 Project. Thinning might also affect flying squirrels through reduction or development of other important resources, such as shrubs, hardwoods, arboreal lichens, or deformed trees and snags (Williams et al. 1992, Carey 1995). The 1st 48 Project would protect these important habitat components. Hansen and Mazurek (2010) found “mixed” results in relation to the flying squirrel, with some studies showing no effect at all from thinned forests compared to unharvested stands.

**Northern Spotted Owl Status within the Project Area**

There are eight (8) identified NSO ACs located within the project area. The project area is 32,892 acres in size, with 12,777 acres of NSO nesting/roosting habitat and 8,069 acres of foraging habitat. Three of the ACs home ranges (1.3 miles) extend beyond the project area. An action area has been defined that addresses the entire home ranges of the three (3) NSO territories that extend beyond the project area. The action area is 36,267 acres. There are 13,686 acres of NSO nesting/roosting habitat and 8,648 of foraging habitat in the action area.

There are also four (4) additional ACs outside of the project area whose home ranges overlap the project area (ACs 238, 250, 274, and 388); however, no treatments would occur in the territories. These ACs were not addressed any further.
Nesting/roosting habitat was originally determined through use of current geospatial data. Field verification of this data was conducted by wildlife biologists. All high-quality habitat was dropped from treatment.

Northern spotted owl protocol surveys were conducted, using the 2012 USFWS protocol, in all suitable habitats for the 1st 48 Project in 2017, with the second year of surveys scheduled for 2018. In addition, NSO surveys were conducted within the planning area in the early and mid-1990s. There are three 100-acre LSRs located in association with ACs 290, 239 and 236; however, the LSR does coincide with the actual nest grove (which is based on the owl’s location) for the AC. Therefore, no treatment would occur within these 100-acre LSRs.

Northern Spotted Owl Critical Habitat

Critical habitat consists of those areas that have “physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection” 16 USC §1532(5)(A). These physical or biological features are referred to as the “primary constituent elements” (PCE) associated with the terrestrial environment that support nesting, roosting, and other normal behaviors are essential to the conservation of the NSO. The PCEs of NSO CHU (Critical Habitat unit) are coniferous forest types that support the NSO in nesting/roosting, foraging, and dispersal habitat.

Approximately 28,413 acres of the action area occurs within the Unit 11, Interior California Coast Subunits 1 and 2 of the 2012 NSO Critical Habitat. Under the Proposed Action, there are 12 units to be treated for hazardous fuel reduction (152 acres), 4 units of oak woodland restoration (37 acres), 8 units of plantation thins (108 acres) and 65 units (530 acres) of fuelbreak construction that would occur in NSO CHU. A total of 823 acres would be treated in CHU, 39 acres would be treated in ICCS 1 and 784 acres would be treated in ICCS 2. A total of 786 acres of NSO nesting/roosting/foraging/dispersal habitat and 37 acres non-habitat would be treated between the two subunits of CHU. In the Interior California Coast subunit 1, fuelbreak construction would occur in 39 acres of low-quality foraging habitat. In the Interior California Coast Subunit 2, hazardous fuel reduction would occur in 49 acres of low-quality nesting/roosting habitat, 28 acres of moderate-quality nesting/roosting habitat, 12 acres of moderate-quality foraging habitat, 41 acres of low-quality foraging habitat, and 37 acres of dispersal-only habitat. Oak woodland maintenance would occur on approximately 34 acres of dispersal-only habitat. Plantation thins would occur on and 108 acres of dispersal-only habitat. Fuelbreak construction would occur in approximately 85 acres of moderate-quality nesting/roosting habitat, 159 acres of low-quality nesting/roosting habitat, 136 acres of moderate-quality foraging habitat, and 95 acres of low-quality foraging habitat.

The 2012 CHU Rule states:

“We encourage land managers to consider implementation of forest management practices recommended in the Revised Recovery Plan to restore natural ecological processes where they have been disrupted or suppressed (e.g., natural fire regimes), and application of ecological forestry management practices (e.g., Gustafsson et al. 2012, entire; Franklin et al. 2007, entire; Kuuluvian and Grenfell et al. 2012 entire) within critical habitat to reduce the potential for adverse impacts associated with commercial timber harvest when such harvest is planned within or adjacent to critical habitat. In sum, the Service encourages land managers to consider the conservation of existing high-quality northern spotted owl habitat, the restoration of forest ecosystem health, and the ecological forestry management practices recommended in the Revised Recovery Plan that are compatible with both the goals of northern spotted owl recovery and Standards and Guidelines of the NWFP.”
Nesting/Roosting and Foraging Habitat

Initial potential treatment units were selected by a silviculturist from a vegetative database and then field verified as to stand density and structure. Field verification to determine potential habitat status was completed by a wildlife biologist. All stands classified as high-quality habitat was excluded from treatment. Mid-mature stands with predominant trees were ground verified as to whether they contained stand structure characteristics that would be classified as high-quality nesting/roosting habitat. All high-quality nesting/roosting habitat stands (those in mid-mature stands with mature forest characteristics, late mature, and old growth) were dropped from treatment.

Direct and Indirect Effects: The following discussions group direct and indirect effects into two primary categories, nesting/roosting and foraging habitat. Within each broad habitat category, effects would be grouped into direct habitat removal and habitat maintenance, as well as impacts to ACs. Disclosing impacts by individual AC can be misleading because the same acre treated may be reported more than once due to an overlap of ACs.

The USFWS defines “habitat maintenance” as a reduction in stand density, but the current habitat function would be maintained immediately post project with the purpose of improving habitat quality over time. “Removal” occurs when the habitat no longer functions as nesting/roosting or foraging habitat (e.g., clear cutting). Habitat maintenance treatments are treatments designed to maintain and enhance habitat. A “downgrade” is taking a higher habitat quality down to a lower habitat type, such as removing too much canopy and making a nesting/roosting stand only suitable as foraging habitat.

No habitat removal or downgrading would occur under the 1st 48 Project except for landing construction. Twenty new landings would be constructed for the project. Twelve landings, up to approximately 0.25 acres in size would be constructed in nesting/roosting/foraging habitat for a total of five (5) acres, three (3) acres of low-quality foraging habitat and two (2) acres of low-quality nesting/roosting habitat, negligible amounts of habitat reduction in any one area. The majority of landings that would be used for this project are existing openings that would only need minor expansion and brushing for safe operations; therefore, five (5) acres of nesting/roosting/foraging habitat removed is an overestimate.

Anchor points above landings/unit would be needed for safety support of cable logging systems. Anchor points include 18- to 20-inch trees, sound snags, or heavy equipment parked above the landing. Landings used for the project would be decommissioned following project activities. In addition, a small number of trees may be removed along cable lines, in association with skyline landings within the unit boundaries, for safety reasons.

Forest Service Road 2S54 within the planning area would be decommissioned. The road is 1.95-miles long and decommissioning it would reduce fragmentation and disturbance, so would be beneficial in the long term. No new roads would be constructed within the project.

The USFWS has determined minimum habitat thresholds, or the minimum amount of nesting/roosting habitat) and foraging habitat, that must be maintained in a territory within a specific distance from the core area of use in order for an NSO pair to persist at the site. Habitat removal or downgrading that reduces habitat below this minimum threshold may be considered “take” under the Endangered Species Act (ESA). Habitat removal that did not reduce the amount of habitat below this threshold was not considered take, although the impacts could still be considered adverse. For example, depending on the location (spatial relationship of proposed treatment areas to existing habitat), amount treated, and intensity of the treatment, actions that modify habitat but maintain habitat functionality without any habitat removal could still have adverse impacts on the owl if a territory was already below the “take”
threshold. The Level 1 Team developed the Project Scope and Intensity Analysis (PSIA), a series of questions that guide the biologist through an analysis of potential effects for each owl AC within the planning area. The PSIA was conducted that evaluated all eight (8) NSO ACs within the analysis area which addressed each AC for the current amount of nesting/roosting/foraging habitat in relation to the threshold, the amount and location of proposed treatments, and the percentage of nesting/roosting/foraging habitat affected. The results of the PSIA were used to further modify the treatments in order to ensure that no adverse effects would occur and that restoration activities would benefit the NSO.

The stands selected for treatment minimally met the definition of suitable nesting/roosting/foraging habitat, but have a lower likelihood contributing to survivorship or reproduction. The stands had one or more features of suitable habitat, but lacked other important characteristics that reduce their likelihood of occupancy or use. For example, a stand may have adequate average tree size and canopy cover, but may be even-aged and lack large (potential nest) trees or multi-layered canopy conditions. The 1st 48 Project was designed to maintain current characteristics of nesting/roosting and foraging habitat but, more importantly, to create the habitat characteristics that are currently lacking.

The oak woodland treatments would restore black and white oak areas that are being encroached upon by dense brush and Douglas-fir saplings. None of the oak woodland treatments occur in suitable NSO nesting/roosting/foraging habitat.

The 1st 48 Project would treat 113 acres of moderate-quality nesting/roosting habitat, 208 acres low-quality nesting/roosting habitat and 175 acres of low-quality foraging habitat and 148 acres moderate-quality foraging habitat. The 321 acres of nesting/roosting habitat and 323 acres of foraging habitat would be modified through the creation of a shaded fuelbreak and HFR treatments. The remaining acres are considered non-habitat for spotted owls and are primarily fuels treatments within hazardous fuels stands within the fire scar of the Ruth Fire.

There are 13,686 acres of nesting/roosting habitat and 8,648 of foraging habitat in the action area. It is expected that current habitat function would be maintained in all treatment areas immediately post-project (as was seen in the post-treatment Level 1 Team review of other SRNF habitat restoration projects); however, approximately 97 percent of the nesting/roosting/foraging habitat in the action area would not have any treatment. Therefore, “adequate alternative habitat” as suggested by Forsman (2011) is being left untreated.

Approximately 85 acres of moderate-quality nesting/roosting habitat, 159 acres of low-quality nesting/roosting habitat and approximately 136 of moderate foraging habitat and 134 acres of low-quality foraging habitat would be thinned for the construction of the shaded fuelbreak. Approximately 28 acres of moderate-quality and 49 acres of low-quality nesting/roosting and 12 acres of moderate-quality and 41 acres of low-quality foraging will be treated through hazardous fuels reduction. The 1st 48 Project is a low-intensity TFB that would not remove any predominant or dominant trees and canopy closure would be maintained at 60 percent or greater in all nesting/roosting/foraging habitat. No treatments would occur in spotted owl nest groves or high-quality nesting/roosting habitat. Adequate alternative habitat (98% nesting/roosting/foraging habitat untreated) exists in the action area.

This project has protected all high-quality habitat, all spotted owl territories (not just high priority sites, RA 10) and is designed to restore and accelerate important habitat characteristic for the spotted owl (RA 6) and protect existing suitable habitat from stand replacing fire. Such long-term restoration and protection of owl habitat is consistent with the recommendations in the Recovery Plan. This project and
the type of habitat proposed for treatment meets the recommendations of and are consistent with the 2012 CHU (and Recovery Plan).

**Nesting/Roosting Habitat – Nesting/roosting Habitat Removal:** The only treatments that would remove habitat would be the construction of landings. Twenty new landings would be constructed, and twelve would occur in low-quality nesting/roosting/foraging habitat. Each landing would be up to 0.25 acres in size. A total of approximately two (2) acres of low-quality nesting/roosting habitat and three (3) acres of foraging habitat would be removed through new landing construction. Removal of habitat for landings is limited to small areas and is considered insignificant because after treatment they would be decommissioned and would resemble small forest openings. Small openings can be beneficial in stands lacking structural diversity to “maximize individual tree development, encourage some understory vegetation development, and encourage the initiation of structural diversity” (Interagency Regional Ecosystem Office memorandum 1996). Often the canopy above the landing still falls within the 60 percent retention thresholds, but is considered removed to evaluate the full potential of affects to any given AC.

Twelve out of the total 20 new landings occur within an AC. Eight (8) of these landing occur in non-habitat. All landings would occur within the outer 1.3-mile radius of the affected ACs. The maximum amount of nesting/roosting habitat that would be removed in any one AC is 1.75 acres, 0.25 acres in any one area. Total removal by new landing construction would be two (2) acres of the 13,686 acres of nesting/roosting habitat in the action area. The loss of habitat in any one area would be negligible and would resemble natural assemblages and small forest openings.

**Nesting/Roosting Habitat Maintenance:** The 1st 48 Project would treat 113 acres of moderate-quality nesting/roosting habitat and 208 acres low-quality nesting/roosting habitat. Of the 321 acres of nesting/roosting habitat being treated, 85 acres of moderate-quality nesting/roosting habitat and 159 acres of low-quality nesting/roosting habitat would be modified through the creation of a shaded fuelbreak and 28 acres of moderate-quality nesting/roosting habitat and 49 acres of low-quality nesting/roosting habitat would be modified through hazardous fuel reduction.

The total acreage for fuelbreak construction units is 530 acres; 85 acres of that is considered moderate-quality nesting/roosting habitat and 159 acres of low-quality nesting/roosting habitat. No high-quality nesting/roosting habitat would be treated within the 1st 48 Project. Since sections of this area of fuelbreak occur in younger stands, 321 acres overestimates the amount of nesting/roosting habitat being treated.

Thin from below would reduce the stand density of trees to improve growth, enhance stand health, and reduce potential tree mortality. Thin from below while maintaining a minimum of 60 percent or greater canopy cover is the best management prescription to maintain and recruit the habitat variables critical to nesting/roosting habitat (e.g., large old trees and codominant and intermediate conifers with crown space in the canopy for crown development) while at the same time improving forest health and reducing risk to wildfire and insects and disease. Removal of the codominant trees would only occur when stem densities needs reduced for proper heath of another adjacent codominant tree or when culturing around resident black oak trees.

The stands within nesting/roosting habitat proposed for treatment are generally even-aged and lack the horizontal and vertical diversity components associated with late-mature stands. These stands have the potential to achieve rapid diameter and height growth with thinning. As these stands develop, the acres suitable for spotted owls and other late-successional associated species should increase. By treating currently unsuitable habitat adjacent to existing late-successional habitat, larger patches would develop. Silvicultural prescriptions can be applied to these stands in order to accelerate their development toward
late seral conditions. These treatments can increase the amount of late seral vegetation quicker than would occur naturally. Treatments would change the stand structure and allow large trees to develop, promote development of an understory canopy, accelerating the development of functional late-successional habitat. Silvicultural prescriptions developed for the 1st 48 Project would ensure retention of existing stand structure, species composition, snags, and downed logs.

Thinning and fuels reduction activities may have a short-term reduction of stand density in suitable NSO nesting/roosting habitat; however, the habitat would remain suitable post project. Canopy closure would be maintained at 60 percent or greater in nesting/roosting habitat, no predominant or dominant trees would be removed and large snags and downed wood would be maintained at the 80 to 100 percent level. All high-quality nesting/roosting habitat was excluded from thinning. Selected stands for thinning are considered low to moderate quality, with the potential to be improved through treatment.

The HFR prescriptions would treat 28 acres of moderate-quality nesting/roosting habitat and 49 acres of low-quality nesting/roosting habitat; however, all existing important habitat characteristics for nesting would be maintained and the stands would still function as nesting/roosting immediately post-project.

Of the 13,686 acres of nesting/roosting habitat within the action area, approximately 113 acres of moderate-quality nesting/roosting habitat and 208 acres of low-quality nesting/roosting habitat would be treated though both shaded fuelbreak and hazardous fuel reduction. The amount of nesting/roosting habitat within the planning area proposed for treatment would be approximately 2 percent (98% nesting/roosting in the action area would not receive any treatment).

Strategically located fuelbreaks would reduce the risk of human-caused fire ignitions along high-use forest and county roads and provide greater protection to existing late-successional habitat in the 1st 48 Project area. Fuel reduction treatments are designed to protect existing habitat characteristics while reducing ground and ladder fuels and creating a defensible space to be used in defense of wildfires. Treatments include thinning existing stands to retain the best, healthiest trees that have a high canopy capacity (those with the strongest crown to bole ratio, have the highest needle or leaf cover and provide the most shade to the forest floor), capable of maintaining those objectives for a long period of time within the buffer area. All predominant and dominant trees would be retained, while removing suppressed, intermediate, and some codominant trees (under specific conditions), and large snags and downed wood would be maintained at the 80 to 100 percent level. Cut material in nesting/roosting habitat would be would be lop and scattered or handpiled and burned. The habitat would remain suitable immediately post project.

The thinning units would be hand piled and burned with some units having a follow-up understory burn. Of the 321 acres of nesting/roosting habitat to be thinned, approximately 321 acres may be jackpot burned, if conditions are within the required limits to maintain a low-intensity burn. Understory burning may also be used within fuelbreaks, including 321 acres of nesting/roosting habitat. The primary objective of understory burning is to reduce ground fuels within fuelbreaks. Once the initial treatment has been completed, maintenance burns or treatments would be implemented every 5 to 15 years or as need is determined. Because of its low intensity, the burn is not uniform in nature creating a mosaic pattern within the stand. Effects of jackpot burning would be limited because of this patchiness leaving interspaces of unburned forest floor. Foraging habitat would be modified as some understory shrubs and some small saplings would be killed and some smaller downed logs would be consumed from the burning in portions of the stand; however, current habitat function would be maintained.
Chapter 3. Environmental Consequences

Understory burning is expected to reduce the quantity of downed woody material to various degrees regardless of the season of burning; however, snag and log numbers would be maintained at levels designated in the SRNF LRMP. Generally, the wetter the conditions during the burn, the less the impact would be to the surrounding habitat components. Understory burning is designed to produce the least damage to the boles of the trees in the unit and to prevent fire from getting into the crowns of the overstory. Tree mortality would be minimal and mainly in the smaller size classes. In some cases, lines would be scratched around snags and existing downed wood.

Fuels treatments are not intended to homogenize habitats. Understory burning would occur under specific weather and moisture conditions designed to minimize damage to the residual stand, maintain snags and large down logs, and maintain about 50 percent of the duff layer (USFS Region 5 Soil Quality S&Gs). Dead and down materials are usually of large enough diameters that the logs are not burned completely and continue to provide key habitat features, such as refugia and escape cover. Fuel moistures and humidity are monitored to assure that the prescriptions are met. Burn prescriptions are designed to prevent severe burn levels.

**Nesting/Roosting Habitat Summary:** Thinning and fuels reduction activities may modify nesting/roosting habitat through a short-term reduction of stand density; however, the habitat would remain suitable post project. Canopy closure would be maintained at 60 percent or greater, no predominant or dominant trees would be removed and large snags and downed wood would be maintained at the 80 to 100 percent level. Selected stands for thinning are considered low to moderate-quality habitat, with the potential to be improved through treatment. Treatments would be beneficial in the long term by creating stand conditions that accelerate the development of higher quality habitat in a shorter timeframe than would occur without treatment. This restoration and maintenance of habitat would aid in bringing these stands along in a manner consistent with pre-fire suppression era growth.

No activities would occur in high-quality nesting/roosting habitat or in 100-plus-acre nest groves of any AC, and no activities would occur within 0.25 mile of any AC during the breeding season.

**Foraging Habitat**

Foraging habitat generally has attributes similar to that of nesting/roosting habitat, however does not contain the structural characteristics necessary to support successfully nesting pairs. The foraging habitat selected for treatment in the 1st 48 Project is lacking diversity of species and sizes as well as structural components such as multi-layered conditions, snags, downed wood and decadent structures such as large limbs, broken tops, and cavities.

There are 8,648 acres of foraging habitat in the action area. The 1st 48 Project would treat 175 acres of low-quality foraging habitat and 148 acres moderate-quality foraging habitat. Of the 323 acres of foraging habitat being treated, 134 acres of low-quality foraging habitat and 136 acres of moderate-quality foraging habitat would be modified through the creation of a shaded fuelbreak and 41 acres of low-quality foraging habitat and 12 acres moderate-quality foraging habitat would be modified through hazardous fuel reduction. The prescriptions would maintain 60 percent canopy cover and would remain suitable foraging habitat immediately post project. Approximately 4 percent of the foraging habitat in the action area would receive treatment leaving 96 percent of the foraging-only habitat in the action area untreated.

Northern spotted owl will also forage in nesting/roosting habitat. There are 13,686 acres of nesting/roosting habitat and 8,648 of foraging habitat in the action area. It is expected that current habitat function would be maintained in all treatment areas immediately post-project (as was seen in the post-treatment Level 1 Team review of the Beaverslide Project on the Mad River RD treated in 2012, which
implemented similar prescriptions); however, approximately 97 percent of the nesting/roosting/foraging habitat in the action area would not have any treatment. Therefore, “adequate alternative habitat” as suggested by Forsman (2011) is being left untreated. The project would develop functional habitat that is currently lacking in the stands.

Foraging Habitat Removal: The only treatments that would remove habitat would be the construction of landings. Twenty new landings would be constructed, twelve of which are in low-quality nesting/roosting foraging habitat. Each landing would be up to 0.25 acres in size. A total of approximately two (2) acres of low-quality nesting/roosting habitat and 3 acres of foraging habitat would be removed through new landing construction. Removal of habitat for landings is limited to small areas and is considered insignificant because after treatment they would be decommissioned and would resemble small forest openings. Small openings can be beneficial in stands lacking structural diversity to “maximize individual tree development, encourage some understory vegetation development, and encourage the initiation of structural diversity” (Interagency REO memorandum 1996). Often the canopy above the roads still falls within the 40 percent retention thresholds, but is considered removed to evaluate the full potential of affects to any given AC.

The majority of landings that would be used for this project are existing openings that would only need minor expansion and brushing for safe operations; therefore, five (5) acres of nesting/roosting/foraging habitat removed is an overestimate. A small number of trees may be removed along cable lines, in association with skyline landings within the unit boundaries, for safety reasons.

Twelve out of the 20 new landings occur within an AC. Eight (8) of these landing occur in non-habitat. All landings would occur within the outer 1.3-mile radius of the affected ACs. The maximum amount of foraging habitat that would be removed in any one AC is 1 acre, 0.25 acre in any one area. Total removal by new landing construction would be 3 acres of the 8,648 acres of foraging-only habitat in the action area. The loss of habitat in any one area would be negligible and would resemble natural assemblages and small forest openings.

The removal of these small patches (0.25 or less in any one area) of low-quality foraging habitat (totaling 3 acres) would allow the shaded fuelbreak treatment of 175 acres of other low-quality stands of foraging habitat. In the long term, this would improve the stands that are currently not providing adequate habitat conditions due to high tree density and lack of structural diversity. In the short term, these small openings may be utilized by the owls for foraging (North et al. 1999, Carey 1995).

Foraging Habitat Maintenance – Shaded Fuelbreak Construction and Plantation Thinning: Approximately 134 acres of low-quality foraging and 136 moderate-quality foraging habitat would be thinned for fuelbreak construction. Fuelbreaks would be created along high-use roads to assist in firefighting efforts and to protect existing nesting/roosting/foraging habitat within NSO territories from human caused fires. These prescriptions are designed to reduce ground fuels and the lower understory vegetation that create ladders for fire to climb into the canopy. Although multi-layered conditions contributing to foraging habitat would be slightly reduced by removing brush and understory trees, treatments would result in a greater assurance of long-term maintenance of suitable foraging habitat within the project area and reduce the risk that existing habitat would be lost due to fire.

Plantation thin treatments would occur in even-aged young stands that are in early seral stages of development. These stands of plantations lack the structure needed to be considered for NSO habitat, such as multiple canopy layers and structure within the stand. The project includes 108 acres of plantation thinning of mechanical TFB (60-plus percent crown closure) with 15 to 24 foot inter-tree crown spacing)
in 30 to 45 year old, even-age plantations to promote the development of shaded fuelbreak overstory, along with mechanical, manual and jackpot burning.

Individual trees with high potential for rapid growth would be widely spaced to accelerate diameter and height growth with the expectation of achieving vertical diversity. These trees are also expected to develop wide crowns and large limbs. No predominant trees would be removed. Existing snags (20-inch dbh or greater) and downed logs (20-inch diameter or greater and 10-feet long) would be maintained unless they pose a safety hazard or reduce the effectiveness of the shaded fuelbreaks.

The low-quality foraging habitat and moderate-quality foraging habitat stands selected for treatment minimally met the definition of foraging habitat, but have a lower likelihood contributing to survivorship or reproduction. The stands have the tree diameter size and canopy cover of suitable habitat, but lack other important characteristics (such as multi-layered conditions that provide for prey species) that reduce their likelihood of use. Treatments were designed to accelerate the development of important habitat components currently lacking in the stands while retaining the existing structural elements, resulting in high restoration benefits. The project would improve habitat conditions and restore high-quality habitat for the spotted owl. Canopy closure would be reduced in the short-term, but would be maintained at a minimum of 60 percent. Foraging habitat would remain suitable immediately post project. In the long-term, the treatments should improve habitat conditions by accelerating the development of stand attributes important to the NSO (e.g., multi-storied stands and large-diameter trees with large crowns) and contribute to the recovery of the species.

In the plantations and dense, overstocked, early-mature stands (not currently suitable foraging habitat to very low-quality habitat) the benefit to the owl would be immediate. The treatments proposed would reduce the overstocked stems and ladder fuels that currently create a “safe haven” for woodrats since the owls cannot effectively forage in these dense stands. Treatments of these stands would create more acres of habitat on the landscape, helping reduce competitions between the spotted and barred owls for the same habitats.

The stands proposed for treatment are generally even-aged and lack the horizontal and vertical diversity components associated with late-mature stands. These young stands have the potential to achieve rapid diameter and height growth with commercial thinning. As these stands develop, the acres suitable for spotted owls and other late-successional associated species should increase. By treating currently unsuitable habitat adjacent to existing late-successional habitat, larger patches would develop. Silvicultural prescriptions can be applied to these stands in order to accelerate their development toward late seral conditions. These treatments can increase the amount of late seral vegetation quicker than would occur naturally. Treatments would change the stand structure and allow large trees to develop, promote development of an understory canopy, accelerating the development of functional late-successional habitat. Silvicultural prescriptions designed for the 1st 48 Project would ensure retention of existing stand structure, species composition, snags, and downed logs.

Thinning in currently low-quality foraging habitat is the best prescription to maintain and recruit the habitat variables critical to NSO high-quality foraging and nesting/roosting habitat. Treatments would have a positive impact on NSO foraging habitat since stand growth would be accelerated resulting in older seral stages earlier than if left unthinned. Reducing tree density within foraging habitat would improve the owl’s ability to forage within the stands as well as improve forest health and reduced fire risk. Thinning provides more sunlight to the forest floor for plant species used as food by key spotted owl prey species. Existing structural conditions would be maintained in order to support prey occurrence and abundance while
allowing for rapid development of additional habitat parameters such as low shrub and forb growth. Current low-quality foraging habitat could develop into higher quality, more productive foraging habitat and even nesting/roosting habitat over time with the accelerated development of late successional characteristics (multi-layered conditions and large diameter trees with cavities and large limbs).

**Fuels Reduction Treatments:** Approximately 41 acres of low-quality and 12 acres of moderate-quality foraging habitat would be modified through fuels reduction treatments. Fuels treatment would occur on 152 acres of strategic roadside and ridgetop units. These fuels treatments would reduce fuel loadings in order to create a defensible space for fire suppression resources, decrease the potential for detrimental wildfire effects to the overall project area adjacent to the community of Ruth, and enhance the treated stands resiliency to fire.

The HFR treatment areas are typically dominated by dead standing trees created by the 2011 Ruth Fire and areas of brush such as manzanita, where sufficient live overstory does not exist for the development of a shaded fuelbreak.

The thinning units would be hand piled and burned with some units having a follow-up jackpot burn. Of the 323 acres of low-quality foraging habitat to be thinned, approximately 300 acres may be jackpot burned if conditions are within the required limits to maintain a low-intensity burn. Jackpot burning may also be used within fuelbreaks, including 175 acres of foraging habitat. The primary objective of jackpot burning is to reduce ground fuels within fuelbreaks. Once the initial treatment has been completed, maintenance burns or treatments would be implemented every 5 to 15 years or as need is determined. Because of its low intensity, the burn is not uniform in nature creating a mosaic pattern within the stand. Effects of jackpot burning would be limited because of this patchiness leaving interspaces of unburned forest floor. Foraging habitat would be modified as some understory shrubs and some small saplings would be killed and some smaller downed logs would be consumed from the burning in portions of the stand; however, current habitat function would be maintained. The results would be a more complex understory and forest floor that would benefit key prey species for the spotted owl such as the dusky-footed woodrat, while breaking up the continuity of the fuels in the understory to reduce flame length and spread of wildfire.

Jackpot burning is expected to reduce the quantity of downed woody material to various degrees regardless of the season of burning; however, snag and log numbers would be maintained at levels designated in the Six Rivers LRMP. Generally, the wetter the conditions during the burn, the less the impact would be to the surrounding habitat components. Jackpot burning is designed to produce the least damage to the boles of the trees in the unit and to prevent fire from getting into the crowns of the overstory. Tree mortality would be minimal and mainly in the smaller size classes. In some cases, lines would be scratched around snags and existing downed wood.

Fuels treatments are not intended to homogenize habitats. Jackpot burning would occur under specific weather and moisture conditions designed to minimize damage to the residual stand, maintain snags and large down logs, and maintain about 50 percent of the duff layer (USFS Region 5 Soil Quality S&Gs). Dead and down materials are usually of large enough diameters that the logs are not burned completely and continue to provide key habitat features, such as refugia and escape cover. Fuel moistures and humidity are monitored to assure that the prescriptions are met. Burn prescriptions are designed to prevent severe burn levels.

Burning could reduce prey species habitat temporarily in the immediate area, but is expected to be short-term leading to an overall increase of post-treatment prey habitat. In addition, owls are known to forage
within the burned areas once the understory vegetation begins to grow again (USDA Forest Service 1985, Clark 2007, Bond 2009). Fuels reduction along high-use roads is expected to result in the protection and long-term maintenance of adjacent late-successional habitat by creating more fire resilient and fire-resistant forests.

**Foraging Habitat Summary:** Thinning and fuels reduction activities may modify foraging habitat through a short-term reduction of stand density; however, the habitat would remain suitable post-project. Canopy closure would be maintained at 60 percent or greater, no predominant or dominant trees would be removed and large snags and downed wood would be maintained at the 80 to 100 percent level. Selected stands for thinning are considered low to moderate-quality habitat, with the potential to be improved through treatment. Treatments would be beneficial in the long term by creating stand conditions that benefit prey and accelerate the development of higher quality habitat in a shorter timeframe than would occur without treatment. This restoration and maintenance of habitat would aid in bringing these stands along in a manner consistent with pre-fire suppression era growth.

**Northern Spotted Owl Activity Center Summary**

Direct, indirect and cumulative effects were analyzed for nesting/roosting and foraging habitat. The USFWS considers that the most activity occurs within 0.5 miles of the nest tree. Northern spotted owl territories with at least 400 acres of suitable habitat within 0.5 miles and 1,336 acres within 1.3 miles of the nest tree are generally thought to be more likely to be reproductively successful (USDI 2009).

**Thresholds:** The USFWS has determined minimum habitat thresholds, or the minimum amount of nesting/roosting/foraging habitat, that must be maintained in a territory within a specific distance from the core area of use in order for an NSO pair to persist at the site. Habitat removal below this minimum threshold may be considered “take” under the ESA. These habitat thresholds are also used to assess the relative condition of the AC. The SRNF also uses the relative condition of an AC to evaluate the level of impact from habitat treatments (manipulating the habitat but maintaining habitat function) even though no take would occur.

The threshold for the home range is to maintain a minimum of 1336 acres of nesting/roosting/foraging habitat within 1.3 miles, 400 acres within 0.5 miles and 936 between 0.5 and 1.3 miles of the AC. The 0.5 miles is the core for nesting and the outer area, out to 1.3 mile, provides other elements critical to their life histories such as foraging. The USFWS has determined that the proportion and types of habitat to be maintained within the core area is very important in predicting NSO presence. The USFWS found that the highest use areas were within 0.5 miles of the nest and contained a combination of 48 percent nesting/roosting and 28 percent foraging habitat (USFWS 2009). Applying these percentages rounded up to the 0.5-mile scale, results in the thresholds of 250 acres of nesting/roosting habitat and 150 acres of foraging habitat. Between 0.5 and 1.3 miles of the AC, the SRNF/USFWS Arcata office Level 1 Consultation Team determined that the 936 acres should consist of a minimum of 300 acres of nesting/roosting habitat and 636 acres of foraging habitat. It is important to recognize the difference between habitat use thresholds in the determination of take under ESA versus descriptions of desired habitat conditions for conservation of NSO. Table 10 displays the current amount of nesting/roosting/foraging habitat within the 1st 48 Project ACs.

One mapped NSO AC affecting this project occurs near FSR 2S48, where a nest tree is located approximately 75 feet outside the treatment unit. Although no NSO detections have been recorded since 1992, in order to protect the nest tree and maintain the effectiveness of the fuelbreak, fuel treatments would occur within 50 feet of the road, following the standard fuelbreak prescription described above. In
affected areas remaining, 40 to 50 percent of existing brush would be maintained for wildlife cover. Overstocked trees less than 8-inch dbh would still be reduced and pruning of residual trees would still be allowed in these areas.

Table 10. Current northern spotted owl (NSO) nesting/roosting and foraging habitat by activity center (AC).

<table>
<thead>
<tr>
<th>AC #10</th>
<th>AC Name</th>
<th>N/R11 habitat within 0.5 miles of AC</th>
<th>F12 habitat within 0.5 miles of AC</th>
<th>N/R habitat within 1.3 miles of AC</th>
<th>F habitat within 1.3 miles of AC</th>
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<tr>
<td>290</td>
<td>Slide Creek</td>
<td>209</td>
<td>147</td>
<td>1,307</td>
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<td>237</td>
<td>Anada Creek</td>
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<td>Jonathan Creek</td>
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<td>905</td>
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<td>Long Glade</td>
<td>206</td>
<td>69</td>
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<td>118</td>
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<td>115</td>
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<td>Ruth Airport</td>
<td>179</td>
<td>217</td>
<td>774</td>
<td>1,489</td>
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</table>

Twelve of the 20 landings occur within six (6) ACs. Five out of the 12 landings within the ACs fall within low-quality nesting/roosting habitat. All new landing construction would occur within the outer 1.3-mile radius of the affected ACs. The maximum amount of nesting/roosting habitat that would be removed in any one AC is 1.75 acres, with a maximum of 0.25 acre in any one area. The loss of habitat in any one area would be negligible and would resemble natural assemblages and small forest openings.

The total treatments within any one AC would vary from 0 to 19 percent of the available nesting/roosting habitat within 0.5 miles and 1 percent to 11 percent within 1.3 miles of the center (treatment acres/percentages within 1.3 miles include the acres within 0.5 miles; Table 11). Only small amounts of nesting/roosting habitat would be lost due to new landing construction. A total of two (2) acres nesting/roosting habitat removed within the action area, 1.75 acres maximum in any one AC. This loss would be negligible in any one given area and would resemble small forest openings after the roads and landings have been decommissioned.

No AC would have thinning or fuelbreak treatments over 19 percent of the nesting/roosting habitat within any one AC. Thinning may modify nesting/roosting habitat but would maintain current habitat function immediately post-project. The project is expected to have beneficial effects by accelerating the development of forest structure to mature conditions more quickly than if left untreated, as well as reducing the risk of stand-replacing wild fire.

The total treatments within any one AC would vary from 0 to 25 percent of the available foraging habitat within 0.5 mile and 0.4 to 13 percent within 1.3 miles of the center (treatment acres/percentages within 1.3 miles include the acres within 0.5 miles). Only small amounts of foraging habitat would be lost due to new landing construction. A total of 3 acres foraging habitat removed within the action area, 1-acre maximum in any one AC. This loss would be negligible in any one given area and would resemble small forest openings after the roads and landings have been decommissioned.

10 Activity Centers (ACs) 347 and AC 236 have both been burned by high severity fires, which is why those numbers show severe deficit within the 0.5-mile core. Activity Center 347 is within the Ruth Fire scar and AC 236 is within the Journey Fire.
11 N/R = nesting/roosting.
12 F = foraging.
No AC would have thinning or fuelbreak treatments over 25 percent of the foraging habitat within any one AC. Thinning may modify foraging habitat but would maintain current habitat function immediately post-project. The project is expected to have beneficial effects by accelerating the development of forest structure to mature conditions more quickly than if left untreated, as well as reducing the risk of stand-replacing wild fire.

<table>
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<tr>
<th>Activity Centers</th>
<th>Habitat Type</th>
<th>Thin from Below</th>
<th>Hazardous Fuels Reduction</th>
<th>Landing Construction</th>
<th>Total Treatment</th>
<th>Percent Total Treatment</th>
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All treated habitat would remain functional immediately post project. In addition, treatment of capable but currently unsuitable stands within the ACs would improve habitat conditions for the owls.

**NSO Critical Habitat**

**Direct and Indirect Effects:** Approximately 36,267 acres of the action area occur within the Unit 11, Interior California Coast Subunits 1 and 2 of the 2012 NSO Critical Habitat. There are 12 units to be treated for hazardous fuel reduction (152 acres), 4 units to be oak woodland restoration (37 acres), 8 units of plantation thins (108 acres) and 65 units (530 acres) of fuelbreak construction that would occur in NSO CHU. A total of 786 acres of NSO nesting/roosting/foraging/dispersal habitat and 34 acres non-habitat would be treated between the two subunits of CHU. In the Interior California Coast Subunit 1, fuelbreak construction would occur in 39 acres of low-quality foraging habitat. In the Interior California Coast
Subunit 2, hazardous fuel reduction would occur in 49 acres of low-quality nesting/roosting habitat, 28 acres of moderate-quality nesting/roosting habitat, 12 acres of moderate-quality foraging habitat, 41 acres of low-quality foraging habitat, and 37 acres of dispersal-only habitat. Oak woodland restoration would occur on approximately 37 acres of dispersal-only habitat. Plantation thins would occur on 108 acres of dispersal-only habitat. Fuelbreak construction would occur in approximately 85 acres of moderate-quality nesting/roosting habitat, 159 acres of low-quality nesting/roosting habitat, 136 acres of moderate-quality foraging habitat, and 95 acres of low-quality foraging habitat would be modified, but would maintain current habitat function within NSO CHU.

Note that all Primary Constituent Elements (PCE) discussed below occur in concert with PCE 1, which is coniferous forest types that support the NSO.

- **Nesting/Roosting Habitat (PCE 2):** Suitable nesting/roosting NSO habitat, as defined by the Forest Service, is composed of mature timbered stands having multi-layered conditions, a canopy closure of 60 percent or greater, and obvious decadence (large, live coniferous trees with deformities such as cavities, broken tops, and dwarf-mistletoe infections). Overstory should be comprised of conifer trees 21 inches or greater dbh and at least 40 percent of the total canopy closure. The forest’s local definition of nesting/roosting habitat also includes stands with overstory canopy closure of at least 40 percent because these stands typically have a hardwood understory which increases total canopy closure to 60 percent or greater.

Potential treatment units were selected by a silviculturist from a vegetative database and then field verified as to density and stand structure. Field verification was completed by the silviculturist and wildlife biologist. All stands classified as late mature or old growth were excluded from treatment. Mid-mature stands with predominant trees were ground verified as to whether they contained stand structure characteristics that would be classified as high-quality nesting/roosting habitat.

All high-quality nesting/roosting habitat stands (mid-mature stands with mature forest characteristics and all mature and old growth) were dropped from treatment.

Of the 36,267 acres within the action area, 13,686 acres are suitable nesting/roosting habitat (PCE2). Approximately 321 acres (2%) of PCE2 is proposed for fuels reduction treatments. Two acres are being removed for landings (8 landings for total 2 acres). The treatments would maintain all components of PCE2. No more than 0.25 acres would be removed in any one area. These would resemble small forest openings.

There would be no removal of PCE2 due to thinning or fuels reduction activities.

Thin from below is a silvicultural method that involves removal of trees from lower canopy positions (overtopped, intermediate, and sometimes codominant), retaining the largest and most vigorous trees with the best-developed crowns. This type of thinning closely mimics the natural course of stand development as it eliminates the trees least likely to grow into the dominant or codominant crown classes. Thinning reduces the stand density of trees to improve growth and yield, enhance stand health, and reduce potential tree mortality. Thin from below while maintaining a minimum of 60 percent or greater canopy cover is the best management prescription to maintain and recruit the habitat variables critical to nesting/roosting habitat (e.g., large old trees and codominant and intermediate conifers with
crown space in the canopy for crown development) while at the same time improving forest health and reducing risk to wildfire and insects and disease.

Fuel reduction treatments are designed to reduce ground fuels and the lower understory vegetation that create ladders for fire to climb into the canopy. Treatments are limited to pruning lower branches of larger trees and removal of brush and small diameter trees 8 inches in diameter or less. No predominant or dominant trees would be removed, canopy closure would be maintained at 60 percent or greater, and snags and downed logs (20-inch dbh or greater) would be maintained unless they pose a safety hazard. The habitat would remain suitable post-project.

Fuel treatments are designed to reduce the risk of fire disturbance on a large scale. Although multi-layered conditions contributing to PCE2 would be reduced by removing brush and understory trees within 150 feet of a road, treatments would result in a greater assurance of long-term maintenance of existing late-successional habitat within the action area. Fuel treatments in strategic areas along high-use roads would reduce the risk of fire ignitions along high use roads and provide greater protection to adjacent late-successional habitat. This would protect and enhance owl Critical Habitat in the end.

Fuelbreak construction would modify 321 acres of low to moderate quality PCE2; however, the habitat would be maintained as nesting/roosting habitat post-project. No PCEs would be removed through commercial thinning or fuels treatments.

Fuel reduction activities may modify suitable NSO nesting/roosting habitat PCE; however, the habitat would remain suitable post project. Even though the treatment areas would remain suitable immediately post-treatment, 13,365 acres (97.6%) of PCE2 in the action area would remain untreated in this project.

Foraging Habitat (PCE 3): The 2012 Critical Habitat Rule describes foraging habitat in the Klamath and Northern California Interior Coast Ranges Zone as having “very vegetative diversity” and that foraging-only habitat “for this zone showed greater divergence from nesting habitat, with much lower canopy cover and tree size.” The Rule states that “habitats used for foraging northern spotted owls are much more variable than in northern portions of the species’ range” and that “northern spotted owls would forage in younger stands and brushy openings with high prey densities and access to prey (Carey et al. 1992; Rosenberg and Anthony 1992; Thome et al. 1999; Irwin et al. 2012). Throughout much of the owl’s range, the same habitat that provides for nesting and roosting also provides for foraging, although northern spotted owls have greater flexibility in utilizing a variety of habitats for foraging than they do for nesting and roosting.”

Foraging habitat often has attributes similar to that of nesting/roosting habitat, but such habitat lacks specific nesting structures necessary to support successfully nesting pairs. It is often the younger stands that provide habitat for those early and mid-successional associated prey species that nesting/roosting habitat do not offer. Foraging habitat is identified in the SRNF vegetation GIS layer, which uses the 11-inch dbh/40 percent canopy closure of the California Wildlife Habitat Relationship (CWHR) classification to define the lower end of this habitat type. Due to this, many acres of conifer-dominated stands are shown here as foraging habitat rather than as dispersal habitat.
Of the 8,648 acres of potential PCE3 within Critical Habitat in the action area, approximately 323 acres of foraging PCE would be treated either through shaded fuelbreak construction (266 acres) and fuels reduction treatments (53 acres), with 3 acres being removed for landings (12 landings for total 3 acres). The treatments would maintain all components of foraging habitat, and would not remove PCEs except on the 3 acres. These would resemble small forest openings since new landing would average 0.25 acres. No more than 0.25 acres would be removed in any one area. These thinning treatments would accelerate the development of late-successional characteristics that favor NSOs and protect existing suitable habitat The loss of PCE in any one area would be negligible. All associated landings would be decommissioned after project activities are complete.

The stands within foraging habitat proposed for treatment are even-aged and lack the horizontal and vertical diversity components associated with late-mature stands. These young stands have the potential to achieve rapid diameter and height growth with commercial thinning. Silvicultural prescriptions would ensure retention of existing stand structure, species composition, snags, and downed logs. Treatment would maintain functional habitat conditions within all currently suitable foraging, and is expected to improve conditions within the stands treated in the long term.

Thinning would have a positive impact to NSO foraging PCE since growth would be accelerated resulting in multi-layered, older seral stages earlier than if left unthinned. Reducing tree density within foraging habitat would improve forest health and a reduced risk from fire. Existing structural conditions would be maintained in order to support prey occurrence and abundance while allowing for rapid development of replacement habitat. Replacement habitat could develop into nesting/roosting habitat over time. Some stands would be immediately improved upon completion of the treatment by allowing increased access to prey by the owl in the dense stands formerly refugia for the wood rat.

Jackpot burning may be used within the fuelbreaks and the fuels reduction treatment units including the 323 acres of foraging habitat. The primary objective of jackpot burning is to reduce ground fuels within fuelbreaks. Because of its low intensity, the burn is not uniform in nature creating a mosaic pattern within the stand. Effects of jackpot burning would be limited because of this patchiness leaving interspaces of unburned forest floor. Foraging habitat would be modified as some understory shrubs and some small saplings would be killed and some smaller downed logs would be consumed from the burning in portions of the stand; however, current habitat function would be maintained. The results would be a more complex understory and forest floor that would benefit key prey species for the spotted owl such as the dusky-footed woodrat, while breaking up the continuity of the fuels in the understory to reduce flame length and spread of wildfire.

Burning would occur under specific weather and moisture conditions designed to minimize damage to the residual stand, maintain large woody debris and maintain about 50 percent of the duff layer. Burning could reduce prey species temporarily in the immediate area, but is expected to be a short-term effect.

Dead and down material are usually of large enough diameters that the logs are not burned completely and continue to provide key habitat features, such as refugia and escape cover. In some areas, fuel treatments may be beneficial to the NSO in potential foraging habitat in CHU
by opening thick sub-canopy vegetation, allowing increased access to prey. In addition, owls are known to forage within the burned areas once the understory vegetation begins to grow again.

Fuel corridors would be created along major roads, mainly along ridge tops, to create a defensible space and safe access to assist in firefighting efforts and to protect existing nesting/roosting/foraging habitat from human-caused fires. Fuel reduction treatments are designed to reduce ground fuels and the lower understory vegetation that create ladders for fire to climb into the canopy. Although multi-layered conditions contributing to foraging habitat would be slightly reduced by removing brush and understory trees treatments would result in a greater assurance of long-term maintenance of suitable foraging and foraging PCE within the planning area.

The project would modify approximately 323 acres of low to moderate quality foraging habitat PCE in fuels and thinning; however the habitat would be maintained as foraging habitat immediately post project.

Removal of PCE3 for new landing construction would be minimal in any one area (0.25 acres or less). No PCEs would be removed through thinning or fuels treatments. The project design would ensure retention of existing stand structure, species composition, snags, and downed logs. Canopy closure would be reduced in the short term, but would be maintained at a minimum of 60 percent closure. Foraging habitat function would be maintained immediately post-project. Treatment would maintain functional PCE conditions within all currently suitable foraging habitats and is expected to improve conditions within the stands treated in the long term. These treatments would accelerate the development of late-successional characteristics that favor NSOs.

- **Dispersal Habitat (PCE 4):** The survivorship of NSOs is likely greatest when dispersal habitat most closely resembles nesting, roosting, and foraging habitat, but owls may use other types of habitat for dispersal on a short-term basis. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy cover to provide protection from avian predators and at least minimal foraging opportunities. The minimum requirement for dispersal-only habitat is forests composed of at least 50 percent of trees with 11 inches DBH or greater and a minimum 40 percent canopy cover. Although NSO use nesting/roosting/foraging habitat as dispersal habitat, here we define dispersal-only as conifer forest types that fall below the definition of foraging but still meet the criteria for dispersal.

Of the 6,505 acres of dispersal-only habitat within the project action area, approximately 145 acres would be treated (2% of the dispersal-only habitat in the action area). These units are very low-quality dispersal habitat because they are densely stocked with little space for an owl to fly through. Thinning would reduce stand density; however, post-treatment canopy cover would be maintained at 60 percent or greater. These stands would be immediately improved as post-treatment dispersal habitat.

Approximately 8 acres of dispersal-only habitat would be removed through landing construction. Removal of PCEs for landing construction would be minimal in any one area (0.25 acres or less). These would resemble small forest openings since new landing would average 0.25 acres. No more than 0.25 acres would be removed in any one area. Canopy closure in all other treatment areas would be maintained at a minimum of 60 percent.
Thinning currently unsuitable stands of dense, young plantations is expected to provide additional dispersal habitat.

Even though all treatment areas would maintain their current habitat function and maintain a minimum of 60 percent canopy closure, approximately 98 percent of the dispersal-only habitat in the action area would not have any treatment. Since the NSO use nesting/roosting/foraging habitat for dispersal as well, of the 28,839 acres of nesting/roosting/foraging/dispersal habitat in the action area approximately 99 percent of habitat suitable for dispersal would be left untreated in the action area.

Due to the negligible amount of habitat being removed on this project, effects to dispersal PCE would be insignificant.

- **Subunit ICC 1 and 2:** Approximately 195,097 acres of Unit 11, Interior California Coast Subunit 1 and 2 occurs on the SRNF with 179,758 acres on the Mad River RD and 17,885 acres within the 1st 48 Project action area.

**Noise and Smoke:** Noise and smoke-generating activities that occur within or adjacent to suitable NSO habitat has the potential to disturb nesting owls. To avoid disturbance, design features and limited operating periods (LOPs) would be implemented as described in the PDFs. The LOP from February 1 through July 31 within 0.25 miles of known ACs would avoid impacts the NSO during the breeding season. If no surveys are conducted, then a September 15 LOP would be used for either occupied or unsurveyed nesting/roosting habitat.

**Direct Injury or Death:** The 1st 48 Project area has eight (8) historic ACs identified. No treatments would occur within the 100-plus-acre nest groves established around each known AC and no activities would occur in high-quality nesting/roosting habitat anywhere in the project area. Surveys to the most current, USFWS approved-protocol have been conducted throughout the project area. Limited operating periods have been established for all activities within 0.25 miles of each AC. Updated surveys would be maintained throughout the life of the project or additional LOPs would be implemented on activities within 0.25 miles of nesting/roosting habitat without up-to-date surveys. There is a low likelihood that direct injury or death could occur to an individual NSO during the implementation of the management activities.

The forest conducted informal consultation on the 1st 48 Project with the USFWS. The informal consultation process on the SRNF is conducted under the Level 1 Consultation process. The Level 1 process requires biologists from the US Forest Service and the USFWS to work together to identify potential impacts to listed species and, where possible, to propose mitigation measures that would minimize impacts to those species. The Forest Service has worked extensively with the USFWS to ensure that the 1st 48 Project was designed to protect listed species and their Critical Habitat.

The Six Rivers Level 1 Team determined that the 1st 48 Project may affect but is not likely to adversely affect the NSO, and it may affect but is not likely to adversely affect NSO critical habitat. The Level 1 Team determined that the proposed prescriptions would improve conditions within the treated areas and would be beneficial to the NSO.
Chapter 3. Environmental Consequences

Forest Service Sensitive Species

No Action Alternative
Under the No Action Alternative, no thinning, shaded fuelbreak construction, or fuel treatments would occur. The No Action Alternative would not change the current conditions. No suitable habitat for any Forest Service Sensitive species would be degraded through thinning or shaded fuelbreak construction. However, the No Action Alternative would not accelerate development of late-successional conditions in younger stands throughout the project area. The No Action Alternative would also not reduce the fuels build-up in the project area or protect existing late successional habitat.

Proposed Action Alternative

Direct and Indirect Effects
All Forest Service Sensitive wildlife species known or thought to occur in the project area (based on habitat and range), were evaluated for this project. It was determined that the project would have no impact on certain Forest Service Sensitive species, based on either the lack of habitat, lack of detections during surveys, or the fact that habitat would not be impacted. Species that would not be affected by this project include the bald eagle (Haliaeetus leucocephalus), Townsend’s big-eared bat (Corynorhinus townsendii), fringed myotis (Myotis thysanodes), California wolverine (Gulo gulo luteus), Humboldt marten (Martes caurina), pallid bat (Antrozous pallidus), western bumblebee (Bombus occidentalis), western pond turtle (Clemmys marmorata), foothill yellow-legged frog (Rana boylii) southern torrent salamander (Rhyacotriton varieatus), and northern red-legged frog (Rana aurora aurora). The following environmental consequences section focuses on those Forest Service Sensitive species and/or habitat that may be affected by this project.

Pacific Fisher (Martes pennanti pacifica, also a Federal Candidate Species)
In northern California, fishers occupy mid-elevation, multi-storied mature and old growth conifer, mixed conifer and mixed-conifer hardwood forests with contiguous canopy cover. Closed canopies (>50%) are typically selected but fishers would use areas of low to moderate canopy cover (25 to 40%) if there is sufficient understory (Lofroth et al. 2010). They do not occur in high-elevation alpine or subalpine habitats.

Foraging habitat varies with primary prey species. Since fishers in California prey primarily on small to medium-sized mammals (woodrats, squirrels etc.) they would use forests with hardwood components which provide mast for prey, structurally complex structures near the forest floor (brushy understories) and high abundance of downed, woody debris (Lofroth et al. 2010).

Rest sites are strongly associated with moderate to dense forest canopy and elements of late-successional forests (Lofroth et al. 2010). Rest sites in northern California typically have greater than 50 percent canopy cover and an average dbh of 30 to 45 inches for the five (5) largest trees in the immediate area. These areas would often have a higher density of snags and large downed wood. Due to high temperatures, rest sites in this region often occur in the bottom of drainages or within 100 meters of water. Cavities, mistletoe blooms, branch deformities and platforms in live trees and snags (conifers and hardwoods) are used for rest sites as well as logs, rock areas, brush piles and concentrations of downed woody debris.

Cavities in live trees and snags are critical for reproduction. Females use cavities in a variety of tree species (Douglas-fir, Ponderosa pine, black oak etc.) but live hardwoods appear to be particularly important in northern California. Most cavities used as natal and weaning dens are formed from heartwood decay and are in large (average 36-inch dbh) trees and snags. These trees are often much older than those available with Douglas-fir averaging 177 years (Lofroth et al. 2010).
Thompson et al. (2007) determined that based on data from a 1994 to 1995 soot track plate study, a 1996 to 1997 telemetry study, and a 2002 to 2003 mark-site study, fishers appear to be abundant and well distributed across “the managed forests of extreme northwest California”. An exact population estimate and distribution for the Forest are still unknown.

Systematic surveys occurred across the Forest in 1999 (Carroll et al 1999) show the highest probability of detections centered on the Trinity River, with detection probability decreasing the farther north and south you go.

Surveys were conducted in the 1st 48 Project area in 2016 using camera stations. Fisher were detected in three areas. No dens sites have been found.

**Direct and Indirect Effects**

Characteristics for denning would be maintained and the stands would still function as denning habitat immediately post-project. All riparian reserves would be buffered on both sides of stream channels (non-fish bearing buffers are 160 feet, fish-bearing buffers are 320 feet or two site potential tree heights), unless intersecting with road networks. In the case of Littlefield Creek, the no-cut buffer (“inner riparian reserves”) south of the stream would extend to the edge of the road, which is less than 160 feet in many areas, but this buffer is still considered adequate to prevent impacts to the stream because the area is so flat. Canopy closure in the outer riparian reserve buffers would be maintained at 60 percent or greater.

No tree removal is permitted within the inner riparian reserve buffers. Exceptions include hand-cut trees less than 6-inch dbh within 25 feet where riparian reserves intersect roads. Thinning and release work within riparian reserves would be accomplished with small gas powered hand tools (e.g., chainsaws, brush cutters). Ignition may occur within riparian reserves only when necessary to minimize prescribed fire behavior intensity and/or the potential for burning material to roll down into a riparian reserve. No fire line (scraped to mineral soil) would be constructed within riparian reserves; however, a hand-cut brush-only control line would be allowed for holding purposes on prescribed fires. Hand piling and pile burning may only occur within a riparian reserve if the hand piles are 6 feet or less in diameter, and less than 6 feet in height.

Little to no true riparian habitat exists within the units given the lack of riparian vegetation associated ephemeral and intermittent stream courses within the project area. However, in the long-term project implementation has the potential to improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to riparian reserves. Project activities would not occur within riparian habitat. Implementation of the project would maintain and improve riparian habitat conditions.

Of the 13,686 acres of fisher denning habitat within the action area, approximately 321 acres of low and moderate quality denning habitat would be treated. No high-quality habitat would be treated. The amount of fisher denning habitat within the action area proposed for treatment would be approximately 2 percent (98% of the denning habitat in the action area would not receive any treatment).

Strategically located fuelbreaks would reduce the risk of human-caused fire ignitions along high-use County roads and provide greater protection to existing late-successional habitat in the 1st 48 Project area. Fuel reduction treatments are designed to protect existing habitat characteristics while reducing ground and ladder fuels and creating a defensible space to be used in defense of wildfires. No dominant or codominant trees would be removed, canopy would be maintained at 60 percent or greater, and large
snags and downed wood would be maintained at the 80 to 100 percent level. The habitat would remain suitable immediately post project.

**Noise and Smoke:** Noise and smoke-generating activities that occur within or adjacent to occupied fisher denning habitat has the potential to disturb fisher. Surveys were conducted in the 1st 48 Project area in 2016 using camera stations. Fisher were detected in three areas. Although no den sites have been located, LOPs have been imposed for all noise and smoke generating activities within 0.25 miles of fisher suitable habitat around the detection sites.

*Northern Goshawk (Accipiter gentilis)*

Goshawks are known to use mature forest habitats for nesting and foraging. Nesting stands are typically in dense pockets of large trees, often on north-facing, bench slopes near water. Foraging habitats are often more open to allow for the aerial ambush foraging strategy of the goshawk.

Goshawks occupy similar habitat to that of the NSO. There are approximately 13,686 acres of suitable goshawk habitat in the 1st 48 Project area. Surveys were conducted in the 1st 48 Project area in 2017. No goshawks were detected.

**Direct and Indirect Effects**

Suitable habitat for the goshawk occurs in the planning area. No predominant trees (potential nest trees) or dominant trees would be removed. Current canopy closure would be maintained. Removal of understory vegetation may improve foraging conditions for the goshawk. If nesting goshawks were subsequently found within 0.25 miles of any treatment units, LOPs would be imposed. The project may impact individual northern goshawk but would not cause a trend towards listing.

*Foothill yellow-legged frog (Rana boylii)*

The foothill yellow-legged frog is found in or near rocky streams or rivers in a variety of habitats. In California, breeding and egg laying usually wait until the end of spring flooding, and may commence anytime from mid-March to mid-June, depending on the occurrence of spring rains. Foothill yellow-legged frogs are diurnal with adults often basking on exposed rock surfaces near streams. When disturbed, they dive into the water and take refuge under submerged rocks or sediments.

**Direct and Indirect Effects**

Suitable habitat for foothill yellow-legged occurs in the planning area. In August 2017, tadpoles and adult frogs were observed in Littlefield Creek at the low water crossing on at MP 0.4 on 2S53 (K. Kenfield personal observation). If water is not present during operations, commercial log hauling may proceed. If water is present, a temporary low water crossing would be required. Currently noncommercial vehicles drive through the low water ford. Installation of the temporary vented ford (two or more 36-inch pipes laid over geotextile cloth on the streambed with fill on top) would cause disturbance to an approximate 30 foot by 10 feet reach of stream. The installation of the vented ford would eliminate vehicles entering the water while it is installed. The project may impact individuals but would not cause a trend towards listing.

**Management Indicator Species and Migratory Bird Species**

Direct, indirect and cumulative effects to MIS and MBS are disclosed in the MIS and MBS reports (Smith 2017) located in the project file with the results are summarized here. Management indicator species and MBS were addressed based on their potential to occur within the project area based on habitat suitability, survey results, or incidental sighting records. Habitat suitability evaluations were made using the California Wildlife Habitat Relationships System, Version 8.0 software, developed by the California
Department of Fish and Game. In addition, habitat evaluations were made utilizing SRNF Wildlife Sighting Database, SRNF Vegetation Layer, field reviews, and forest GIS vegetation layers.

**No Action Alternative**

Under the No Action Alternative, no thinning, shaded fuelbreak construction, or fuel treatments would occur. The No Action Alternative would not change the current conditions. No suitable habitat for any MIS or MBS species would be degraded through thinning or shaded fuelbreak construction. However, the No Action Alternative would not accelerate development of late-successional conditions in younger stands throughout the project area. The No Action Alternative would also not reduce the fuels build-up in the project area or protect existing late-successional habitat.

**Proposed Action Alternative**

**Management Indicator Species**

Under the National Forest Management Act (NFMA), 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” (PL 94-588 §6 (g)(3)(B)). The 1982 regulations implementing NFMA require that “Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area.” (36 CFR 219.19) Management indicator species is a concept used by the agency to serve as a barometer for species viability at the forest level. Population changes of MIS are believed to indicate the effects of management activities.

The SRNF LRMP uses MIS to assess potential effects of project activities on the various habitats and habitat assemblages with which these species are associated. Forty-one fish and wildlife species have been selected as MIS or assemblages for a variety of habitats that are potentially affected by resource management activities on the Forest (LRMP IV-97).

The potential impacts to MIS were analyzed and the results are summarized here. The full report is located in the project file.

Seral stages in the project area range from shrub to mid-mature stands with small patches of late-mature and old growth. The project is designed to improve habitat conditions through the acceleration of late-successional habitat characteristics, while still maintaining current functional habitat. Canopy closure would be maintained in late-successional habitats, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80 to 100 percent of the average numbers found within mature and old growth stands within the Forest.

This project would treat a total of 142 acres of early seral stage habitat due to fuelbreak construction and thinning in early seral stands (shrub through early mature). For species that utilize early seral habitat (such as the lazuli bunting), this represents 3 percent of the early seral stage habitat in the project area.

Shaded fuelbreak construction would occur in late-successional habitat along the main roads. Fuel treatments would occur in approximately 321 acres that are considered suitable for late successional associated species. Fuel treatments would degrade approximately 2 percent of the suitable habitat for these species available in the project area. The shaded fuelbreak would be approximately 150-feet wide on either side of the road. No predominant or dominant trees would be removed. All exiting snags and downed wood would be retained, unless the former poses a safety hazard. There would be minor habitat degradation for understory species such as the Pacific wren and ruffed grouse within the project areas through the removal of brush and understory trees; however, in the long term, reduction of fuel ladders in these areas would improve adjacent habitat areas resilience to fire disturbance. Overstory canopy closure
would be maintained at 60 percent or greater, ground disturbance would be limited to existing roads and skid trails, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80 to 100 percent of the average numbers found within mature and old growth stands within the Forest.

All riparian reserves would be buffered on both sides of stream channels (non-fish bearing buffers are 160 feet, fish-bearing buffers are 320 feet or two site potential tree heights), unless intersecting with road networks. In the case of Littlefield Creek, the no-cut buffer (“inner riparian reserves”) south of the stream would extend to the edge of the road, which is less than 160 feet in many areas, but this buffer is still considered adequate to prevent impacts to the stream because the area is so flat. Canopy closure in the outer riparian reserve buffers would be maintained at 60 percent or greater.

The crossing of Littlefield Creek by FSR 2S02 is thought to be perennial due to increased flow from the Ruth Fire (from reduced transpiration due to canopy removal). Resident rainbow trout and foothill yellow legged frog are found in the stream at the crossing. If the stream is flowing at the time needed for commercial haul, a temporary pipe array will be installed consisting of two or more culverts, geotextile fabric, and clean gravel (i.e., no fine sediments). Installation of the temporary vented ford (two or more 36-inch pipes laid over geotextile cloth on the streambed with fill on top) would cause disturbance to an approximate 30 foot by 10 feet reach of stream. The installation of the vented ford would eliminate vehicles entering the water while it is installed.

No tree removal is permitted within the inner riparian reserve buffers. Exceptions include hand-cut trees less than 6-inch dbh within 25 feet where riparian reserves intersect roads. Thinning and release work within riparian reserves would be accomplished with small gas powered hand tools (e.g., chainsaws, brush cutters). Ignition may occur within riparian reserves only when necessary to minimize prescribed fire behavior intensity and/or the potential for burning material to roll down into a riparian reserve. No fire line (scraped to mineral soil) would be constructed within riparian reserves; however, a hand-cut brush-only control line would be allowed for holding purposes on prescribed fires. Hand piling and pile burning may only occur within a riparian reserve if the hand piles are 6 feet or less in diameter, and less than 6 feet in height.

Little to no true riparian habitat exists within the units given the lack of riparian vegetation associated ephemeral and intermittent stream courses within the project area. However, in the long term, project implementation has the potential to improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to riparian reserves. Project activities would not occur within riparian habitat. Implementation of the project would maintain and improve riparian habitat conditions.

Jackpot burning may also cause short-term habitat degradation through the loss of small woody debris; however, burning would occur under specific weather and moisture condition designed to minimize damage to the residual stand, maintain large woody debris, and maintain at least 50 percent of the duff layer. Some minor local increases in fuels may occur from project-generated slash, but due to proposed post-harvest fuel treatments, fuel loading would not be a threat to the treated areas. In the long term, reduction of fuel ladders would improve stand resilience to fire disturbance.

Jackpot burning the special habitat areas (oak woodlands) would reduce encroachment and protect the habitat in the long term. Management indicator species such as the black-tailed deer would benefit from burning these areas.
The 1st 48 Project would not adversely impact MIS. Although shaded fuelbreak construction would degrade habitat for species such as the Pacific wren and ruffed grouse, the majority of the project would improve/restore habitat conditions for all MIS by thinning young, homogenous stands, accelerating the development of multi-storied conditions and other late successional habitat characteristics. In addition, development of strategic fuelbreaks would help protect existing habitat from stand replacing fire.

**Migratory Bird Species**

The potential impacts to MBS were analyzed and the results are summarized here. The full report is located in the project file. The project would not adversely impact migratory species or their associated habitats.

Project design standards would minimize potential impacts to migratory species. The project is designed to improve habitat conditions through the acceleration of late-successional habitat characteristics, while still maintaining current functional habitat. Although there would be minor habitat degradation for understory species through the removal of brush and understory trees, in the long term the reduction of fuel ladders in these areas would improve adjacent habitat areas resilience to fire disturbance. Overstory canopy closure would be maintained at 60 percent or greater, ground disturbance would be limited to existing roads and skid trails, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80 to 100 percent of the average numbers found within mature and old growth stands within the Forest.

**Survey and Manage Wildlife Species**

No wildlife S&M species occur within the 1st 48 Project; therefore, no pre-project surveys are required. This project is in compliance with the 2001 Record of Decision and Standards and Guidelines for Amendments to Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA and USDI 2001), the April 25, 2013 9th Circuit Court Order in Conservation Northwest (and others) v. Sherman, No. 11-35729 No. 08-1067-JCC (W.D. Wash) and the February 18, 2014 District Court Order in Conservation Northwest (and others) v. Robert Bonnie (and others), No. C08-1067-JCC (W.D. Wash.).

**Cumulative Effects to TES, MIS, MBS, and other Wildlife Species**

Regarding all the past impacts from land uses (mining, timber harvest, and road constructions), the 1st 48 Project would facilitate restoration by thinning plantations and young natural stands. The beneficial cumulative effects include the reduction of habitat fragmentation and the development of late-seral conditions.

**Timber Harvest**

Timber harvest activities and the suppression of wildfire in Mad River RD have led to changes in seral stages and increases in fuels. This shift in seral stage distribution is highest in the tanoak and Douglas-fir series, due to harvest of commercially valuable old growth Douglas-fir stands that began in the late 1950s. There has been a reduction in old-growth forests and an increase in shrub, pole, and early mature forests.

Currently three (3) timber sales occur within the UMR watershed on the Mad River RD: Little Doe/Little Gulch, Kelsey Peak and Beaverslide. The action area for Beaverslide overlaps with the 1st 48 Project, but no treatments overlap or occur within any AC associated with the 1st 48 Project. The Shasta Trinity Salvage Project also overlaps with the 1st 48 Project, but no treatments overlap or occur within any affected AC. Therefore, these projects would not be discussed any further.

The action areas for the 1st 48 Project and the Kelsey Peak Project overlap. No timber sale units for Kelsey Peak are within the overlap; however, 638 acres of the Kelsey fuels corridor overlaps into the 1st
48 Project. The Kelsey fuels corridor connects directly into the 1st 48 Project shaded fuelbreak creating an extended fuelbreak near the town of Ruth.

The Kelsey Peak Project has proposed treatments in 414 acres and 2,175 acres of nesting/roosting and foraging respectively. This equates to 3 percent nesting/roosting habitat being treated and 10 percent foraging habitat combined for the two projects being treated within the UMRW. All acres of these treatments would maintain its current habitat function except for a negligible amount removed for landings that resemble small forest openings and would be decommissioned post-project. This leaves 97 percent and 90 percent of the available nesting/roosting and foraging habitat untreated and available as alternative habitat for the use by spotted owls.

Because the effects of thinning and fuel treatments are primarily beneficial to NSO, similar projects (Beaverslide) in the area should be considered to have achieved the desired conditions and provided positive cumulative effects to the area, as recommended by the Recovery Plan and the CHU Rule.

Within or overlapping the boundaries of the Upper Mad River Watershed there are over 85 NSO ACs. Since the two projects are immediately adjacent to each other, four ACs overlap the Kelsey and 1st 48 projects (Table 12 and Table 13).

Habitats
Four of the eight ACs in the 1st 48 Project area also overlap the Kelsey Peak Project planning area. Incorporating the entire home ranges for these four NSO ACs has defined the action area and has been evaluated throughout this document. The combined effects of the 1st 48 and Kelsey Peak projects are displayed in the Table 12 and Table 13 below.

<table>
<thead>
<tr>
<th>AC#</th>
<th>Acre Total for 48</th>
<th>Acre Total for KP</th>
<th>Acre Total for Both</th>
<th>Acre Total Forage Habitat Avail</th>
<th>% Habitat Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5 miles 1.3 miles</td>
<td>0.5 miles 1.3 miles</td>
<td>0.5 miles 1.3 miles</td>
<td>0.5 miles 1.3 miles</td>
<td>0.5 miles 1.3 miles</td>
</tr>
<tr>
<td>239</td>
<td>0 28</td>
<td>0 246.5</td>
<td>0 273</td>
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<td>251</td>
<td>14 29</td>
<td>54 294</td>
<td>68 323</td>
<td>199 1127</td>
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</tr>
<tr>
<td>387</td>
<td>0 21</td>
<td>69 495</td>
<td>69 486</td>
<td>192 1,388</td>
<td>36 36</td>
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<tr>
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<td>0 11</td>
<td>42 444</td>
<td>42 455</td>
<td>217 1,489</td>
<td>20 30</td>
</tr>
</tbody>
</table>

The only treatment occurring in these four (4) ACs for both projects is fuelbreak construction along high use roads. Only brush and understory trees were or would be cut. No predominant or dominant trees were or would be removed and existing canopy was or would be maintained. Snags and downed logs were and
would be maintained at the 80 to 100 percent level. All treated acres in both project is or would remain suitable immediately post project.

The maximum amount of acres treated within an AC for the two project combined is 19 percent of nesting/roosting and 36 percent of foraging. Although current habitat function has been or would be maintained in all treated areas, approximately 98 percent of the available nesting/roosting and 90 percent foraging within the UMRW would be left untreated and available as alternative habitat for the use by spotted owls.

All treatment areas in the action areas would remain suitable immediately post project. Treatments were designed to maintain and restore habitat function in low to moderate quality habitat in all project areas.

Post treatment monitoring was conducted by the Level 1 Team on the Kelsey Peak Project, as well as on similar projects elsewhere on the Forest. All the units exceeded canopy closure requirements, and protected predominant trees, snags, and downed logs. The units are still functional habitat and should respond well to the treatments. It was agreed by the Level 1 Team these types of treatments would have a beneficial effect on the future habitat conditions of the area and creating more alternative habitats for owls to use as additional treatments occur on the landscape.

**Fire**

Historical records and fire evidence show that fires regularly occurred in this area with a variety of fire frequencies and intensities. Both wildfires and their exclusion through aggressive suppression affect plant and animal habitat, including stand structure, number of standing snags, amount of large woody debris, soil organic matter content, nutrient availability, and erosion hazard.

The dramatic reduction in wildfire burn acreages over the last 80 years appears to have resulted in unnatural fuel profiles that are more continuous, both horizontally and vertically. Given this increased conifer density, future wildfires could become larger and more destructive than in the past.

In the prolonged absence of fire, and aggravated by other disturbance factors, these fire-adapted forests and grasslands have undergone significant changes in species composition and structure. Intermediate canopy layers and higher ground fuel loadings have developed which allow ground fires to reach the crown more easily, making fires more difficult to control. Young plantations now occupy most of the harvested old-growth sites within the project area. Early and mid-seral stages of Douglas-fir are more susceptible to mortality by wildfire than older late seral stands. Thick, corky bark on the lower bole and roots of older trees protects the cambium from heat damage. In addition, the tall trees have their foliage concentrated on the upper bole, which makes it difficult for fire to reach the crown; however, trees are typically not free of lower branches until they are more than 100 years old (Hermann et al, 1990). Stands selected for treatment in project area are predominantly 80 years old or less.

The high stem densities in plantations and younger stands also results in greater fire risk. Fire suppression activities have significantly reduced the amount of fire over the past 50 years leaving high fuel loads in places, which threaten the resiliency of the upland and riparian habitats in the event of a wildfire. In addition to these past activities, road building has cut across numerous riparian reserves and fragmented habitat in multiple locations throughout the project area, which has the potential to alter the sediment routing within the riparian reserve.
Chapter 3. Environmental Consequences

Within the 1st 48 Project area, there are two (2) large fire scars: 1. The 2011 Ruth fire that burned 1,608 acres, and the 2015 Journey Fire, which consumed 1,010 acres, partially re-burning forests that were scorched in the 2001 Trinity Fire.

Illegal Marijuana Cultivation
A current issues arising in the scientific community is the effect of illegal marijuana gardens on public and private lands. The use of rodenticide has been linked to death in the Pacific fisher and the NSO. The project area has had gardens in the past, and some may exist on private lands as well, although there has been less of this type of activity on the district than other areas of the forest due to steep terrain and brushy conditions. It is uncertain how much cumulative impacts this would have on the owl at this time, but ongoing research has shown that there is greater risk to foraging Pacific fisher because of its scavenging activities during parts of the year. The data on these impacts is just starting to be generated. Whether rodenticide use is impacting the population of fisher or owls is still to be determined.

Marijuana cultivation on Forest Service land is an illegal activity and therefore is beyond the Forest Service control. The Forest Service law enforcement actively searches for and removes any grow-sites found; however, it is unknown how many sites exist in the Forest. It is hoped that by treating these low-quality stands and plantations that are not currently habitat for owls, fisher, and other species would have increased areas for foraging, and possibly help limit their exposure to the toxins that may be found in the forest from illegal activities.

Due to the scope, size, and intent of this project, there are no concerns of negative cumulative effects for TES, MIS, MBS, or other wildlife species. This proposed project is designed to attain 2011 Recovery NSO Plan, 2012 NSO Critical Habitat Rule, and LSR objectives and contains implicit measures to reverse cumulative watershed effects over the long term in the treated area.

Watershed Resources

Introduction
This section presents the predicted effects of the Proposed Action as compared to the No Action Alternative on watershed resources.

Environmental Consequences

Methodology
Cumulative watershed effects were analyzed at the 6th-field watershed scale. The watersheds are Ruth Lake-Mad River (180101020203) and Barry Creek-Mad River (180101020202). All units were field visited to validate presence and condition of riparian reserves and to determine existing and potential sediment sources.

To quantify cumulative watershed effects the Region 5 Equivalent Roaded Acre (ERA) method was used to determine if these watershed are near the Threshold of Concern (TOC). Landscape treatments are considered to have no effect to water quality after 30 years, but all activities in the watersheds from 1988 to the present were considered, both public and private. Effects from previous treatments were assumed to recover linearly.
**Alternative 1 – No Action**

**Direct Effects**
There are no direct effects of choosing Alternative 1 – No Action Alternative.

**Indirect Effects**
Because no vegetation would be cut, there would be no indirect effects to stream shading from canopy reduction, although not treating the fuels would make it more likely that the canopy is reduced or removed by wildfire.

Roads are the largest source of controllable sediment sources. Without this project, most of the roads in the project area would not be maintained for years to come. This project provides the funds needed to maintain roads in this area. In addition, FSR 2S54 would still be at risk from culverts being plugged and failing, which could introduce large amounts of sediment to Littlefield Creek, which is fish bearing.

**Cumulative Effects**
Vegetation and debris would continue to accumulate on the forest floor. This could lead to hotter, more intense fires and a decrease in the ability to suppress them.

Roads would continue to deteriorate and contribute small amounts of sediment to the watershed, which is Total Maximum Daily Load (TMDL) listed for sediment. The watershed is well below the threshold of concern (TOC) for sediment, but untreated sediment sources push the watershed closer to that limit.

**Alternative 2 – Proposed Action**

**Direct Effects**
The Proposed Action would limit equipment entry into riparian reserves. For the project as a whole, there are 141 acres of riparian reserves deemed equipment exclusion zones. Of this, 90 acres are “inner” riparian reserves, (within 80 feet of the stream) which will only have fuel treatments by hand. There are 51 acres of “outer” riparian reserves, which are equipment exclusion zones, but trees may be yarded out using a cable. There are 3.7 miles of intermittent streams and one mile of perennial streams within the project units. The streams coming off South Fork Mountain are high gradient, steeply incised, with mostly stable banks and little true riparian vegetation. The project also includes areas near Littlefield Creek and Jonathan Creek. These streams are low gradient, with substantial floodplains or terraces, have less stable banks and more true riparian vegetation (primarily willow). Streams were not evaluated for seasonality of flow. If they were dry at the time they were inventoried in the field, they were clearly intermittent, but if they were flowing at the time of inventory, they were assumed to be perennial.

The project would not reduce the forest canopy below 60 percent, and even this would be temporary as the trees that are left behind are expected to grow faster and close gaps in the canopy. There would be no logging and associated ground disturbing activities within 80 to 160 feet of any watercourse although there will be fuels treatment by hand. Within 80 to 160 feet of streams, canopy reduction would be even less because only fuel treatment by hand would be allowed. There would be no effect on stream shading and stream temperatures would not be elevated due to project activities. Between 80 and 160 feet of watercourses equipment would be excluded, although manual fuels treatments would be permitted so long as canopy cover remains at or above 60 percent. These buffer widths are slightly greater than those called for in the NWFP.

Roads in the project area would be maintained and in some cases repaired prior to project activities. This would cause a slight reduction in sediment production from these roads. When the project no longer needs
these roads, they would be maintained again (bladed, culverts cleaned, waterbars constructed) and left in a better condition than before the project.

Forest Service Road 2S54 would be decommissioned and removed from the transportation system. This involves removal of all culverts and associated fill, constructing permanent dips or waterbars to control drainage, and blocking the road with a barrier. Decommissioning may introduce a small amount of sediment during earthmoving and possibly the first winter following, but would be diminimus and short-lived.

**Indirect Effects**

Project treatments would reduce the likelihood of catastrophic fire and improve the ability of firefighters to control unwanted wildfires. This reduces the risk that fire could remove the forest canopy, which would lead to increased sunlight and possibly elevated stream temperature levels. Loss of canopy and fine fuels could also lead to an increase in sediment delivered to the streams in the project area.

After FSR 2S54 is decommissioned, there would be no need for maintenance and no risk of culverts plugging and failing.

**Cumulative Effects**

This project treats a very small percentage of the watersheds in which it is proposed to occur. For the Ruth Lake-Mad River watershed, the ERA model indicates that the existing condition is 8.3 percent; this project would add 0.2 percent for 8.5 percent. The Threshold of Concern (TOC) is by compartment, which Ruth Lake-Mad River has four, and varies from 10 percent to 14.3 percent. There are no foreseeable future projects. This project would not lead to cumulative watershed effects in the Ruth Lake-Mad River watershed.

For the Barry Creek-Mad River watershed, the ERA model indicates that the existing condition is 5.5 percent; this project would add 0.3 percent for 5.8 percent. This watershed does have foreseeable future actions (primarily remaining units from the Beaverslide and Kelsey Peak timber sales). Assuming that all the remaining units are treated in 2018, the ERA would increase to 6.1 percent. The TOC for Barry Creek-Mad River ranges from 13.4 to 14.9, so this watershed would remain well under threshold. This project would not lead to cumulative watershed effects in the Barry Creek-Mad River watershed.

The entire Mad River watershed is listed as impaired due to excess sediment and temperature under Section 303(d) of the Clean Water Act. Due to limited project activities in riparian reserves and 60-plus percent canopy outside of riparian reserves, stream temperature would not be affected. Some small amount of sediment may be generated by road maintenance and decommissioning activities during project implementation, but these activities are expected to reduce sediment production in the long term.

**Total Maximum Daily Load and 303(d) Listing**

In accordance with Section 303(d) of the Clean Water Act, the State of California periodically identifies “those waters within its boundaries for which the effluent limitations... are not stringent enough to implement any water quality standard applicable to such waters.” In 1992, US Environmental Protection Agency (EPA) added the Mad River to California’s 303(d) impaired water list due to elevated sedimentation/siltation and turbidity, as part of listing the entire Mad River basin. The North Coast Regional Water Quality Control Board (Regional Board) has continued to identify the Mad River as impaired in subsequent listing cycles, the latest in 2012. The 2006 303(d) listing identifies temperature as an additional impairment to the watershed. The EPA finished the Mad River TMDL for sediment and turbidity in December 2007. The temperature TMDL will be developed by the State of California in the future. In the Mad River basin, turbidity levels are closely linked with suspended sediment load. Thus, the
TMDL focuses on total sediment load as well as suspended sediment load, which are the pollutants associated with excess sediment and turbidity that violate water quality standards.

The Upper Mad subarea (comparable to the Upper Mad River 5th-order watershed) produces only six percent of the sediment within the larger Mad River Watershed. For the Upper Mad River Watershed, the total sediment is estimated at 234 tons per square mile per year with an average of 38 percent being from management related sources. The TMDL target for sediment in the Upper Mad subarea was set at 173 tons. This would mean a reduction of 26 percent for the Upper Mad watershed. The EPA specified that in order to meet a 26 percent reduction in total sediment within the Upper Mad watershed, management-related sediment must be reduced by 68 percent over time. Activities within the proposed project are designed to minimize and in some areas reduce management related sediment and move towards meeting the EPA sediment load allocation.

Due to limited project activities in riparian reserves and 60-plus percent canopy retention, stream temperature would not be affected. The primary management-related sources of sediment are attributed to current road conditions. Some small amount of sediment may be generated by proposed road maintenance and decommissioning activities during project implementation, but these activities are expected to reduce sediment production in the long term. Road maintenance and road decommissioning activities proposed in this project implement the road-related sediment reductions required by the Mad River TMDL and described in the Upper Mad River Watershed Restoration Action Plan. This project will result in a low risk of added cumulative effects and no adverse cumulative watershed effects are likely to occur.

Compliance with the Clean Water Act, and the limits set by the TMDL established in 2007, is through use of best management practices (BMPs) and adhering to the terms and conditions of the Waiver of Waste Discharge Requirements for Nonpoint Source Discharges Related to Certain Federal Land Management Activities on National Forest System Lands in the North Coast Region (The Waiver; Order No. R1-2015-0021). Enrollment in The Waiver under Category B must be granted before project activities commence.

**Watershed Restoration Action Plan**

Barry Creek-Mad River and Lost Creek-Mad River (the next watershed upstream; outside of the 1st 48 Project area) were identified as Priority Watersheds under the Watershed Condition Framework. As such, these watersheds had developed watershed restoration action plans (WRAPs). The primary strategies for restoring these watersheds are fuels reduction projects and road maintenance, stormproofing, and decommissioning. Although this project was not anticipated when the WRAP was created, it meets the goals and intent of the WRAP.

**Aquatic Conservation Strategy**

The Aquatic Conservation Strategy (ACS) is intended as a means to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on federal lands managed by the Forest Service and BLM within the range of the NSO.

In order to make the finding that an action “meets” or “does not prevent attainment” of the objectives, the analysis must include a description of the existing condition, a description of the properly functioning range of natural variability of the important physical and biological components of a given watershed, and how the proposed project or management action maintains the existing condition or moves it toward the properly functioning range of natural variability. Management actions that do not maintain the existing condition or contribute to improved conditions in the long-term would not meet the intent of the ACS and thus, should not be implemented.
Under the ACS, riparian reserves are designed to:

- Maintain and restore riparian structures and functions of intermittent streams.
- Provide benefits to riparian-dependent and associated species other than fish.
- Enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas.
- Improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The riparian reserves will also serve as connectivity corridors among LSRs (LRMP IV-44, 45). Riparian reserves along streams and unstable areas are designated riparian reserve land allocation per the SRNF LRMP Management Area 9. The land management emphasis for riparian reserves is to achieve the goals of the ACS (LRMP IV-106-108).

Alternative 2 would contribute to the attainment of the ACS, as it was designed to fulfill the nine objectives associated with the following stream classifications within the project area:

- **Fish-bearing streams**: Riparian reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation; or to a distance equal to the height of two site-potential trees, or 300-foot slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.

- **Permanently flowing nonfish-bearing streams**: Riparian reserves consist of the stream and the area on each side of the stream extending from the edge of the active stream channel to the top of the inner gorge, to the outer edges of the 100-year floodplain, to the outer edges of riparian vegetation, to a distance equal to the height of one site potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.

- **Seasonally flowing or intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas**: This category applies to features with high variability in size and site-specific characteristics. At a minimum, the riparian reserves must include the extent of unstable and potentially unstable areas (including earthflows) and extend from the edges of the stream channel to a distance equal to the height of one site potential tree, or 100-foot slope distance, whichever is greatest. A site potential tree height is the average maximum height of the tallest dominant trees (200 years or older) for a given site class.

   Intermittent streams are defined as any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria.

This project is consistent with the ACS, as unique design features and mitigations measures are incorporated to ensure proposed activities would contribute to maintaining or restoring both the condition of the project area and, through these actions, watershed condition as a whole over the long term with only minor, unavoidable short-term impacts. Project design criteria would fully protect aquatic resources and allow treatments within riparian reserves only when and where they would maintain or improve conditions.

While minor, short-term increases in sediment could occur in the short-term during tree removal operations (skidding and log hauling, road maintenance (grading), and road decommissioning (during removal of drainage structures and re-establishing natural drainage patterns), in the long term, road improvements would be expected to lower chronic fine sediment inputs from compacted surfaces to
promote a more natural watershed sediment regime. Overall, the Proposed Action would have long-term positive effects for aquatic habitats within the project area and for the watershed as a whole.

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.**

The 1st 48 Project area is not within Key Watershed under the NWFP. Barry Creek Mad River is designated a Priority Watershed under watershed condition framework (WCF). The Proposed Action is small in acreage and widely dispersed across the landscape alongside open roads in narrow 300-foot strips, existing roadside plantations and an oak woodland stand. Thinning to establish shaded fuelbreaks would retain forest overstory canopies at 60-plus percent, functioning to provide sufficient shade from solar radiation to prevent increases in water temperature.

Thinning of trees (ladder and crown fuels) prescriptions would be restricted to the outer portion of the riparian reserves to retain tree root systems that hold soil and stream channels in place, functioning to minimize soil erosion and potential for increased sedimentation to protect water quality. Alternative 2 incorporates design features to retain large woody debris and avoids thinning of trees within inner riparian reserve buffers to also ensure future down wood recruitment is sufficient to maintain suitable stream habitat conditions.

Events such as the Ruth Fire in 2011, consumed forest vegetation leaving soils barren and vulnerable to erosion and displacement resulting in substantial disruptions to the watershed conditions and hydrological function. Alternative 2 would contribute to the attainment of this ACS objective, as roadside fuelbreak treatments are designed to aid wildfire containment and control to decrease the probability for large-scale, high-intensity fire behavior to protect water temperature, sediment loads, and nutrient cycling at levels that provide for productive riparian and aquatic ecosystems in the long-term.

The 1st 48 Project proposes to decommission FSR 2S54, an ML 2 road that is 1.95-miles long, and has four low-water crossings and three culverted stream crossings; featuring a large landslide near milepost 0.65 that encompasses the entire road prism. Although the landslide would not be treated since it is now stabilized, decommissioning of the access segment from the intersection of Forest Service Road 2S02 would include barricading the entrance to prevent motorized travel to promote passive restoration of the travelway, removal of drainage structures to re-establish natural drainage patterns, and restoring maintenance-free conditions for the long-term. The combination of barricading and water dispersion treatments are designed to stop water from concentrating on the travelway surface, reduce the potential for stream diversions (i.e., prevent water from flowing down the road or trail), and reduce the potential for off-site sediment delivery to water resources.

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.**

Under Alternative 2, there is no provision for equipment use within riparian reserves. The Proposed Action limits HFR treatments to low intensity manual pruning and cutting of small trees less than 8-inch dbh, while retaining all hardwood trees. Newly excavated stream channel banks and fill disposal sites would be mulched to reduce surface erosion in the short-term. Mulch shall consist of locally available
slash, wood chips, wood straw, or certified weed-free rice or barley straw. As such, it is likely there would be no negative effects to stream channel banks or stream connectivity.

The project area lies within the upper Mad River watershed, which encompasses 120 square miles (24% of the basin) from the headwaters of the Mad River to Robert Matthews Dam, which impounds runoff from the upper watershed in Ruth Lake Reservoir (the only existing impoundment on the Mad River), built in 1961 by the Humboldt Bay Municipal Water District (HBMWD). The reservoir has a storage capacity of about 48,030 acre-feet and was designed to provide a safe yield of 75 million gallons per day (mgd; 230 acre-feet/day), approximately 8 percent of the total annual runoff for the watershed.

Prior to construction of Matthews Dam, late summer and early fall flows in the Mad River above Pilot Creek were intermittent. At the former US Geological Survey (USGS) gage near Forest Glen (No. 11480500 located approximately 9 miles downstream of Matthews Dam), mean daily flow for the month of August from 1953 to 1961 ranged from 2 to 8 cubic feet per second (cfs), with an average of 4 cfs. Currently the HBMWD manages the release of water from Ruth Reservoir to meet domestic and industrial water needs as well as instream flow requirements for the protection of listed fish species (HBMWD 2004). Because of these releases, mean daily flow at USGS gage near Forest Glen for the month of August from 1962 to 1994 ranged from 73 to 97 cfs and averaged 85 cfs (HBMWD 2004).

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

The physical integrity of riparian reserves would be maintained, as the Proposed Action is designed to avoid use of equipment (tractor/masticator) within the full 160 and 320-foot-wide equipment exclusion zones, and only manual treatment would occur with the inner 80- and 160-foot buffers. As such, there would likely be no impact to stream channel banks or stream bottom configurations. There are no wetlands, ponds or lakes within the project area for no effect to aquatic systems.

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.

All landings and existing temporary roads required for access are outside of riparian reserve buffers. Thin from below would only occur in the outer riparian reserve buffers with only limited manual HFR. Ground-based equipment would be excluded from full buffers to avoid disturbance to soils, organisms and potential for chemical contamination (diesel or oil leaks or spills). As such, there would likely be no impact to water quality and chemical integrity.

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.

This project is small in acreage, spread out across the landscape, and will not reduce canopy below 60 percent. The full 160-foot and 320-foot riparian reserve buffers would be designated an equipment exclusion zones. The inner riparian reserve buffer fuels treatments would be limited to manual and jackpot burning only away from stream channels. Although there may be minor amounts of sediment production in the short-term, primarily from road maintenance and decommissioning, the amount of increase at any single location would be undetectable and diminimus.
6. Maintain and restore in-stream 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.

The extent, duration and intensity of proposed activities under Alternative 2 are not sufficient to adversely affect in-stream flows. Evapotranspiration rates would not be further altered, nor would sufficient ground compaction occur to alter rates of surface runoff. The proposed treatments would not result in changes to spatial and temporal hydrology both due to the limited magnitude of the treatments and the very small and localized spatial extent of the treatments. Therefore, the timing, magnitude, and duration of flows would not be altered. Instream flows and fluvial processes would continue to occur at the rates under which the stream system evolved. Habitat diversity, channel stability, and water quality would continue to be moderate to high.

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

There are no wet meadows or wetlands near the project.

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 distribution of CWD sufficient to sustain physical complexity and stability.

The project will not alter species composition, structural diversity, thermal regulation, nutrient filtering, rates of surface or bank erosion, channel migration, or large woody debris recruitment in riparian reserves, as equipment exclusion buffers and low-intensity TFB and HFR treatments are spatially limited to 130 acres or 16 percent of the project area units.

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

As the Proposed Action is designed to maintain forest canopy closure at 60-plus percent providing shade with diverse multi-storied structure, riparian reserve conditions would maintain microclimate in the reserve corridors. In some drainages, these reserve corridors would extend to ridgeline saddles and connect with the corridors of other subwatersheds to provide for travel and dispersal of animals and maintain habitat connectivity across the landscape. This would provide sufficient well-distributed habitats for terrestrial and aquatic species such as fish, mollusks, amphibians, lichens, fungi, bryophytes, vascular plants, and retention of adequate habitat conditions for dispersal of NSOs.

Geologic Resources

Introduction
The geologic effected environment consists of unstable lands that have potential to impact streams. The SRNF LRMP requires addressing the potential for increased mass movement for proposed timber harvest or building of roads and landings by development of landslide hazard maps and risk assessment (USDA 1995 pp. IV-71). Unstable and potentially unstable lands (including earthflows) are included in riparian reserves as directed by the ACS objectives, which direct management activities to result in non-degradation and restoration of aquatic and riparian ecosystems (USDA 1995 pp. IV-44-45). This is because landslides are a key component of the riparian system, supplying and metering sediment and
large wood that are essential habitat elements of Pacific Northwest river systems. Unstable lands are defined as lands prone to mass failure under natural conditions and where human activities, such as road building and harvest, are likely to increase landslide distribution and frequency to the point likely to modify geomorphic and hydrologic processes. They include active landslides and those that exhibit sound evidence of movement in the past 400 years, inner gorges, and lands identified as unstable by geologic investigation (USDA 1994).

In order to meet ACS objectives, vegetation management activities follow several sets of guidelines including LRMP S&Gs, BMPs (USDA 2010) and PDFs. These guidelines are incorporated into project analyses and design, and provide a set of practices, which, during project implementation, allow for both accomplishment of project objectives, and maintenance and restoration of riparian function and condition. Because of these prescriptive methods, vegetation management within all unstable lands meet ACS objectives as project activities do not accelerate mass movement above background rates. This is largely achieved by restricting mechanical vegetation management to outside of unstable lands.

The forest plan also requires compliance with federal regulations for airborne asbestos (USDA 1995, p. IV-116).

Environmental Consequences

Methodology

Resources used to identify unstable and potentially unstable lands were bedrock geology and geomorphic maps verified by field investigations. The bedrock geology GIS database was derived from published geologic maps. The original published geologic map was also used as a reference. (McLaughlin 2000). GIS databases for geomorphology and active landslides were derived from air photo analysis performed by forest service geologists. Active landslides and geomorphic landforms were verified in field. Active landslides adjacent to streams with evidence of activity within the past 400 years were mapped individually within a single GIS database and were included as riparian reserves. All inner gorges were encompassed by stream riparian reserve buffer distances so were not mapped individually.

Alternative 1 – No Action

Direct Effects

Eight active landslides were identified in the project area including two deep-seated earthflows. No ultramafic bedrock and therefore, no naturally occurring asbestos occur in the project area.

There are no direct effects of choosing the No Action Alternative.

Indirect Effects

A major mitigating factor in reducing the risks of accelerating landslide activity is the prevention of high-intensity fire itself through the proposed actions of fuels reduction and prescribed burning (Levitan 2013, Rolof et al. 2005). The low burn intensities and retention of trees associated with the proposed fuels treatments minimize the longer-term risks associated with high intensity burns such as decreased infiltration from hydrophobicity, and loss of root strength with vegetation clearing (Iverson 2000, Roering and Jackson 2009, Wondzell and King 2003, Ziemer 1981, de la Fuente et al. 2002).

While there are areas of concern where project effects, such as mechanical ground-based yarding, might have short-term deleterious effects, such as locally triggering slope instability if not performed according
to appropriate design features, the consequences of no action might be more significant from a slope stability perspective. Notably, reactivation of deep-seated landslides has been observed in a number of high severity burned areas (Mikulovsky et al. 2012). Common factors among these reactivations include stand-replacing (high or complete tree mortality) fire in late seral or old growth stands, and deep-seated landslides (earthflows, block sides, rotational/translational complexes, etc.) on highly sheared or unconsolidated geologic types. In the Coast Ranges, Franciscan rock types that were mélanges were involved and mélanges exist within the project area and contain existing earthflows. Because the project area has been fire-excluded for a lengthy period, it is likely that wildfire in the area would spread rapidly and extensively, and would burn at high severity in areas that resemble those with the described reactivated landslides. It is reasonable to assume then, that treatments such as those proposed, if they prove effective at reducing fire risk, will provide safer access for firefighters to contain fire starts, reduce the overall pattern of high burn severity on the landscape, and be effective in helping maintain hillslope stability and landslide activity rates within their range of historic variability, and meet the desired condition under SRNF LRMP.

**Cumulative Effects**

There are no cumulative effects associated with the No Action Alternative.

**Alternative 2 – Proposed Action**

**Direct Effects**

There are no direct effects to geological resources.

**Indirect Effects**

The activities that pose some, but minimal risk to unstable lands are commercial ground and cable mechanical harvest, and prescribed burning. Because all mechanical harvest or operation of machinery within unstable lands is prohibited, the risk and effects are indirect. The risk is that disturbed ground adjacent to unstable lands may trigger mass movement at a rate and distribution greater than average rates without human disturbance. The disturbances that pose the risk are skid trails that can concentrate flow to active scarps and landslide masses, and compaction that can alter groundwater patterns and, to an unpredictable degree, potentially increase subsurface water flow to active scarps and landslide masses. Disturbance of ground is restricted to 15 percent or less as per LRMP Standard and Guideline 1-2 (USDA 1995 p. IV-71). This limits both the number of skid trails and area of ground compacted, thereby limiting potential effects and risk. Standards and guidelines require remediation of skid trails including installation of water bars, which eliminate risk of increased concentrated flow to unstable lands.

Risk of increased landslide activity due alteration of deeper subsurface flow patterns due to compaction poses minimal risk. Compaction by heavy machinery has a greater impact to the soil at the surface and causes more increased surface runoff and erosion than it does to alter deeper subsurface flow patterns (Reid 2010). Although there is a potential for changes to deeper subsurface flow patterns due to compaction, with the limit of ground compaction to less than 15 percent, it is unlikely that increased subsurface flow to unstable lands will occur, minimizing risk of increased landslide activity, due to compaction.

Increased subsurface water to landslide masses has been shown to increase mass movement activity (Ziemer 1981, Reid 2010, Roering and Jackson 2009, Roering et al. 2003)), however, increased subsurface water that triggered landslides was typically from lack of tree evapotranspiration after total vegetation loss due to harvest or fire (Ziemer 1981, Reid 2010, Roering and Jackson 2009, Roering et al. 2003). The
project retains at minimum 40 percent of canopy cover, and leaves all pre-dominant and dominant trees, so land adjacent to unstable lands will not provide increased subsurface water by loss of vegetation.

The proposed actions for prescribed burning plan to maintain low to moderate intensity thereby retaining live trees and root strength. At low and moderate intensities, surface duff cover is restored rapidly and poses minimal risk to increased runoff to unstable lands. Risk of debris flows exists where soil burn intensities reach moderately high to high levels, but these are typically short-term risks during the one to two winter seasons post burn (Wondzell and King 2003). The project designs include multiple strategies for controlling burn intensities such as implementation within strict moisture regimes and limits on spatial extent and fuel types. By following project designs, the risk of generating moderately high to high burn intensities is greatly reduced.

Further, all risk of landslide activity is by intense storms. This trigger is unpredictable. Though, on average, 10- to 15-year magnitude storms are the most likely to produce mass movement (Spittler 1989, Wondzell and King 2003), actual storm intensities that can trigger landslides depend on antecedent and subsurface infiltration conditions (Iverson 2000, Roering and Jackson 2009). However, a major mitigating factor in reducing the risk of landslide activity is the prevention of high intensity fire itself through the proposed actions of fuels reduction and prescribed burning (Levitan 2013, Rolof et al. 2005). The low burn intensities and retention of trees associated with the proposed fuels treatments minimize the longer-term risks associated with high intensity burns such as decreased infiltration from hydrophobicity, and loss of root strength with vegetation clearing (Iverson 2000, Roering and Jackson 2009, Wondzell and King 2003, Ziemer 1981, de la Fuente et al. 2002, Bosch and Hewlett 1982).

Cumulative Effects
Surveys identified eight active landslides within the project area. There are no other Forest Service or private land activities occurring within these sites. Cumulative effects are minimal to none for risk of increased rate of landslide activity. Landslide activity has been shown to increase about 10 years after all vegetation has been removed by fire or harvest due to loss of root strength. The project would not remove all vegetation, thereby preserving root strength in the long-term and will not increase landslide activity. Concentrated flow from skid trails would not occur due to application of skid trial remediation as per S&Gs and pose no long-term risk. If S&Gs, BMPs, and PDFs are followed, negative effects to slope stability should be minimal or absent as compared to the likelihood that extensive landslide reactivation would be in the event of stand-replacing fire across much of the landscape.

Soil Resources

Introduction
This section presents an assessment of current soil conditions and the analysis of potential effects of proposed treatments to short-term and long-term soil quality and productivity in the project area.
Environmental Consequences

Methodology

Forest Service Manual 2550 – Soil Management (Nov. 2010)

Forest Service Manual (FSM) 2550 provides a national directive to maintain or restore soil quality on NFS lands, and establishes the management framework for sustaining soil quality and hydrologic function while providing goods and ecosystem services outlined in forest and grassland LRMPs. The FSM defines soil productivity and soil quality, and describes soil functions that may be used in evaluating soil quality.

The FSM outlines programmatic requirements for assessments, analyses, and monitoring pursuant to management activities, and outlines general requirements that S&Gs be developed and implemented at regional and forest levels.

Standards and guidelines are intended to prevent substantial and permanent damage or degradation that affects inherent ecosystem processes. Substantial and permanent soil impairment is defined as detrimental changes in soil properties (physical, chemical, biological) that result in the loss of the inherent ecological capacity or hydrologic function of the soil resource, over the mid-term (substantial, beyond the duration of the project) to long-term (permanent, beyond a land management planning period), respectively.

Forest Service Region 5 FSM Supplement – Soil Quality Management (R5-2500-2017-1)

Soil management direction is applied to lands dedicated to growing vegetation; it is not applied to areas dedicated to other uses, such as roads, trails, administrative and recreation sites, etc. The Supplement specifies three (3) key soil functions to be used in R5 for assessment and analysis of soil quality: support for plant growth function, soil hydrologic function, and filtering-buffering function. Indicators and desired conditions for indicators are outlined for each soil function. Soil condition is rated as good, fair, or poor for each indicator relative to the desired condition. This approach is intended to help determine the status and trend of soil management, determine whether ecosystem health and long-term soil productivity is being maintained, and better determine needs and priorities for restoration activities.

The R5 Soil Quality Management Supplement (SQMS) uses the following indicators to evaluate management effects on key soil functions:

Support for Plant Growth Function (Soil productivity)

- **Soil stability**: maintain adequate soil cover to prevent accelerated erosion.
- **Surface organic matter**: maintain adequate soil cover to provide for support of soil biology and nutrient cycling (maintain soil inputs of organic matter).
- **Soil Organic Matter (SOM)**: maintain the topsoil in place (avoid excessive displacement). An area is considered displaced if more than one-half (0.50) or four (4) inches (whichever is less) is removed from a contiguous area larger than 100 square feet.
- **Soil strength**: maintain a favorable rooting environment (avoid excessive compaction).
- **Soil moisture regime**: maintain the inherent soil moisture regime, especially in wet meadows and fens.

Soil Hydrologic Function

- **Soil stability**: maintain adequate soil cover to prevent accelerated erosion.
Soil structure and macro-porosity: maintain sufficient structure and macro-porosity in most of the area to provide for water infiltration and permeability (avoid excessive compaction, displacement, puddling, or severe burning).

Filtering-Buffering Function
For projects involving chemical or nutrient applications to the soil, an analysis is completed to maintain soil chemistry and capacity to filter and buffer foreign compounds. Another provision of the supplement is considerable direction on the process of conducting assessments and analyses. The activity area is no longer defined necessarily as individual harvest units, and it is not considered always necessary to field review every unit. For large projects (such as this), a prioritization approach is recommended, utilizing various soil risk ratings and interpretations to focus field review on areas with the higher risks to soils:

- Assessments can be conducted on individual treatment units, entire activity areas, or specially designated land management areas. The area bounded by the assessment would be described or defined.”
- “Existing soil condition must be determined in the field, and field work needs to be focused where risks are greatest. Generally, it is not feasible or practical to field visit all proposed management areas, so priority sites must be chosen. Highest priority areas to field review are where soil condition may have been adversely affected by past management, and where proposed activities have the greatest potential to cause adverse effects to soil functions.”

Various types of soil disturbance (compaction, displacement, severe burning, etc.) may affect key soil functions in different ways on different soils and sites. Both degree and extent of disturbance are important considerations that must be evaluated together to assess potential adverse impacts on soil functions for the activity area. Quantitative measures or thresholds/limits for various types of soil disturbance are generally not provided in the Supplement, recognizing that one-size-fits-all ‘standards’ are often inappropriate for particular or differing soil types, and recognizing that disturbances need to be evaluated in a site and soil specific manner during assessments and analyses. The objective is to avoid or minimize disturbances that may impair key soil functions for the activity area, as that is defined. Areas rated in a poor condition should be considered for restoration activities.

Specific measures, indicators, and thresholds are established at the project scale in assessing soil condition, and for evaluating the effects of the proposed project on the soil resource: what gets looked at, why, and interpretation of what it means to soil quality and site productivity. This is described for this project in the methods and analysis sections below.

Soils information for the project area was obtained from two sources. The SRNF Soil Survey (1993) was primarily used for soil mapping coverage and various soil interpretations (e.g., susceptibility to burning damage). The Natural Resource Conservation Service (NRCS) Web Soil Survey\(^{13}\) has publicly available soil mapping, map unit descriptions, information on soil physical, chemical, and engineering properties, along with additional NRCS soil interpretations. This was used to obtain official series descriptions, updated taxonomy information, and lab information (such as clay and organic matter content), realizing that such properties likely differ from the site-specific soils being assessed, but useful to rate soils on a relative basis for general sensitivity to various kinds of disturbance. Ultimately, soil resource information was field-verified to assure accuracy of soil properties and interpretations at the site/project scale.

\(^{13}\) See [http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm](http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm)
Soil Erosion Rating
The Region 5 Soil Erosion Hazard Rating (EHR) System (USDA Forest Service 1990) was used to rate the risk of soil erosion for all soils in the project area. This system uses various physical soil properties along with climate and site-specific factors to rate soils for hazard of sheet and rill erosion. This system can also be used to determine the amount of surface cover necessary post-activity to avoid raising the erosion hazard rating to a higher risk level, and to determine the slope gradient at which EHR becomes higher with other site factors held constant. Hazards of gully erosion or mass wasting are not addressed with this procedure; these are evaluated on site during site visits, specifically looking for past problem areas that could also be future problems.

Field Observations
The purpose of the field investigations were to: 1) validate soil mapping coverage; 2) gather information on site-specific soil properties; 3) assess current soil conditions as affected by past management activities; 4) develop predictions on soil response to the proposed activities.

Field surveys were largely ocular, meaning emphasis was given to traversing a large portion of unit areas and visually observing the range of conditions and kinds and amounts of disturbance from past activities, with soil pits along the way to document soil types and condition. Most soil pits were relatively shallow (1 to 2 feet deep) as physical soil impacts are largely confined to this surficial layer. Profile horizonation, texture, structure, rock content, and color were used to distinguish and identify different soils for mapping validation, as well as evaluating resistance and resilience of soils to physical impacts, for example susceptibility to compaction. Other site-specific data was collected for the analysis portion below, mainly site and topography data such as slope gradient, soil cover amount and components including rock cover, and LWM concentrations.

Current soil conditions in undisturbed state were observed, as well as altered states resulting from past management effects. Most of the mechanical units have some level of management history using ground-based equipment, as detailed below. Old features such as skid trails, landings, and former temporary roads were inspected for degree and extent of detrimental soil conditions, in particular erosion features, compaction, and soil displacement. No soil-related legacy problems were identified to be brought forward to the IDT as restoration opportunities to consider with the project.

Analysis Methods and Assumptions
Analysis first requires an assessment of the existing or baseline condition and then a prediction of the effects from the proposed activities. Existing current conditions were determined in the field. Soil impacts from proposed activities consider the types of activities, types of equipment and manner of operations expected, potential for detrimental disturbances, including where and to what extent, and further how long impacts are expected to persist considering expected rates of natural recovery or revegetation.

Information sources include the silvicultural prescriptions, including treatment methods, aerial photography, NRCS and USGS certified data, forest GIS layers, the Forest Soil Survey (USFS 1993), custom GIS products generated for this project, field notes from site visits, and other interdisciplinary specialists’ input (particularly geology, hydrology, silviculture and fuels).

Regarding silvicultural prescriptions and mechanical operations: some unit prescriptions have optional methods to be used for the fuel reduction component of activities, namely through hand piling, mechanical piling, mastication, and/or understory burns. This is intended to confer flexibility for implementation as site-specific conditions warrant at the time; however, different activities carry different consequences for analysis purposes. It thus must be assumed for analysis that the more disturbing of alternate practices will
be used (i.e., “conservatively” estimating more rather than less soil-disturbing methods will take place). For example, many of the units involve pile burning, with piling accomplished by hand and/or machine piling; for analysis, it is assumed machine piling is the more impactful option. Some of the PDFs are prescribed with this in mind, which risk being overly restrictive where less-disturbing activities wind up being chosen. This is necessary to address the range of soil disturbing activities that may be expected to occur and ensure compliance with LRMP standards. Mechanical treatments are expected to be restricted to allowable slope gradients as specified in the LRMP. Units are further assumed to be treated in designated portions over approximately 10 to 15 years, so impacts will be spread out over time, not all at once or in a couple years like the scope of a conventional commercial timber sale.

**Spatial and Temporal Bounding of the Effects Analysis**

For soil resource analysis, the analysis area for direct effects is bounded spatially by the entire “footprint” of the project activity units, as this is the full extent of direct soil disturbing activities. The R5 Supplement and the forest plan indicate that the activity area is an appropriate scale to analyze project effects on the soil resource. Forest plan soil quality standards (SQS) are intended to be used at this scale to determine project effects on key soil functions, focusing here upon soil productivity and soil hydrologic function.

For indirect and cumulative effects, the analysis area is likewise the same as the proposed project area (unit areas only). Although surface runoff egressing the project units could possibly affect adjacent downhill slopes, it is only relevant where 1) runoff may be expected to occur, and 2) site-specific topography indicates runoff could pose additional off-site scouring, erosion, or water quality concerns. It is an assumption that runoff and erosion concerns are expected to be controlled on-site through effective BMPs and drainage controls. Thus, the analysis area for direct and indirect effects is the same, the proposed project area units.

The analysis is further bounded in time by the foreseeable future period during which effects of this project could persist as detectable, significant effects. Some soil impacts, such as cover reductions, can naturally recover quite quickly from needlecast and other organic debris deposited on the forest floor. Others, such as compaction and effects of displacement, can persist for decades. In general, expectation for temporal longevity of effects is discussed as short-term (<5 years), mid-term (5 to 20 years), or long-term (>20 years) effects. For cumulative effects, the analysis is bounded in time by past, present, and reasonably foreseeable future projects.

By adhering to SQS for limiting detrimental effects such as erosion, compaction, displacement, and loss of organic matter components, key soil functions described above are assumed to be maintained, in both space and time. A further level of analysis and discussion is warranted where SQS are expected to be exceeded in significant portions of the unit area. Greater than 15 percent of the area has conventionally been used for this extent threshold of concern for soils, though it is only technically specified for compaction and coincidental area in tractor skid trails.

**Analysis Indicators**

The effects of individual management activities on the soil resource, pertaining to soil productivity and soil ecological function, is guided using the regulatory framework outlined above, with particular emphasis on the most specific guidance: Six Rivers LRMP S&Gs and SQS (Appendix L).

Three indicators were chosen that best address relevant soil issues in the project and measure compliance with LRMP S&Gs. The indicators include soil stability (soil cover for erosion prevention), soil organic matter (conservation of), and soil structure & porosity (limiting aerial extent of compaction and
displacement). The unit measures for each indictor are percentage area (acres) not meeting desired conditions, as set forth from applicable LRMP S&Gs and/or SQS.

**Soil Resource Inventory**

The Order 3 soil survey was judged as having good accuracy and utility for project planning based upon field review. No areas were found that had substantially different soil types, which would change interpretations and conclusions regarding environmental effects of proposed activities. This project area has an unusual variety of soil types, not one or a few dominant soils based on relative acreage; however, most soils are fairly similar in certain key respects such as surface texture and depth. In all, there are 10 soil map units with 20 family-phases in various combinations and component proportions (Table 14 and Table 15).

Map phases are most commonly based upon slope class and perhaps depth class. Here Clallam is an example having 3 phases differentiated by rock fragment content and aspect (“dry” occurring on south aspects). Riverwash bridges alluvial and dry-floodplain and stream terrace environs. All but one (1) soil map unit are associations, meaning the components occur in a predictable and repeatable pattern such that they could be mapped at Order 2 survey intensity (1:24,000). This was not necessary here since most of the soils have similar manageability characteristics relative to this kind of project, as described below, so there would be no added benefit from the effort.

Soil maps are in Appendix A of the Soils Report, with Table 14 serving as the soil map unit legend. Select properties and risk ratings including EHR for the dominant soils are displayed in Table 15 and Table 16 below.

<table>
<thead>
<tr>
<th>Soil Map Unit</th>
<th>Map Unit Name</th>
<th>MU Type</th>
<th>Acres</th>
<th>GIS Slop %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min.</td>
</tr>
<tr>
<td>100</td>
<td>Typic Xerofluvents-Riverwash, 2-10% slopes</td>
<td>Assoc.</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>250</td>
<td>Oxalis-Hecker-Doty, deep, 25-70% slopes</td>
<td>Family</td>
<td>1.1</td>
<td>27</td>
</tr>
<tr>
<td>256</td>
<td>Hecker deep, 35-70% slopes</td>
<td>Assoc.</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>257</td>
<td>Dins deep-Nanny deep-Woodseye, 5-35% slopes</td>
<td>Assoc.</td>
<td>8.4</td>
<td>0</td>
</tr>
<tr>
<td>258</td>
<td>Albus-Race, deep, 35-70% slopes</td>
<td>Assoc.</td>
<td>119</td>
<td>12</td>
</tr>
<tr>
<td>259</td>
<td>Nanny deep-Woodseye-Bins deep, 35-70 slopes</td>
<td>Assoc.</td>
<td>151</td>
<td>0</td>
</tr>
<tr>
<td>260</td>
<td>Skalan-Kistik-Holland, deep, 35-70% slopes</td>
<td>Assoc.</td>
<td>278</td>
<td>0</td>
</tr>
<tr>
<td>265</td>
<td>Clallam-Hugo-Holland, deep, dry, 35-70% slopes</td>
<td>Assoc.</td>
<td>103</td>
<td>0</td>
</tr>
<tr>
<td>266</td>
<td>Clallam-Hugo-Holland, deep, 30-50% slopes</td>
<td>Assoc.</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>281</td>
<td>Clallam deep, eg Deadwood, 35-70% slopes</td>
<td>Assoc.</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td><strong>823</strong></td>
<td>0</td>
</tr>
</tbody>
</table>
### Table 15. Soil families in descending extent, including select properties and interpretations. Acreage is prorated from unit component acres, less exclusions. Abbreviations are standard soil science.

<table>
<thead>
<tr>
<th>Soil Family/Phase</th>
<th>Rel. Acres</th>
<th>Rel. Acres</th>
<th>A Texture</th>
<th>Depth Tex.</th>
<th>Δ Sub. Texture</th>
<th>Depth</th>
<th>RFC (top 12&quot;)</th>
<th>HydroGroup</th>
<th>Compaction</th>
<th>BurnDamage</th>
<th>SiteClass</th>
<th>Part. Class</th>
<th>Taxonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skalan deep</td>
<td>81.5</td>
<td>13.4%</td>
<td>vgl</td>
<td>12 vglCL</td>
<td>56 55</td>
<td>B-C</td>
<td>moderate</td>
<td>low</td>
<td>3-4</td>
<td>L-skel</td>
<td>Ultic Haploxeralf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holland deep</td>
<td>69.6</td>
<td>11.1%</td>
<td>vgl 6</td>
<td>gL 40-60</td>
<td>40 C</td>
<td>moderate</td>
<td>low-mod</td>
<td>3</td>
<td>fine-L</td>
<td>Ultic Haploxeralf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kistini deep</td>
<td>60.9</td>
<td>9.7%</td>
<td>vgl 8 vcl</td>
<td>53-79</td>
<td>40 C</td>
<td>high</td>
<td>moderate</td>
<td>3-4</td>
<td>L-skel</td>
<td>Ultic Haploxeralf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albus deep</td>
<td>53.6</td>
<td>8.6%</td>
<td>gl 14 gcl</td>
<td>44-60</td>
<td>15 B-C</td>
<td>moderate</td>
<td>moderate</td>
<td>3-4</td>
<td>L-skel</td>
<td>Ultic Haploxeralf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nanny deep</td>
<td>47.5</td>
<td>7.6%</td>
<td>gl 10 egL</td>
<td>40-60</td>
<td>20-45 B-C</td>
<td>moderate</td>
<td>moderate</td>
<td>3-4</td>
<td>L-skel</td>
<td>Typic Xerumbrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodseye [shallow]</td>
<td>46.7</td>
<td>7.5%</td>
<td>gl 8 egL</td>
<td>14 20-60</td>
<td>C</td>
<td>moderate</td>
<td>moderate</td>
<td>4-5</td>
<td>L-skel</td>
<td>Ultic Xerumbrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race deep</td>
<td>41.7</td>
<td>6.7%</td>
<td>gl 16 ccl</td>
<td>40-60</td>
<td>20 C</td>
<td>moderate</td>
<td>moderate</td>
<td>3</td>
<td>fine-L</td>
<td>Dystric Xerochrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clallam deep eg</td>
<td>39.5</td>
<td>6.3%</td>
<td>egL 42 R</td>
<td>42 60-80</td>
<td>B</td>
<td>moderate</td>
<td>high</td>
<td>5</td>
<td>L-skel</td>
<td>Dystric Xerochrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clallam deep dry</td>
<td>36.0</td>
<td>5.8%</td>
<td>vgl 13 egL</td>
<td>53 35</td>
<td>B</td>
<td>moderate</td>
<td>high</td>
<td>4-5</td>
<td>L-skel</td>
<td>Dystric Xerochrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bins deep</td>
<td>33.2</td>
<td>5.3%</td>
<td>L 10 gi</td>
<td>58 0-15</td>
<td>B-C</td>
<td>moderate</td>
<td>low-mod</td>
<td>3</td>
<td>fine-L</td>
<td>Typic Xerumbrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deadwood [shallow]</td>
<td>26.4</td>
<td>4.2%</td>
<td>vgl 14</td>
<td>18 15</td>
<td>D</td>
<td>moderate</td>
<td>high</td>
<td>5-6</td>
<td>fine-L</td>
<td>Dystric Xerochrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holland deep dry</td>
<td>20.6</td>
<td>3.3%</td>
<td>vgl 6 gL</td>
<td>40-60</td>
<td>40 C</td>
<td>moderate</td>
<td>high</td>
<td>3</td>
<td>fine-L</td>
<td>Ultic Haploxeralf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hago deep dry</td>
<td>20.6</td>
<td>3.3%</td>
<td>gi 7 SIl</td>
<td>40-60</td>
<td>15 B</td>
<td>high</td>
<td>high</td>
<td>3</td>
<td>fine-L</td>
<td>Dystric Xerochrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hecker deep</td>
<td>19.2</td>
<td>3.1%</td>
<td>gi 6 vglCL</td>
<td>40-60</td>
<td>15 B-C</td>
<td>high</td>
<td>mod-low</td>
<td>4</td>
<td>L-skel</td>
<td>Mollic Haploxeralf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clallam deep</td>
<td>7.8</td>
<td>1.3%</td>
<td>egL 13</td>
<td>53 35</td>
<td>B-C</td>
<td>moderate</td>
<td>4</td>
<td>L-skel</td>
<td>Dystric Xerochrept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typic Xerofluvents</td>
<td>6.6</td>
<td>1.1%</td>
<td>gl 10-30</td>
<td>vgL 40-60- &gt;35</td>
<td>A</td>
<td>low</td>
<td>low</td>
<td>n/a</td>
<td>S-sk L</td>
<td>Typic Xerofluvents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hago deep</td>
<td>6.5</td>
<td>1.0%</td>
<td>gi 7 SIl</td>
<td>40-60</td>
<td>15 C</td>
<td>high</td>
<td>moderate</td>
<td>3</td>
<td>fine-L</td>
<td>Dystric Xerochrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riverwash</td>
<td>4.9</td>
<td>0.8%</td>
<td>egS 10-30</td>
<td>cS 60+ &gt;35</td>
<td>A</td>
<td>low</td>
<td>low</td>
<td>n/a</td>
<td>S-sk L</td>
<td>Riverwash</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxalis deep</td>
<td>0.4</td>
<td>0.1%</td>
<td>SIl 8</td>
<td>40-60</td>
<td>0-10 C</td>
<td>high</td>
<td>moderate</td>
<td>non-com</td>
<td>fine-L</td>
<td>Vertic Xerochrept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doty deep</td>
<td>0.2</td>
<td>0.0%</td>
<td>L 7 CL</td>
<td>40-60</td>
<td>5 B</td>
<td>high</td>
<td>low</td>
<td>4</td>
<td>fine-L</td>
<td>Pachic Xerumbrept</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Most of the soils within the project area are deep, well drained, with gravelly to very gravelly loam surface textures; several soils have finer-textured subsoils, sometimes fairly shallow and sometimes at depth. Woodseye and Deadwood are the only shallow soils, and only Deadwood has a soil hydrologic group D.

Soil hydrologic groups (Table 15) indicate the potential of a soil to produce runoff from long duration storms, when soils are already thoroughly wet and are not protected by vegetation. Groups range from A, indicating very low runoff potential, to D, indicating prone to flashy runoff with erosion consequences. Soils here are mostly B or C. Group C soils indicate moderate runoff potential due to their less permeable subsoil, shallower profile depth, or both.

Compaction risk rating in Table 15 follows Roath (2006). Relatively high rock fragment content (RFC) and organic matter content are both beneficial in making topsoils moderately resistant and resilient to compaction from ground based machinery. Most soils have a moderate compaction risk because of loam surface textures. Soils with a high rating have a finer-textured subsoil (clay loam or silt loam) within 12 inches of the surface. These shallowing-occurring fine textures are susceptible to compaction, and have a higher risk of exposing less-permeable subsoil from incidental displacement with mechanical ground-based yarding. This is the sort of risk identification that may drive development of unit-specific PDFs after field review; compaction risk is usually best dealt with by limiting the extent (% area) of mechanical operations.

Burn damage risk rating (Table 15) indicates the susceptibility of heat to penetrate the soil during a fire, volatilize SOM, and kill soil microorganisms. While this is primarily determined by fire intensity, soil properties such as texture, rock content, parent material, and organic matter content can influence heat penetration to some degree. Long-term burn damage is mainly related to the loss of SOM, which requires long timeframes to accumulate within the soil. Soil moisture status at the time of burning also has a profound influence on heat penetration (Busse et al. 2010), but is not a factor in this rating system due to its transient nature. Clallam, Deadwood, and dry-phase soils have a high burn damage susceptibility rating because of lower levels of SOM in the topsoil. Soils with a moderate rating and not severely burned are expected to naturally recover in the short term. That said, prescribed burning activities still carry a risk of erosion if too much soil cover is removed, particularly on flatter slopes and soils with high EHR.
Table 16. Erosion hazard ratings for soil map units (calculations may be seen in Appendix C of the Soils Report).

<table>
<thead>
<tr>
<th>Soil MU</th>
<th>Map Unit Name</th>
<th>% slope</th>
<th>Soil Cover Levels</th>
<th>Erosion Hazard Rating</th>
<th>High EHR limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>Oxalis-Hecker-Doty, deep, 25-70% slopes</td>
<td>31</td>
<td>C-B</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>256</td>
<td>Hecker deep, 35-70% slopes</td>
<td>45</td>
<td>B-C</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>257</td>
<td>Bins deep-Nanny deep-Woodseye, 5-35% slopes</td>
<td>14</td>
<td>B-C</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>258</td>
<td>Albus-Place, deep, 35-70% slopes</td>
<td>30</td>
<td>B-C</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>259</td>
<td>Nanny deep-Woodseye-Bins deep, 35-70% slopes</td>
<td>15</td>
<td>B-C</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>260</td>
<td>Skalan-Kistirn-Holland, deep, 35-70% slopes</td>
<td>36</td>
<td>B-C</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>265</td>
<td>Clallam-Hugo-Holland, deep, dry, 35-70% slopes</td>
<td>33</td>
<td>B-C</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>266</td>
<td>Clallam-Hugo-Holland, deep, 30-50% slopes</td>
<td>50</td>
<td>B-C</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>281</td>
<td>Clallam deep eq, Deadwood, 35-70% slopes</td>
<td>38</td>
<td>C</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

Note: “current” condition assumes 95% ground cover, “post-project” assumes > 50% ground cover, “bare” includes only overstory canopy and rock cover.

Erosion hazard rating results in Table 16 are calculated for project specific conditions and local climate. These are based upon the dominant soil component in each map unit. Often an approach rating the “most limiting” component is taken or rating components separately, if they are drastically different. Soil map units here do not generally have strongly contrasting soil components that might otherwise necessitate this.

None of the soils have a high EHR with 50 to 70 percent soil cover on their respective average slope gradients. Most of the soils do not even have a high EHR when bare, due to these surface loams being very porous (>2 in/hr. infiltration rate), which is typical of loamy and most fine-loamy forest soils. All soils will reach a high EHR at some point of steepness with 50 percent or less soil cover, or even with 50 to 70 percent cover for most soils. The EHR slope limit in Table 16 is the slope gradient at which EHR becomes high with assumed 50 to 70 percent soil cover post-project; this would indicate a need for soil cover additions above this limit to maintain a moderate or lower EHR (**denotes these soils do not actually occur on slopes this steep (e.g., Bins)). The soils that do have a high EHR when bare are relatively minor in extent (<60 acres total), but would warrant caution where they occur to not create large bare areas, particularly on slopes greater than 50 percent as a general practice for all soils here.

Thus, from a manageability perspective, considering texture, depth, and interpretive ratings, these soils fall into three groups: 1) soils which are more susceptible to compaction and displacement impacts because of fine-textured subsoils shallow beneath the surface (Kistirn, Hugo, Hecker, Oxalis, Doty); 2) soils susceptible to burn damage because of low OM content (Clallam, Deadwood, and dry-phase soils on south aspects); 3) other soils which are generally more resistant/resilient to management related impacts.

Oxalis is repeatedly noted as different. This is a somewhat unique soil found in the “glades” that supports mixed grassland-oak woodland; it has finer textures (SiL overlying SiC) than any of the other soils (Table 15), and is considered “non-commercial”—it does not support productive forest. Silty clay is a very unusual texture on NFS lands. Also, notable, Oxalis is vertic meaning it has shrink-swell clays that form cracks seasonally when dry; thus infiltration and permeability function differently in this soil, and natural recovery of compaction is relatively fast. Oxalis only occurs in tiny portions (0.5 to 0.6 acres) of two units (416 and 613), both oak woodland restoration units where actual ground impacts are expected to be quite minimal.

All of these management risk ratings collectively indicate the general sensitivity or resistance and resilience of different soil types to different kinds of disturbances or impacts. They were also used as a pre-field filter to help identify and prioritize emphasis areas for more detailed field review, to ensure that soils types, which are generally more sensitive to management related impacts, receive more attention and thorough review, given the management activities proposed. Units are routinely dropped during the field review phase for various resource concerns, including slope stability and soils concerns when they pose...
higher risks. Again, these are the sort of risk factors that may drive development of unit-specific PDFs after field review.

**Alternative 1 – No Action**

**Direct Effects**
Direct effects of the No Action Alternative would be of no immediate effect at all on the soils, as new soil disturbing activities would not take place. Soil cover for erosion protection would not change. Present compaction levels would remain the same in the short-term, with very slow long-term natural recovery. Surface organic matter components would continue to accumulate faster than decomposition. Soil organic matter would be unaffected. Soil hydrologic function would be unaffected.

**Indirect Effects**
Indirect effects of the No Action Alternative would be the increased accumulation of organic matter in terms of surface and ladder fuels, with a corresponding continual increase in fire hazard. Fire hazard is not the probability of a fire ignition, but that a fire ignition (human or lightning caused) would result in a successful fire start and spread, and fire behavior would be more severe. Fire hazard already represents an unacceptable threat to values at risk in proximity to the project area due to present vegetation composition. The No Action Alternative would do nothing to alleviate the hazard, and would do nothing to provide for a more manageable firefighting scenario in the eventual case of another fire.

These fuelbreaks also provide opportunities for compartmentalizing fires when they do occur, as a matter of when, not if. To the extent that management activities can reduce the eventual size of high severity fires, soil resources benefit in the long term. Low to moderate severity fire is not usually considered a serious threat to soil resources, but high soil burn severity can have long-term consequences to soils. High severity fire may have other resource benefits, depending on scale, but not for soils as an essentially non-renewable and irreplaceable resource in human timeframes.

**Cumulative Effects**
There would be no additional impacts to soils with the No Action Alternative, so there would be no additive effects of other past, present and reasonably foreseeable future actions, and therefore by definition no cumulative effects. Soils would continue to have natural ecological function and soil productivity would be unaffected relative to the current existing condition. It can certainly be argued that there are ecological cumulative effects of the No Action Alternative, in terms of wildfire effects to soils, watersheds, and TE fish and wildlife habitats, but wildfires are not Forest Service actions, so they are not usually discussed in this NEPA context of cumulative effects.

**Alternative 2 – Proposed Action**
The environmental effects were analyzed with the intent and assumption that BMPs and the following PDFs are effectively applied to the Proposed Action, meaning they are implemented and achieve the intended results on the ground. Best management practices are intended to manage water quality consistent with the Federal Water Quality Act (WCA) and State of California water quality programs. Best management practices are not repeated here; see the project hydrologist’s report for specifics. Notable here is that many of the BMPs concurrently address soils concerns to the extent they are intended to prevent or minimize surface erosion and sediment movement. Appendix C of the EA discloses a list of applicable BMPs.
Direct Effects

Direct effects are generally analyzed in the context of activity types and where they are expected to occur (i.e., what “footprint features” would be left behind and what are the soil impacts there). The direct effects of these activities are very largely predictable based upon expected methods of operations and location of activities in terms of topography and soils and vegetation composition, the latter indicating types and amounts of removals or general treatment intensity (Table 17). The effects of these different activities on the soil resources are well understood from years of experience planning and monitoring the effects of such activities on a wide variety of soils.

New temporary roads and landings are the most impactful features associated with activities, in particular ground-based (tractor) operations. No new temporary roads are proposed with this project, in agreement with the Collaborative. The majority of landings are old landings to be reutilized, but a number of new landings would also be created. These would have severe compaction, and thus have reduced infiltration and be prone to producing runoff; drainage features are required to control runoff and avoid adverse impacts (BMPs). Being “temporary” means that they will need to be rehabilitated once their use is finished. PDFs herein stipulate that rehabilitation will include de-compaction via ripping (furrowing using conventional rock-rippers common on logging equipment) or “dibbling” meaning working the ground with an excavator bucket (common method in other areas, also called “potato patch”). This would be followed by re-contouring to the approximate original terrain in cases where the feature was “constructed” by blading topsoil to create a favorable grade or bench (constructed using cut and fill).

The proposed landings are mostly roadside on gentle grade, so little blading should be necessary to make them usable, and thus little to no recontouring is expected to be necessary; however, some form of decompaction would be necessary. These areas would also be rendered bare, so some form of soil cover may be required to prevent erosion, either organic mulch, slash, and/or seeding to establish vegetation. In most cases, old access roads and landings are in favorable locations to be re-utilized, which will minimize new disturbance and cumulative effects. Even with rehabilitation measures, new and reutilized temporary roads and landings would still have long-term effects left to slowly recover naturally over time.

Table 17. Soil map unit acres by logging system method (Alternative 2).

<table>
<thead>
<tr>
<th>[ACRES]</th>
<th>Logging System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil MU</td>
<td>Hand</td>
</tr>
<tr>
<td>100</td>
<td>3.6</td>
</tr>
<tr>
<td>250</td>
<td>24</td>
</tr>
<tr>
<td>256</td>
<td>8.4</td>
</tr>
<tr>
<td>257</td>
<td>151</td>
</tr>
<tr>
<td>258</td>
<td>28</td>
</tr>
<tr>
<td>259</td>
<td>19</td>
</tr>
<tr>
<td>260</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>10.1</td>
</tr>
</tbody>
</table>

Skid trails would be created as necessary to operate the mechanical ground-based units. These would also have compaction, but not as severe as temporary roads and landings. These may or may not have “detrimental” levels of compaction, depending on traffic intensity. A few passes with a tracked grapple-
skidder will generally not produce a detrimental degree of compaction if soils are dry. Most soils have a moderate compaction risk (Table 17), but some have a high compaction risk, namely Kistirn (SMU 260), Hugo (SMU 265-266), and Hecker (SMU 250-256); these intersect with many of the ground-based units (Appendix C). Thus, it is conservatively assumed that skid trail compaction will be detrimental, and these equipment trails in combination with temporary roads and landings should not exceed 15 percent of the unit area as part of the layout plan to ensure this aerial extent is not exceeded (PDF). If equipment trails are deeply rutted, they should also be decompacted by ripping and allowed to naturally revegetate.

Mastication uses specialized equipment to “chew up” or create wood chips from standing surface and ladder fuels (shrubs and saplings) and redistribute them on the soil surface. This creates increased surface fuels for some time, while reducing potential for crown fire. Chips are more or less directionally propelled during operations, which leaves a somewhat clumpy distribution of chips. If chips build up around tree boles, there is the potential for tree mortality from cambial scorch during broadcast burns. On the positive side, chips decompose over the course of 5 to 10 years, benefitting buildup of SOM. Burns can be safely accomplished after a lag time for chips to decompose. Thick chip layers can also inhibit germination of some understory species for some time, which there is little scientific information about (i.e., what species are more sensitive, in what settings, can it also inhibit invasive species?). Finally, large additions of carbon (C) to the soil can potentially immobilize nitrogen (N) through microbial metabolism for some time and affect C:N ratios for plants. This effect was not seen on two intensively studied long-term research experiments by PSW Research Station, Redding, despite great effort to document it (Zhang et al. 2016, Powers and Young unpublished). All that said, mastication effects on fire hazard and understory development are temporary, which may or may not fit with other short-term management objectives.

There is a great variety of equipment used to accomplish mastication, which is usually smaller and lighter ground pressure than conventional harvest equipment, but not a given depending on specific equipment used, which is not necessarily known beforehand to estimate soil impacts. It is conventionally thought that operating upon a fresh masticated chip layer helps to protect soils from compaction effects, but to what degree likely depends on several factors.

Tractor piling of fuels for later burning is one the more controversial practices regarding soil impacts. In the past, this was usually conducted with fixed-blade D-6 type tractors, resulting in much topsoil displacement into piles, and much maneuvering and many passes with resulting compaction effects, especially if soils were moist. Today, this practice often utilizes smaller tractors with six-way blades and a brush rake attachment, which is nimble and much more effective in piling fuels without the associated displacement or severe compaction impacts. This project proposes using primarily smaller excavators (type 3) to pile fuels, which is lower ground-pressure on the soils, and can reach out to operate a larger swath in fewer passes, usually single-pass. This kind of operation does not typically produce soil displacement or detrimental levels of soil compaction or unless operating in truly adverse weather on saturated soils (Rust 2009).

Most units are proposed to have some form of manual treatment, hand pile burn, or prescribed burn activities, discussed here collectively as “hand-treatments.” This is often a follow-up or maintenance treatment sometime after initial treatments are completed. Hand treatments are generally low impact, rarely creating impacts of a degree or extent that would be considered detrimental for soils, only foot traffic and potential burning effects for possible soil impacts.

Pile burning creates severe heating of soils under the piles, but these occupy a relatively small portion of unit area, and are surrounded by duff-covered soils to provide a filter strip to prevent sediment movement.
Soil heating is reduced if burning is conducted when soils are moist to wet (Busse et al. 2010, 2013), shortening soil recovery time as well. Prescribed (broadcast) burning, conducted as desired, usually should not burn all the duff to bare mineral soil, or only in patches. However, this practice does have more potential to remove more duff from more of the area than may be desirable for soil cover and erosion prevention. Burn plans will need to be conservative, and explicitly take measures to retain soil cover levels specified in PDFs.

There are steep areas not suitable for mechanical operations (>35%) in many of the ground-based units that will need to be avoided or only treated by hand. Steep areas should not be traversed with heavy equipment. Flexibility is usually granted for tracked equipment to strategically operate on short pitches less than 100 feet and less than 40 percent slope, in which case equipment should go straight up and down slope with no turning; any such instances should be identified for installation of waterbars at close spacing and addition of soil cover (e.g., slash) if bare soil results. Thus, minor flexibility is allowed, but it carries additional mitigations.

It is expected there would be areas of bare soils after ground-based operations are complete, typically less than 10 percent of unit area. Bare areas are typically small and dispersed; larger bare areas in one portion of a unit would pose a concern for erosion and sediment production. Any such areas rendered bare on greater than one-fifth of an acre would be monitored for vegetation recovery, and would be actively mulched and/or seeded if any evidence of significant erosion is discovered, and/or if natural revegetation is not timely (PDF).

Cable and road-based mechanical treatments are generally lower impact on soils, especially with full suspension cable. Road-based cable generally only achieves single-end suspension, with some resulting soil gouging. With either system, a PDF specifies at least one-end suspension of the butt-end of the tree, which will greatly help reduce gouging. Where gouging does expose bare soils, hand waterbars and raking cover back onto the corridor shall be done to mitigate water routing and potential for gullying since these activities are by necessity on steeper slopes.

All of these foreseeable direct impacts would not occur all at once; rather they would be spread out over the next 15 years (estimated). Best management practices and PDFs would be kept concurrent with operations. Thus, the acreage extent of impacts would be annually variable over the life of the project.

Given the activity-centric context described above, effects below will now be discussed relative to the analysis indicators used to address Forest Plan requirements, and where appropriate relative to specific activity type or specific units.

**Soil cover for erosion prevention**

Reduction of soil cover to varying degrees is a given by-product of proposed activity types. This is acceptable given that residual soil cover still meets requirements for erosion prevention, generally greater than 50 percent on slopes less than 50 percent and greater than 70 percent on slopes greater than 50 percent, as indicated by EHR analysis.

Site-specific EHR development (Appendix C) indicates that greater than 50 percent cover is adequate to avoid a high erosion hazard for all soils present here, at least upon average (GIS-derived) slope gradients for those soils. But even with greater than 50 percent cover most soils will still reach a high EHR at some point of steepness, ranging from 53 to 86 percent slope for soils that actually occur on slopes that steep (table 3). Thus, it is conservatively recommended that on slopes exceeding 50 percent, more residual soil
cover is required at greater than 70 percent, which is easy to achieve for cable operations but not necessarily for broadcast burns.

All other areas have loam surface textures, and greater than 50 percent soil cover in the form of duff and litter is estimated as sufficient to avoid a high erosion hazard. Only prescribed (broadcast) burning activities have potential to exceed 50 percent cover losses, and then only if the burns are much hotter than planned. It is expected that burns will be conducted with target residual cover levels in the prescription, and all units should accordingly meet this requirement at unit-scale post-activity.

**Soil porosity (compaction)**
The Six Rivers LRMP defines detrimental compaction is a 10 percent reduction in total soil porosity, and this condition cannot occupy greater than 15 percent area of an activity unit. All units surveyed currently meet this standard. For proposed activities, this would practically apply only to units with mechanical ground-based activities. One PDF specifies limiting temporary roads and landings and skid trails collectively to less than 15 percent unit area, and this is a conventional standard that sale administration staff is accustomed to implementing and achieving. It is thus expected that all units will meet this standard post-activity.

**Soil Organic Matter**
Soil organic matter (SOM) is organic matter and humus within the topsoil, which is crucial for nutrient and water holding capacity and long-term soil productivity. In Mediterranean climates, it is produced mainly from annual fine-root turnover, and to a lesser extent from fine surface organic matter additions; these are long-term processes, and long timeframes are necessary to accumulate SOM. The SOM is principally vulnerable to loss from erosion (export), severe burning effects (volatilization), and displacement (redistribution, but still generally on-site).

Forest SQS include a standard of retaining 85 percent of total SOM in the top 12 inches of soil. Though not stated, this standard is aimed at avoiding excessive soil displacement; notably it is non-implementable because even an experienced soil scientist cannot objectively determine compliance, or lack of. That said, soil displacement effects are a lesser concern for SOM loss, because the displaced soil is still on-site unless eroded, so the nutrient capital is still accessible by plant roots. This was a much greater concern historically when large brushfields were “reclaimed” for conifer plantations by “topsoil windrowing” to remove root-crowns of sprouting species that would be aggressive competition for resources, along with removing nutrient and SOM rich topsoil. It came to light that this practice was degrading to long-term soil productivity, particularly when windrows were spaced far apart and then many tree roots could not reach the enriched soil; such practices have not been conducted for several decades now. Displacement here will be incidental and very small in scale of movement, very unlike the old practices that became a concern for degraded soil productivity. Soil displacement in this context is not a concern with this project.

Erosion is explicitly part of the project design to prevent and avoid. Therefore, severe burning has the greatest potential to cause some loss of SOM and nutrients in the top several inches of soil, precisely where they are most concentrated (Wells et al. 1979, McNabb and Cromack Jr. 1990). Fire effects are specifically a concern in the event that proposed burning activity is much hotter and hotter over larger areas than planned. Burn prescriptions that aim to preserve greater than 50 percent duff cover for erosion prevention should certainly not be hot enough to significantly degrade SOM in the surface soil, except perhaps in small patches, as with pile burning where residence time is longer. Broadcast burning prescriptions as practiced usually produce low to moderate soil burn severity (SBS), as opposed to 5 to 15 percent high SBS plus 30 to 40 percent moderate SBS typical for wildfires in this vicinity (BAER
records, on file with author). In either case, soil heating will be reduced if burns are conducted when soils are moist (Busse et al., ibid).

Proposed activities, including burning activities, are fully expected to result in all units meeting applicable standards for SOM post-activity.

**Surface organic matter (duff and fine litter)**

Surface organic matter here is for nutrient cycling, as opposed to aforementioned erosion prevention, which may or may not coincide as the same cover levels. The LRMP specifies at least 50 percent cover of duff and fine litter for soil productivity (with perhaps more needed for erosion prevention, as determined for the project). As already stated, it is expected that this level of soil cover will be met for all project units post-activity.

Furthermore, these are not clearcuts. A living forest canopy that continually adds litterfall to the forest floor will compensate in the short-term to cover small areas that may have burned hot or otherwise inadvertently removed more cover than desired. A healthy productive forest is the best case for self-maintaining favorable nutrient cycling, particularly on the more developed soils (Ultisols and Alfisols).

The portion of the burn scar area that burned at high fire severity lacks a productive overstory, so surface organic matter levels are still recovering, particularly in thickness of the duff layer. Shrub regrowth has been aggressive, so current cover levels are adequate in extent (>50%). Fuels reduction activities will set this recovery back slightly, but it is still expected that this standard will be met post activity.

**Large Woody Material**

Large woody material contributes to SOM and habitat for arthropods that masticate fine organic matter into smaller particles that soil microbes can then utilize as food. Large woody material becoming SOM is an even longer-term process than for duff and litter, and in a fire-prone setting, most LWM probably never makes it to this state, but is consumed by fire sometime at higher levels of decomposition class. That said, the habitat value of LWM for arthropods, bacteria, and fungi is ecologically important.

As stated above, LWM is generally deficient in most of the project area, attributed to roadside firewood scavenging by the nearby community. This is not a problem, nor undesirable here. These roadside units are proposed as fuelbreak units, and LWM requirements are explicitly waived in strategic fuelbreak areas, so this is a non-issue here.

This leaves plantations and oak woodland units where the retention standard would perhaps apply. These are both also deficient in LWM. The oak woodlands are an ecological type that would not be expected capable of producing and maintaining LWM standards. The plantations do not currently have much LWD because of past management practices, particularly site prep for planting that would have removed or burned most of this material. The stands are relatively immature, so there will not be large trees on site to contribute such materials for some time into the future. Such forested areas where LWM does not currently occur are not expected to meet the retention standard with current activities.

As with duff and fine litter, burning activities and especially broadcast burns have the most potential of consuming what LWM does exist here. Since plantations do not have adequate size class of trees for LWM recruitment, the only practical management option is to protect existing LWM in non-plantations from mechanical disturbance and more importantly burning. Burn plans will need specific provisions to protect this resource (PDF). It is thus estimated in good faith that LWM will be protected to the extent
practical, and LWM levels will increase over time, on average project-wide and eventually within plantations in the long term.

**Infiltration and permeability (soil hydrologic function)**

The Six Rivers Plan specifies that infiltration and permeability would not be reduced to a rating of 6 or 8 under the EHR system. Furthermore, the area in detrimental condition should not be of a size or extent that would result in a significant change in production potential for the activity area; this is not specified for this criterion, but is conventionally assumed to be 15 percent of the area, as with other criteria.

The primary impact to soil hydrologic function is compaction by ground-based equipment, which usually only affects surface infiltration, not permeability as this is based upon subsurface water movement that is typically below compaction depth. Notably, the EHR system was developed primarily for agricultural soils; forest soils nearly always have rapid to moderate infiltration rates, being naturally more porous than equivalent Ag soils. Reducing infiltration from rapid to moderate still produces a water movement rating 3 to 4 for almost all of these soils. The water movement rating becomes a 6 if infiltration is reduced from rapid to moderate on a shallow soil (e.g., Woodseye), or an 8 if infiltration is reduced to slow (<0.6 in/hr.) on any soil. Reduction of infiltration to 0.6 inches per hour would be unusually severe compaction, such as with a temporary road or severely compacted landing.

Soil hydrologic function is currently in good condition except in the limited areas, namely old landings and just a few main skid trails close to landings, comprising about 5 percent area in previous mechanical units and less than 2 percent of the project area as a whole.

For proposed activities, this function is potentially compromised where severe compaction from ground-based equipment is expected, specifically landings if not rehabilitated and any reutilized temporary roads or landing spurs. Heavy equipment traffic (including temporary roads and landings and skid trails) is limited to less than 15 percent area (PDF) to satisfy the porosity/compaction standard. Even most compaction that would qualify as detrimental would NOT be compacted severely enough to reduce infiltration to less than 0.6 inches per hour. Thus, the PDF that limits detrimental compaction is expected to more than satisfy the soil hydrologic standard also. All units are expected to comply with this standard post activity. Project design features also specify rehabilitation of any temporary roads and landings that are used, so this condition is expected to be actually improved on net-balance post-activity.

**Unit-specific Mitigations (none)**

Often differing soil types or differing levels of current legacy soil impacts drive the need for additional unit-specific requirements beyond project-wide PDFs, necessary to ensure compliance with LRMP standards. No such measures were identified as necessary for this project during field review or analysis phases of the soil assessment for this project.

**Indirect Effects**

Indirect effects of the Proposed Action relative to soils within the bounding area include changes to the soil environment, reallocation of soil resources (water and nutrients) to fewer plants, changes in the distribution of organic matter upon and within the soil, and changes in potential soil damage from future wildfires.

The Proposed Action would create short- to mid-term changes in the soil environment. Soil temperatures would be elevated due to opening the canopy and increased solar exposure of the soils. This would stimulate soil microbial and fungal activity and increase decomposition of soil organic matter and CO₂ efflux from the soils. This would also synergistically stimulate root activity of vegetation, also increasing CO₂ efflux but as importantly, increasing annual fine-root turnover, which is a primary input to soil C and
organic matter. On balance, soil C attrition in CO$_2$ efflux would probably exceed accrual in root turnover for the first several years, then stabilize once revegetation and canopy expansion proceeds to shade the soil, then perhaps becoming a C sink from increased tree growth and vigor. This is all largely speculative, as current science has not yet formed reliable principles on effects of such practices, particularly belowground. Regardless, these effects would be temporary as the overstory canopy closes, understory fills in, and forest floor layers increase in depth over several years. Thus, such effects are expected to be short- to mid-term, minor, and not relevant to long-term soil productivity. The scale of the proposed activities is not large enough to make net carbon sink or source estimates relevant to local or larger scale climate effects.

With thinning as a silvicultural practice, residual stocking of trees is supposed to be high enough to fully occupy the site, so finite soil moisture and nutrient resources are still fully utilized, just reallocated to fewer individual trees. Therefore thinning should have little effect on soil moisture or nutrient status. Trees will increase growth rates, expand crown and root systems, and would generally be healthier and more resistant to drought and insect attack with more available water and xylem flow.

Increased organic matter mineralization rates, as mentioned above, can provide short term benefits to microbial activity and soil nutrient status, but as that nutrient capital is ‘used up’ more rapidly, it can also possibly lead to nutrient deficits later. Conservation of surface organic matter as proposed with these activities is intended to maintain adequate nutrient cycling and prevent nutrient deficits. Often overlooked, the root systems of trees and vegetation that are removed remain in the soil, and slowly decompose to provide organic matter inputs directly within the soil, as well as provide readily available growth pathways for new roots through compacted soil. This is currently thought by investigators to be the probable explanation for a general lack of negative effects on tree growth with extreme experimental compaction in the Long Term Soil Productivity study (Powers et al. 2005, Ponder Jr. et al. 2012, Zhang et al. 2017, Busse et al. 2017). This experiment also tested effects of complete organic matter removals on soil nutrient status and tree growth, with no negative effects overall in the first 20 years to date. Thus, short-term pulse changes in organic matter presence and distribution upon the soil are not expected to significantly affect soil productivity.

Given direct localized impacts described above, mainly associated with ground-based operations, this should be balanced against a reduced potential for future wildfires to damage the soil in a more harmful fashion. On a Regional basis, fire is considered a much larger threat to soil productivity than active management activities, because the cumulative annual ‘footprint’ of fire is dramatically larger, and it causes much more erosion, which represents the most irreversible & irretrievable kind of soil damage. However, it is also unknown with what severity a future wildfire would burn on these particular areas, depending not just on fuels, but topography and weather conditions at the time as they influence fire behavior. It is reasonable to assume that fuel reduction activities should help moderate future fire behavior, and therefore benefit soil resources, at a cost of management impacts today. This is considered acceptable, as long as management related impacts are minor in scale. Soil impacts associated with proposed activities are expected to be mostly minor in severity, and ultimately minor in scale.

In summary, indirect effects of proposed activities upon the soil resource are generally neutral or beneficial, are short-term in nature, and no adverse or long-term indirect effects are foreseen.

**Cumulative Effects**
Past timber harvest activities have occurred in approximately 40 percent of the project area (FACTS). There were past regeneration harvests followed by broadcast burning for site prep, replanting, and
subsequent thinning about 20 years later. These old 1960s to 1970s clearcuts are today’s plantations. Soil impacts at the time for ground-based clearcuts were no doubt significant, considering size and volume of materials skidded and removed, and larger, heavier equipment conventionally used for skidding at the time (Table 18 and Table 19).

**Table 18. FACTS database activities intersecting with project units.**

<table>
<thead>
<tr>
<th>FACTS database -- Activity Type</th>
<th>Fiscal Year</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Thin</td>
<td>From</td>
<td>To</td>
<td>Acres</td>
</tr>
<tr>
<td>Sanitation Cut</td>
<td>1983</td>
<td>1983</td>
<td>18</td>
</tr>
<tr>
<td>Seed-tree Seed Cut (with and without leave trees) (EA/RH/NFH)</td>
<td>1982</td>
<td>1990</td>
<td>106</td>
</tr>
<tr>
<td>Shelterwood Removal Cut (EA/NRH/FH)</td>
<td>1983</td>
<td>1986</td>
<td>14</td>
</tr>
<tr>
<td>Stand Clearcut (EA/RH/FH)</td>
<td>1968</td>
<td>1982</td>
<td>77</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1968</td>
<td>1990</td>
<td>337</td>
</tr>
</tbody>
</table>

**Table 19. Ruth Timber Sale activities intersecting with project units.**

<table>
<thead>
<tr>
<th>Silvicultural Rx</th>
<th>Year</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Thin</td>
<td>From</td>
<td>To</td>
<td>Acres</td>
</tr>
<tr>
<td>Sanitation</td>
<td></td>
<td></td>
<td>5.6</td>
</tr>
<tr>
<td>Shelterwood</td>
<td></td>
<td></td>
<td>15.5</td>
</tr>
<tr>
<td>Shelterwood Removal</td>
<td></td>
<td></td>
<td>34.7</td>
</tr>
<tr>
<td>Single Tree Selection</td>
<td></td>
<td></td>
<td>25.9</td>
</tr>
<tr>
<td>Clearcut</td>
<td></td>
<td></td>
<td>69.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1984</td>
<td>1987</td>
<td>157</td>
</tr>
</tbody>
</table>

Most relevant for soil resources, regardless of past methods the remaining footprint of past activities can and was observed in the field, and current soil condition assessed accordingly. Where past impacts cannot be observed today, they were likely minor impacts that have naturally recovered and are not significant today, or else they *would* still be apparent. This is bolstered by the finding that almost all of the lasting past impacts that *were* observed are not judged to be detrimental severity or significant in aerial extent today. There are no additional foreseen future projects within the bounded analysis area. Presumably there will be future management actions in the vicinity at some point, but it is unknowable at this time as to what those actions may consist of, where they would be located, or the management setting and operational environment (e.g., biomass harvest, restoration, post-wildfire, revised LRMP standards, etc.).

The Proposed Action and connected activities are to take place over the next approximately 15 years; for analysis purposes, these are collectively considered the “present” action regardless of implementation timing. To reiterate, the cumulative effects assessment area for the soils resource is bounded in space within the proposed activity units, including area with connected actions such as road decommissioning and landing rehab treatments, because this is the full extent of where soil-disturbing activities are to take place. Effects analysis is bounded in time by Past, Present, and Reasonably Foreseeable Future Actions within this area. A summary is provided below:
Chapter 3. Environmental Consequences

- **Past**: Effects of past management have almost entirely naturally recovered, with only a small portion of the old harvest footprint having soil disturbance that qualifies as detrimental under current soil management standards. Field review indicated that almost all of the previously managed stands have less than 5 percent of the area with detrimental disturbance currently.

- **Present**: Impacts of the Proposed Action will by design occupy less than 15 percent of the area of any individual unit, and will re-utilize old access roads, skid trails, and landings where possible, again to limit cumulative effects for individual units as a whole. “Where possible” is indefinite, sometimes reutilization of prior access routes and landings is not operationally pragmatic; it is expected from field review for this project that reutilization is entirely feasible. The direct and indirect effects of the Proposed Action are minimized to the degree possible, in severity and extent (considered in tandem), partly due to the application of integrated PDFs.

- **Future**: There are no known future planned activities that will have any foreseeable adverse effects intersecting with the current project’s analysis area.

Current existing detrimental effects of past actions are minimal in extent area. The Proposed Action alternative by itself would not produce significant amounts of adverse direct or indirect soil impacts, using 15 percent area in detrimental soil conditions collectively as the threshold used to determine if soil impacts are significant, per current management direction. There are no reasonably foreseeable future actions, which would produce significant impairment of soil quality or productivity. Thus there are no additive significant effects of past, present, and foreseeable future actions expected, and therefore by definition no significant cumulative effects for soil resources.

The Proposed Action is design consistent with the regulatory framework outlined above. Forest plan S&Gs and SQS are intended to comply with NFMA, maintaining soil productivity. Standards and guidelines and SQS indicators were used as the context to describe and analyze the extent and magnitude of expected soil impacts, spatially and temporally. Implementing project-specific PDFs are intended to help ensure compliance with these LRMP provisions, and it is thus deduced that long-term soil productivity is maintained within this project area.

**Cultural Resources**

**Introduction**

This section presents the predicted effects of the Proposed Action as compared to the No Action Alternative on cultural resources.

**Environmental Consequences**

**Methodology**

The Forest Service is directed to identify, evaluate, treat, protect, and manage historic properties by several laws. However, the National Historic Preservation Act of 1966, as amended (16 USC 470 et seq.; NHPA), provides comprehensive direction to federal agencies about their historic preservation responsibilities. Executive Order 11593 – Protection and Enhancement of the Cultural Environment (May 13, 1971), also includes direction about the identification and consideration of historic properties in federal land management decisions.
Chapter 3. Environmental Consequences

The NHPA extends the policy in the Historic Sites Act of 1935 (49 Stat. 666; 16 USC 461-467) to include resources that are of state and local significance, expands the National Register of Historic Places (NRHP), and establishes the Advisory Council on Historic Preservation (ACHP) and State Historic Preservation Officers (SHPO). Section 106 of NHPA directs all federal agencies to take into account effects of their undertakings (actions, financial support, and authorizations) on properties included in or eligible for the National Register. The ACHP’s regulations (36 CFR 800) implements NHPA §106. Section 110 of NHPA sets inventory, nomination, protection, and preservation responsibilities for federally owned historic properties.

Section 106 of the NHPA and the ACHPs implementing regulations, Protection of Historic Properties (36 CFR Part 800), require that federal agencies take into account the effect of their undertakings on historic properties, and that agencies provide the ACHP with an opportunity to comment on those undertakings. Programmatic agreements (36 CFR 800.14(b)) provide alternative procedures for complying with 36 CFR 800. Region 5 has such an agreement: Programmatic Agreement among the USDA 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). The R5 PA was adhered to in order to comply with the §106 process.

Executive Order 11593 directs federal agencies to inventory cultural resources under their jurisdiction, to nominate to the NRHP all federally owned properties that meet the criteria, to use due caution until the inventory and nomination processes are completed, and to assure that federal plans and programs contribute to preservation and enhancement of non-Federally owned properties.

The forest’s LRMP cultural resource-specific S&Gs are outlined below:

- A cultural resources inventory would be completed for any proposed activity that could affect cultural resources. Results of these inventories would be documented in a project specific Cultural Resources Inventory Report (CRIR). A certified archaeological surveyor, archaeologist, or historian would conduct the cultural resource inventory.

- The significance of and effects on inventoried sites would be evaluated by an archaeologist or historian. Consultation with the California SHPO and the ACHP would take place as required.

- Identified cultural resources would be protected from disturbance and artifact theft through the implementation procedures outlined for the National Preservation Act and the Archaeological Resources Protection Act (ARPA).

- Proposed projects with potential to affect local Native American cultural values or contemporary uses, or in location known as traditional Native American spiritual use area, would be discussed with a cross section if the local Indian population and tribal governments. These discussions would take place in the early stages of planning and environmental analysis to identify possible mitigation opportunities or alternatives.

**Alternative 1 – No Action**

**Direct Effects**
There are no direct effects of choosing the No Action Alternative.
Indirect Effects
There are no indirect effects of choosing the No Action Alternative.

Cumulative Effects
There are no archaeological sites that would be impacted by Alternative 2 (Proposed Action); therefore, there would be no cumulative effects.

Alternative 2 – Proposed Action

Direct Indirect Effects
In order to comply with the regulatory framework regarding the protection of cultural resources, pre-field research was conducted consisting of examination of previous archaeological surveys in the planning area, site records, maps, and GIS data. This data indicated that seven of those surveys were conducted within the Area of Potential Effect (APE), defined as the project’s treatment units. These surveys have been carried out between 1978 and 2012.

The surveys resulted in the identification of 10 archaeological sites, none of which is located within the APE. Archaeological surveys were conducted within the project’s APE between October 2016 and August 2017 and recorded in a CRIR on file in the Heritage Department of the SRNF Supervisor’s Office. Two archaeological sites were identified because of the archaeological surveys.

Standard resource protection measures as defined in the R5 PA would be applied to fully protect archaeological sites within the APE.

Cumulative Effects
There are no cumulative effects associated with Alternative 2 – Proposed Action.

Threatened, Endangered, Sensitive Botanical Resources

Introduction
A BA/BE was prepared for this project and is included in the project file (McRae 2018). The objectives of this biological assessment/evaluation are (a) to determine the effects of the 1st 48 Project on any TES vascular plant, bryophyte, lichen or fungi species and (b) to insure these species receive full consideration in the decision-making process to maintain species viability (USDA/USFS 2005).

No federally listed plant species are known to occur, nor does suitable habitat exist in the project area.

Two Forest Service Sensitive botanical species were found to occur within the project planning area, the mountain lady’s slipper orchid and the waterfan lichen. Although both occur in the planning area, they have been buffered out of the project area (the units). Both species are also managed under S&M S&Gs and addressed in the S&M report developed for this project. A no action buffer of approximately 0.5 acres was marked on the ground at the mountain lady’s slipper orchid site, most, if not all of which occurs in the riparian reserve associated with Dashield Creek. The buffer was delineated in the field to account not only for protection of the species but also to account for habitat elements associated with mountain lady’s slipper, specifically overstory shading and existing canopy layers, existing moisture conditions, maintenance of CWD, maintenance of existing tree, shrub and forb diversity, and adequate habitat around the existing plants for short-range dispersal of seeds and rhizome.
The waterfan lichen, a submerged aquatic lichen, also occurs within the riparian reserve associated with Dashield Creek. This is the only known occurrence for this species on the SRNF. This occurrence was not buffered in the field because of its location submerged in Dashield Creek.

Because both sites occur in riparian reserves, are outside the project area (the units) and the mountain lady’s slipper orchid site is within a no action buffer, there is no effect to either species under either Alternative 1 (No Action Alternative or Alternative 2 (Proposed Action).

The potential exists for the following Forest Service Sensitive fungi species to occur in the project area: *Dendrocollybia racemosa, Sowerbyella rhenana, Phaeocollybia olivaceae, Boletus pulcherrimus and Tricholomopsis fulvescens*. Silvicultural and fuels design, PDFs and LRMP S&Gs, as described below, reduce the level of negative direct and indirect impacts under Alternative 2 to sensitive fungi.

Implementation of Alternatives 2 may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability of Sensitive fungi species.

**Environmental Consequences**

**Methodology**

A pre-field analysis was used to determine which units to survey within commercial timber, biomass, and shaded fuelbreaks, the spatial context for analysis where direct, indirect and cumulative effects are likely to occur over the life of the project. The analysis included review and consideration of 1) the Forest Sensitive species database and associated spatial layers of known occurrences relative to the project area, 2) Geographic Information System (GIS) spatial layers of the vegetative subseries and stand age in which the project occurs, 3) elevation gradient of the project area, 4) land-use history, 5) aerial photo interpretation, and 6) professional knowledge of TES species habitat and distribution on the forest.

Table 20. Seral stage composition in shaded fuelbreak.

<table>
<thead>
<tr>
<th>Seral Stage</th>
<th>% of Acreage in Fuelbreak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass/Forb</td>
<td>00.7</td>
</tr>
<tr>
<td>Shrub</td>
<td>05.6</td>
</tr>
<tr>
<td>Pole</td>
<td>08.9</td>
</tr>
<tr>
<td>Early mature</td>
<td>42.5</td>
</tr>
<tr>
<td>Mid-mature</td>
<td>29.1</td>
</tr>
<tr>
<td>Late-mature</td>
<td>09.3</td>
</tr>
<tr>
<td>Old-growth</td>
<td>03.0</td>
</tr>
</tbody>
</table>

As a result of potential habitat information garnered from review of the spatial coverages, air photo review, field reconnaissance, and intuitively controlled surveys in the stands, a total of 341 acres of the approximately 823 acres proposed for treatment were surveyed. Units or portions thereof not subject to survey were plantations, portions of natural stands characterized as even-aged early mature stands with little stand structure, riparian reserves since these areas are essentially protected from intensive activities, and units within vegetation types not considered suitable for sensitive species. An example of the latter could be the Douglas-fir-Canyon live oak subseries, which is characterized by high surface rock content, a characteristic not suitable for the target species.

Based upon pre-field analysis, including a query of the USFWS IPaC database (USFWS 2018) no federally listed or proposed plant species are known to occur within the 1st 48 Project planning area nor is suitable habitat present. The non-fungal Sensitive species targeted for field surveys were mountain lady’s slipper (*Cypripedium montanum*), fascicled lady’s slipper, (*Cypripedium fasciculatum*), small-flowered calycadenia (*Calycadenia micrantha*), and the waterfan lichen (*Peltigera gowardii*) Surveys were conducted for Sensitive fungi species by a mycologist who focused on areas of suitable habitat. His report and survey field forms can be found in the project record (Davidson 2018). Targeted Sensitive fungi species included *Boletus pulcherrimus*, *Dendrocollybia racemosa*, *Phaeocollybia olivacea*, *Sowerbyella rhenana*, and *Tricholomopsis fulvescens*.

Surveys for the 1st 48 Project for all Sensitive species in Table 21, except for the fungi species, occurred in July 2017 when they were identifiable. Approximately 58 percent of the proposed fuelbreak was considered unsuitable habitat for Sensitive species and therefore was not surveyed. Unsuitability related to seral stage and resultant stand conditions, specifically those units/areas in the shrub-harvest, pole-harvest, early mature with harvest and early mature stands seral stages. Table 20 above displays the percentage of each seral stage within the fuelbreak. All mid mature, late mature and old growth within the fuelbreak was surveyed. In addition, dry, open rocky grassland and hillsides were surveyed for *Calycadenia micrantha*.
Table 21. Sensitive Species Considered in the Project as a Result of Pre-Field Analysis.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Known (K) or Potential (P)</th>
<th>Taxonomic Group</th>
<th>General Habitat/Substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryophytes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bug-on-a-stick</td>
<td><em>Bauzbaumia viridis</em></td>
<td>P</td>
<td>Bryophyte</td>
<td>Late decay class down logs</td>
</tr>
<tr>
<td>Vascular Plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small-flowered calycadenia</td>
<td><em>Calycadenia micrantha</em></td>
<td>P</td>
<td>Vascular plant</td>
<td>Dry open rocky grassland and hillsides</td>
</tr>
<tr>
<td>Fascicled lady’s slipper</td>
<td><em>Cypripedium fasciculatum</em></td>
<td>P</td>
<td>Vascular plant</td>
<td>Mature forest</td>
</tr>
<tr>
<td>Mountain lady’s slipper</td>
<td><em>Cypripedium montanum</em></td>
<td>P</td>
<td>Vascular plant</td>
<td>Mature forest</td>
</tr>
<tr>
<td>Lichens</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waterfan lichen</td>
<td><em>Peltigera gowardii</em></td>
<td>K</td>
<td>Aquatic Lichen</td>
<td>Cool mountain streams that run year round.</td>
</tr>
<tr>
<td>Fungi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td><em>Boletus pulcherrimus</em></td>
<td>P</td>
<td>Fungus</td>
<td>Mature forest/ectomycorrhizal</td>
</tr>
<tr>
<td>N/A</td>
<td><em>Dendrocollybia racemosa</em></td>
<td>P</td>
<td>Fungus</td>
<td>Mature forest/parasitic</td>
</tr>
<tr>
<td>N/A</td>
<td><em>Phaeocollybia olivacea</em></td>
<td>P</td>
<td>Fungus</td>
<td>Mature forest/ectomycorrhizal</td>
</tr>
<tr>
<td>N/A</td>
<td><em>Sowerbyella rhenana</em></td>
<td>P</td>
<td>Fungus</td>
<td>Wet mossy areas under conifers/saprobe on litter</td>
</tr>
<tr>
<td>N/A</td>
<td><em>Tricholomopsis fulvescens</em></td>
<td>P</td>
<td>Fungus</td>
<td>Mature forest/ectomycorrhizal</td>
</tr>
</tbody>
</table>

Because the sensitive fungi species noted above are also managed under S&M standards and guideline, surveys were conducted in November utilizing S&M survey equivalent effort survey protocols where applicable. Surveys for sensitive fungi in stands that are not old growth are not required under S&M S&Gs. However, because commercial treatments are proposed in old-growth habitat within the fuelbreak, S&M protocols require equivalent effort surveys (strategic surveys; USDA/USDI 2001).

Survey Results
Table 22 displays a summary of the survey results relative to units within the Proposed Action.

Table 22. Survey Results, Sensitive Species Detected in the Planning Area.

<table>
<thead>
<tr>
<th>Species</th>
<th>Taxonomic Group</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain lady’s slipper (<em>Cypripedium montanum</em>)</td>
<td>Vascular plant</td>
<td>In inner gorge of Dashield Creek in riparian reserve. Site buffered; flagged and painted.</td>
</tr>
<tr>
<td>Waterfan lichen (<em>Peltigera gowardii</em>)</td>
<td>Lichen</td>
<td>In Dashield Creek, south of Unit 418 and in riparian reserve adjacent to Units 412 and 421.</td>
</tr>
</tbody>
</table>

The following provides information on what is known or suspected about the biology and ecology of the species with relevance to the proposed activities and effects analysis that follows. Regarding sensitive fungi, little if any information is known about management effects to a particular species, therefore, species will at times be addressed in the context of their particular habit or taxonomic group.

Mountain lady’s slipper
The mountain lady’s slipper was the only sensitive species located are within the proposed fuelbreak. Project design features associated with activities within the fuelbreak units are disclosed in Chapter 2 of the EA.
Mountain lady’s slipper is found in a broad range of habitats throughout the western United States and Canada. In California, there are roughly 200 populations of mountain lady’s slipper; however, between 50 to 70 percent have not been visited in the last five (5) years (Kaye and Cramer 2005). Including the one detection associated with this project, there are currently 17 extant populations of mountain lady’s slipper on SRNF ranging from the Orleans RD to Mad River RD.

Habitat attributes related to aspect (northerly), canopy cover (greater than 60 percent) and seral stage (mid-mature and older), and the population sizes (fewer than 10 stems) in the project area are in keeping with those attributes ascribed the species by Kaye and Cramer (2005) in the Region 5 Forest Service Conservation Assessment for this species. Besides the aforementioned habitat attributes assigned mountain lady’s slipper, this species also requires the presence of a fungus in its early stage of development thus the presence of host trees and organic matter that favor fungal associations are also critical habitat element.

Conditions conducive for the health of existing mountain lady’s slipper populations are those that provide for partial canopy cover, native understory and forest floor species associates, host species for mycorrhizal fungi and organic matter cover on the forest floor that sustains the fungus, and suitable habitat surrounding the parent population for subsequent recruitment.

**Waterfan lichen**

The waterfan lichen is endemic to North America. It has been historically reported in all four (4) major mountain chains in the United States but has apparently been extirpated in most of the Appalachians (Dennis et al. 1984). The one known occurrence on SRNF occurs within the project area along Dashield Creek at the following locations.

The waterfan is an aquatic lichen and as such, its characteristic habitat is cool pollution free moving water in mountain streams where it occurs on submerged rocks. It is a good indicator of water quality.

**Sensitive Fungi Species**

Little if any information is known about management effects to a particular Sensitive fungus; therefore, species will be addressed in the context of their particular habitat and ecological function. The three fungi species listed that may occur within the project area can be divided into three groups: saprobic, mycorrhizal, and parasitic. *Sowerbyella rhenana* is saprobic meaning that it is a decomposer, thriving on the litter and duff of the forest floor. Litter saprobes, such as this species, can extend over a large area, via mycelial networks. Relatively shady and moist to mesic mature stands with various sized litter (including some CWD) describe the habitat for saprobes. *Phaeocollybia olivacea*, *Boletus pulcherrimus* and *Tricholomopsis fulvescens* are mycorrhizal. Mycorrhizal fungi form interdependent relationships with their host tree, exchanging nutrients, minerals, and water. *Dendrocollybia racemosa* is parasitic on decaying fungi. Common to all of these fungal groups are habitat conditions characterized by shady, mid- to late-mature stands with conifer or hardwood hosts and ample organic substrate (e.g., leaf, needle, woody debris). Networks of fungal hyphae or mycelia (the body of the fungus) group together into strands. These networks scavenge nutrients from the surrounding soils, acting as an extension to the root system. These hyphae can grow to infect nearby plant roots and can eventually connect neighboring plants. This network facilitates carbon transfer from the host to the fungus. Networks also facilitate water transfer (Bruns 1995).
Management that retains living trees (the host) and the important underground linkages for mycorrhizal fungi via the mycelial network will maintain habitat parameters for mycorrhizal species (Amaranthus and Perry 1994). Likewise, management that retains overstory canopy and the litter and CWD of the forest floor will maintain habitat parameters for saprobes (Norden et al. 2004). Factors considered when assessing risk to sensitive fungi were overstory shading, presence of host trees or shrubs, and presence of litter, duff and CWD. Issues to consider when evaluating effects to Sensitive fungi for the 1st 48 Project pertain to activities occurring in mid-mature and older stands, which only includes fuels projects and the a) extent of understory vegetation removal, b) burn intensity and d) burn interval.

**Cumulative Effects to Sensitive Botanical Species**

Implementation of this project is not expected to result in any direct or indirect impact to either the mountain lady’s slipper or the waterfan lichen; therefore, there would be no cumulative effects posed by this project to Sensitive Botanical species.

**Sensitive Fungi**

Implementation of this project may directly or indirectly impact sensitive fungi species. Cumulative effect activities and events relate to clearcutting (or similar cutting) in mid- and older seral stages and wildfire intensities.

As mentioned above in the introductory section, past logging methods in the planning area emphasized clearcutting, which removed habitat associated with sensitive fungi. While fungi can tolerate low intensity fire, a wildfire that is stand replacing, like clearcuts, also removes habitat for sensitive fungi. The practice of clearcutting and past high intensity wildfires have influenced the percentage of the planning area within a given seral stage; however, the current distribution of mature seral stages (habitat for sensitive fungi) is still within the Douglas-fir recommended management range thresholds for the planning area and within the white fir recommended management range thresholds within the south zone.

Silviculture prescriptions are no longer oriented toward clearcutting, but focus more on thinning. The scale and intensity of foreseeable future timber and fuels activities in logged stands on the Forest, along with PDFs, are not likely to significantly degrade habitat for sensitive fungi. Thinning prescriptions coupled with recommended management range guidelines for the mid-seral and older stands would further reduce the significance of concerns for retention of fungal habitat in the future. Foreseeable future wildfire in conifer stands is expected to be of mixed severity and as such is not likely to negatively impact sensitive fungi, and may actually benefit fungi by diversifying the structure of forest floor organics.

While local extirpations may have occurred and may occur in the future, these losses would not constitute a trend toward federal listing or loss of viability as a result of cumulative effects in the planning area. Future extirpations would be limited by type of prescription, PDFs, and recommended management range guidelines. Other factors include a) the potential for sensitive fungi to occur underground or associated with stable substrates (logs) in undisturbed stands surrounding the affected area, b) the ability of spores to move into a disturbed area from the surrounding forest and persist as mycelia underground or in the substrate, and c) the geographic distribution of most of these species south (as far as the northern Sierras) of the project area and into the Pacific Northwest.

**Alternative 1 – No Action**

**Direct Effects**

There are no direct effects of choosing the No Action Alternative.
Indirect Effects
There are no indirect effects of choosing the No Action Alternative.

Cumulative Effects
There are no direct or indirect effects of choosing Alternative 1; therefore, there are no cumulative effects.

Alternative 2 – Proposed Action

Direct Effects
Mountain lady’s slipper orchid
There are no direct effects to the mountain lady’s slipper orchid from implementing Alternative 2 based on the following:

- The site occurs in the riparian reserve and is afforded protection under this land allocation. Additionally, a no disturbance buffer was flagged in the field. No activities would occur in this buffer, which includes not felling trees in the buffer. Therefore, there would be no direct effects.
- Edge effects are reduced to a negligible level in light of the buffer size of 0.40 acres whose effectiveness is enhanced due to its proximity to a thinned stand (versus regenerated stand).
- In terms of indirect impacts, the buffers were delineated in the field to account not only for protection of the plants but to account for habitat elements associated with mountain lady’s slipper, specifically overstory shading and existing canopy layers, existing moisture conditions, maintenance of CWD, maintenance of existing tree, shrub and forb diversity, and adequate habitat around the existing plants for short-range dispersal of seeds and rhizome.

Waterfan lichen
Due to the occurrence of the waterfan lichen in a riparian environment and its absence from the project area (the units), there are no direct effects to the waterfan lichen from implementing Alternative 2.

Sensitive Fungi
Effects to sensitive fungi are discussed in light of the magnitude of change in potentially suitable habitat as a result of project implementation. Effects are associated with activities occurring within the mid-mature and older stands slated for treatment. Direct effects associated with actions proposed under Alternative 2 pertain to removal or severance of mycelial components (which comprise the fungal organism) residing in the organic or topsoil layer for mycorrhizal fungi.

Silviculture and fuels design, PDFs and LRMP S&Gs reduce the level of negative impacts to sensitive fungi. Silviculture and fuels design includes a) the nature of the silvicultural treatments (thinning from below, variable density, retention of existing species diversity) that allow for structural diversity, retention of host trees and partial shade to the forest floor, and b) the nature of the fuels treatment in the units which focus on thinning, pruning and piling of small diameter trees and shrubs within a limited space near roads. Project design features and LRMP guidelines oriented toward soils or wildlife that also benefit sensitive fungi and include:

- For each unit, soil porosity would be maintained to at least 90 percent of its natural condition over at least 85 percent of the unit area.
- Skid roads and trails would be limited to no more than 15 percent of the harvest area.
- At the end of project activities, a layer of litter and duff would occur over at least 50 percent of the activity area.
In all treatment units, retain at least five logs per acre of existing CWD (at least 20 inches in diameter and 10 feet long) on the ground.

All existing large snags (20 inches or greater in diameter) would be retained in units unless they pose a safety concern.

While not eliminating effects to fungi, it is assumed by managing for habitat elements in stands to be thinned, adverse effects to sensitive fungi species can be reduced. Effects of relatively small-scale activities are not likely to significantly reduce the fungal species diversity that was in place prior to the disturbance (Durall et al. 1999). In certain areas in a stand, meso-habitat features would be impacted by skidding, felling of canopy trees, yarding tops, end-lining or pile burning, but mycelial networks can extend several meters through the forest floor, so conceivably localized impacts may impact or sever part of the fungal individual but would not necessarily impact the entire body of the organism. Furthermore, if vegetative and soil conditions are retained in places within the unit, spores stored in the soil provide a propagule for development of fungi after the disturbance. These impacted areas would recover in time and along with it the development of fungal communities (Dahlberg and Stenlid 1995).

Based on the aforementioned, implementation of Alternatives 2 may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability of sensitive fungi species.

**Indirect Effects**

*Mountain lady’s slipper orchid and the waterfan lichen*

There are no indirect effects to the mountain lady’s slipper orchid or the waterfan lichen from implementing Alternative 2.

*Sensitive fungi*

Indirect effects to Sensitive fungi associated with actions proposed under Alternative 2 pertain to reduction in canopy shade and organic forest floor cover, reduction in the abundance of host trees and refuge species to sustain inoculum through periods of successional change in the stand, removal or reduction of forest floor organics and CWD which form the primary micro-habitat for saprobic species, and breakdown of soil structure (e.g., compaction) which not only affects the mycelia therein but also damages fine root tips to which the mycelia attach. (Amaranthus et al. 1996). See the discussion under direct effects to Sensitive fungi species regarding how the management of habitat elements can reduce effects to these species.

**Cumulative Effects**

*Mountain lady’s slipper orchid and the waterfan lichen*

There are no direct or indirect effects to the mountain lady’s slipper orchid or the waterfan lichen from implementing Alternative 2; therefore, there are no cumulative effects.

*Sensitive fungi*

Implementation of this project may directly or indirectly impact sensitive fungi species. Cumulative effect activities and events relate to clearcutting (or similar cutting) in mid- and older seral stages and wildfire intensities. As mentioned above in the introductory section, past logging methods in the planning area emphasized clearcutting, which removed habitat associated with sensitive fungi. While fungi can tolerate low intensity fire, a wildfire that is stand replacing, like clearcuts, also removes habitat for sensitive fungi. The practice of clearcutting and past high intensity wildfires have influenced the percentage of the planning area within a given seral stage; however, the current distribution of mature seral stages (habitat
for sensitive fungi) is still within the Douglas-fir recommended management range thresholds for the planning area and within the white fir recommended management range thresholds within the south zone.

Silvicultural prescriptions are no longer oriented toward clearcutting, but focus more on thinning. The scale and intensity of foreseeable timber (e.g., Cedar Gap, Kelsey Peak) and fuels activities in logged stands on the forest, along with PDFs, are not likely to significantly degrade habitat for sensitive fungi. Thinning prescriptions coupled with recommended management guidelines for the mid-seral and older stands would further reduce the significance of concerns for retention of fungal habitat in the future. Foreseeable future wildfire in conifer stands is expected to be of mixed severity, and as such, is not likely to negatively impact sensitive fungi, and may actually benefit fungi by diversifying the structure of forest floor organics.

While local extirpations may have occurred and may occur in the future, these losses would not constitute a trend toward federal listing or loss of viability as a result of cumulative effects in the planning area. Future extirpations would be limited by type of prescription, PDFs, and recommended management range guidelines. Other factors include a) the potential for sensitive fungi to occur underground or associated with stable substrates (logs) in undisturbed stands surrounding the affected area, b) the ability of spores to move into a disturbed area from the surrounding forest and persist as mycelia underground or in the substrate, and c) the geographic distribution of most of these species south (as far as the northern Sierras) of the project area and into the Pacific Northwest.

**Determination**

Based on the above it is my determination that the 1st 48 Project would not affect either the mountain lady’s slipper orchid (*Cypripedium montanum*) or the waterfan lichen (*Peltigera gowardii*).

With the aforementioned PDFs in place for Sensitive fungi species, the 1st 48 Project may affect individuals but is not likely to lead to a trend toward Federal listing or a loss of viability for *Boletus pulcherrimus*, *Dendrocollybia racemosa*, *Phaeocollybia olivaceae*, *Sowerbyella rhenana*, *Tricholomopsis fulvescens*.

**Survey & Manage Plants**

**Introduction**

This section presents the predicted effects of the Proposed Action as compared to the No Action Alternative on S&M botanical resources.

**Environmental Consequences**

**Methodology**

**Survey and Manage Guidance 2018 – Six Rivers National Forest**

This document is intended to provide a summary of the current S&M status and management direction to address those S&M vascular, non-vascular and fungi species that correspond to the 1st 48 Project area.

*Forest Service Correspondence, File Code 1950 – Direction Regarding the Survey and Manage Standards and Guidelines, May 13, 2014* provides the current Forest Service direction for the S&M program. At this point in time, project work on SRNF will be considered under either option 2a or 2b, unless the project record can demonstrate that “Survey and Manage pre-disturbance survey(s) have been initiated (defined
as “at least one occurrence of actual in-the-field surveying undertaken according to applicable protocol”) for the project.

Under Option 2, management direction is dependent on when the project was initiated. Initiated is defined in this context as “scoping [has been] initiated or the project is entered into the Schedule of Proposed Actions”. Districts can choose which direction to follow; if the project was initiated prior to April 30, 2015, the project can follow the direction in (a) or (b) below. Projects initiated after April 30, 2015 must follow direction in (b):

a. “The January 2001 ROD standards and guidelines and the associated January 2001 species list, and/or the four categories of projects exempt from the Survey and Manage standards and guidelines as stipulated by Judge Pechman (October 11, 2006 Pechman exemptions). Same as previous June 12, 2013 Interim Direction.

b. The January 2001 ROD standards and guidelines and the December 2003 species list, except for the red tree vole which remains as Category C across its range, and/or the four categories of projects exempt from the Survey and Manage standards and guidelines.”

Exemptions
The four (4) categories of projects exempt under Option 2b for the S&M S&Gs, as stipulated by Judge Pechman (October 11, 2006, “Pechman exemptions”), are:

- Thinning projects in stands younger than 80 years old;
- Replacing culverts on roads that are in use and part of the road system, and removing culverts, if the road is temporary or to be decommissioned.
- Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road and trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions; and
- The portions of projects 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 S&M requirements except for thinning of stands younger than 80 years old under subparagraph a of this paragraph.

Trigger and the need for survey of the proposed project area, three criteria must be evaluated:

- It must occur within the suspected range of a species covered by the appropriate protocol (by year and species).
- It must occur within suitable habitat for those target species.
- The proposed project must have the potential of being a habitat disturbing activity, which would cause significant negative effect on the species habitat or the persistence of the species at the site.
- The species must occur within the NWFP area, or occur close to the NWFP area and have potentially suitable habitat within the NWFP area. The species must be closely associated with late-successional or old-growth forest. The reserve system and other NWFP S&Gs do not appear to provide for a reasonable assurance of species persistence.

S&M Vascular Plants, Bryophytes and Fungi
Option 2b is applicable to the 1st 48 Project. This option references the December 2003 species list. The list includes numerous fungi species that could occur on the Forest and within the project area. Of the plant
species, Table 23 below lists the species considered for this project by virtue of the species range and the presence of potentially suitable habitat in the project area. Beyond activities captured by the Pechman exemptions listed above, the trigger for pre-disturbance surveys is based upon the potential for the activity to be habitat disturbing and thus resulting in a “significant negative effect” to the persistence of species at the site. The following paragraphs elaborate on the definitions of “habitat disturbance” and “persistence at a site.”

Habitat disturbing activities (species habitat) include:

- Defined as those disturbances likely to have a significant negative impact on the species habitat, its life cycle, microclimate, or life support requirements.
- The evaluation of the scale, scope, and intensity of the anticipated negative impact of the project on habitat or life requirements should include an assessment of the type, timing, and intensity of the disturbing activity.
- “Habitat-disturbing” is not necessarily the same as “ground-disturbing”; helicopter logging or logging over snow-pack, for example, may not disturb the ground but might clearly affect microclimate or life cycle habitat factors.

Exemptions include:

- Routine maintenance of improvements and existing structures is not considered a habitat-disturbing activity. Examples include pulling ditches, clearing encroaching vegetation, managing existing seed orchards, and falling hazard trees.
- Pre-disturbance surveys are not required for wildland fires for benefits in designated wilderness. Wildland fires for resource benefits are prescribed fires that result from natural ignition, are consistent with the applicable LRMP, are addressed in a fire management plan, and are burning within prescription (see S&G pg. 22).
- Exemptions to pre-disturbance survey requirements may also be proposed for wildland fire for resource benefits in LSR if the LSRA addresses the potential presence and likely effect on S&M species, and REO review of that aspect of the Assessment concludes such fire(s) will not prevent achievement of the persistence objectives of these S&Gs.
- A line officer should seek a specialist’s recommendations to help determine the need for a survey based on site-specific information. The project may not require surveys if no suitable habitat exists within the project area, project is outside the range of the species/taxa, or if the project design can avoid habitat associated with a given species.

Persistence of the species at the site:

- Defined as whether the activity might cause a significant negative effect on the habitat or the persistence of the species at the site where the activity is being proposed. There is no reference in the S&M S&Gs to look at the watershed, district, or range-wide scales when making this determination. It really is not a question about the persistence of the actual species as a whole; instead, it is a question about the persistence of a (potential) site of a species.

Species requiring pre-disturbance surveys:

- Pre-disturbance surveys are conducted prior to signing NEPA decisions or decision documents for habitat disturbing activities. This applies to Category A and C species, as well as Category B fungi if proposed activities are occurring in late-succession forest stands and considered habitat disturbing.
- Surveys are conducted using protocols for each species or taxonomic group (e.g., fungi species).
Table 23 includes the S&M botanical species that are known or have the potential to occur in the project area and only refers to the list associated with option 2b—those projects initiated after April 30, 2015.

**Table 23. List of Survey and Manage plant species that have the potential to, or are known to occur in the project area.**

<table>
<thead>
<tr>
<th>Group</th>
<th>Scientific Name</th>
<th>S &amp; M Category</th>
<th>Known or Previously documented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-vascular plants/Bryophytes</td>
<td>Buxbaumia viridis</td>
<td>E</td>
<td>Potential</td>
</tr>
<tr>
<td></td>
<td>Ptilidium californicum</td>
<td>A</td>
<td>Potential</td>
</tr>
<tr>
<td>Non-vascular plants/Lichen</td>
<td>Dendriscocaulon intricatulum</td>
<td>E</td>
<td>Previously documented (one site)</td>
</tr>
<tr>
<td>Vascular plants</td>
<td>Cypripedium fasciculatum</td>
<td>C</td>
<td>Potential</td>
</tr>
<tr>
<td></td>
<td>Cypripedium montanum</td>
<td>C</td>
<td>Potential</td>
</tr>
<tr>
<td>Fungi</td>
<td>Boletus pulcherrimus</td>
<td>B</td>
<td>Potential</td>
</tr>
<tr>
<td></td>
<td>Dendrocollybia racemosa</td>
<td>B</td>
<td>Potential</td>
</tr>
<tr>
<td></td>
<td>Phaeocollybia olivaceae</td>
<td>E</td>
<td>Potential</td>
</tr>
<tr>
<td></td>
<td>Sowerbyella rhenana</td>
<td>B</td>
<td>Potential</td>
</tr>
<tr>
<td></td>
<td>Tricholomopsis fulvescens</td>
<td>B</td>
<td>Potential</td>
</tr>
</tbody>
</table>

**Survey and Manage Species Analysis**

**Known sites of Survey and Manage Species**

Review of NRIS and other datasets indicated there is one known site of *Dendriscocaulon intricatulum*, a Category E S&M lichen species within the project area in Unit 805. A 0.25-acre no-disturbance buffer has been established around this site.

**Survey and Manage Species Further Analyzed**

Category A and Category C species identified for pre-disturbance surveys were based upon species range relative to the project area, presence of suitable habitat in the project area and extent of habitat-disturbing activities therein, and current scientific information relative to species taxonomy. As a result of the analysis, pre-disturbance surveys were conducted for two vascular plants and one bryophyte. As a result of surveys, one new site of the vascular plant *Cypripedium montanum* (Category C) was detected and two new sites of the bryophyte species *Ptilidium californicum* (Category A).

**Alternative 1 – No Action**

**Direct Effects**

Review of NRIS and other datasets indicated there is one known site of *Dendriscocaulon intricatulum*, a Category E S&M lichen species, within the project area. Category A and Category C species identified for pre-disturbance surveys were based upon species range relative to the project area, presence of suitable habitat in the project area and extent of habitat-disturbing activities therein, and current scientific information relative to species taxonomy. Because of the analysis, pre-disturbance surveys were conducted for two vascular plants and one bryophyte. As a result of surveys, one new site of the vascular plant *Cypripedium montanum* (Category C) was detected and two new sites of the bryophyte species *Ptilidium californicum* (Category A). There are no direct effects associated with the No Action Alternative.

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14 “2014 option 2b” Project initiated after April 30, 2015.
Indirect Effects
There are no indirect effects associated with the No Action Alternative.

Cumulative Effects
There are no cumulative effects associated with the No Action Alternative.

Alternative 2 – Proposed Action

Direct and Indirect Effects
The following is an evaluation of habitat disturbing activities relative to the known and newly detected S&M species in the 1st 48 Project area. Only vascular plants and non-vascular botanical species will be further analyzed. The assessment considers the extent and significance of habitat disturbance, in particular, life cycles, microclimate or life support requirements, from actions proposed under Alternative 2.

*Dendriscocaulon intriculatum (Manage Known Sites) – in Unit 805*

*Dendriscocaulon intriculatum* is a lichen that grows on the bole and branches of oak trees. As a lichen, it exchanges water, gases through its “skin”, and thus is influenced by changes in atmospheric moisture. Lichens are most susceptible to changes in their environment when the thallus is hydrated. In this condition, lichens are most photosynthetically active, contrarily, no gas exchange occurs in air-dried lichens (Nash 1996). Changes in atmospheric moisture and its effect on lichens are influenced by temperature. Lichens are well adapted to temperatures experienced in their microhabitat (Nash 1996), but tolerances to heat outside the natural range of variability can trigger a stress response in the lichen. In a dry state, lichens have a tremendous capacity to tolerate heat stress, but when hydrated that tolerance diminishes.

In light of these ecological variables associated with lichens, the 1st 48 Project includes design features that would reduce potential negative effects of heat and smoke as well as maintain residual substrate for *Dendriscocaulon intriculatum*. A 0.25-acre buffer (radius approximately 50 feet) was established at the detection in Unit 805. This buffer area is considered a no-disturbance buffer. Trees shall not be fallen into the buffered area.

*Cypripedium montanum (Pre-disturbance Surveys & Site Management) – Adjacent to Unit 421*

Potential habitat disturbing activities related to *Cypripedium montanum* known sites pertain to mechanical disturbance that removes plants, disrupts upper soil horizons, triggers a shift in associated species composition, and opens the canopy beyond the tolerance threshold of mountain lady’s slipper. Where new sites were detected, no-disturbance buffers were established in the field. Buffers were delineated in the field to account not only for protection of the plants but to account for habitat elements associated with mountain lady’s slipper, specifically overstory shading and existing canopy layers, existing moisture conditions, maintenance of CWD, maintenance of existing tree, shrub and forb diversity, and adequate habitat around the existing plants for short-range dispersal of seeds and rhizome. Trees shall not be fallen into the buffered area.

Edge effects were also taken into consideration. Edge effects include changes in air and soil temperature, wind velocity, and relative humidity from a given edge into an intact forest. To reduce the potential for edge effects to known sites, buffers, their size and dimension, were established with aspect, slope position, and proximity to riparian areas in mind. A 0.5-acre buffer was established around the occurrence in the riparian zone adjacent to Unit 421. *Cypripedium montanum* is not only an S&M species, but also Forest Sensitive species. A more detailed analysis of effects is included in the BE/BA for this project (McRae 2018).
Ptilidium californicum (Pre-disturbance Surveys and Site Management) – in Units 412 and 805
Potential habitat disturbing activities related to Ptilidium californicum pertain to extent of canopy opening and vegetation manipulation in the vicinity of the documented occurrence which could increase drying effects of solar radiation and wind, removal of mature trees around the occupied tree, which would remove sites for future dispersal opportunities, and broadcast burning that could result in torching the base of the occupied tree. Two occurrences of Ptilidium californicum were detected, one in Unit 412 and the other in Unit 805, both on the base of a 36-inch-diameter white fir in a mid-mature stands.

A no-disturbance buffer of approximately 0.5 acres was established around the occupied trees to ensure the retention of the existing vegetation and stand structure, which provides the shade to the forest floor surrounding the occupied tree. The buffer incorporated mature trees for future dispersal opportunities. Under the Proposed Action, the silviculture treatments surrounding the buffer would provide peripheral shade to the buffer, thereby reducing edge effects, and potentially suitable substrates by retaining pre-dominant, healthy dominant and co-dominant conifers around the buffer. Trees shall not be fallen into the buffered area.

With the PDFs in place for Dendriscocaulon intricatulum, Cypripedium montanum, and Ptilidium californicum, measures have been provided for the persistence of the species at known sites; therefore, the project is consistent with the current S&M direction.

Equivalent Effort Fungi Surveys
Equivalent effort surveys were conducted for potential S&M plant species in July 2017. Survey efforts focused on potentially suitable habitat for these species, specifically stands in the mid-mature and older seral stages with the structure and canopy cover that defines the habitat. Surveys were performed by a mycologist who conducted a reconnaissance of all potential areas within the project area on October 14, 2017. Approximately 194 acres of suitable fungi habitat were identified for survey. Following S&M protocols, the first fungi surveys were conducted from November 10, 2017 to November 12, 2017. There were 43 species of fungi, mostly wood rotting saprobes or pathogenic fungi recorded; however, no S&M species were detected.

The second survey was from November 28, 2017 to November 30, 2017. During this survey, Ramaria rubrievanescens was detected, a Category B S&M fungi requiring management of the known site. The site was flagged with a no disturbance buffer and the boundary of unit 402 was moved so that the buffered area is now outside of the unit. Trees shall not be fallen into the buffered area.

Ramaria rubrievanescens (Equivalent Effort Surveys and Site Management)
Potential habitat disturbing activities related to Ramaria rubrievanescens pertain to removal or severance of mycelial components (which comprise the fungal organism) residing in the organic or topsoil layer for mycorrhizal fungi, reduction in canopy shade and organic forest floor cover, reduction in the abundance of host trees and refuge species to sustain inoculum through periods of successional change in the stand, removal or reduction of forest floor organics and CWD which form the primary micro-habitat for saprobic species, and breakdown of soil structure (e.g., compaction) which not only affects the mycelia therein but also damages fine root tips to which the mycelia attach (Amaranthus et al. 1996).

Silvicultural and fuels design, PDFs and LRMP S&Gs reduce the level of negative direct and indirect impacts to sensitive fungi. Silvicultural and fuels design includes a) the nature of the silvicultural treatments (TFB and oak woodland maintenance to retain existing species diversity) that allows for structural diversity, retention of host trees and partial shade to the forest floor, and b) the nature of the fuels treatment in the units which focus on thinning, pruning and piling of small-diameter trees and shrubs.
within a limited space near roads. Project design features and LRMP guidelines oriented toward soils or wildlife that also benefit sensitive fungi include:

- For each unit, soil porosity would be maintained to at least 90 percent of its natural condition over at least 85 percent of the unit area. Skid roads and trails would be limited to no more than 15 percent of the harvest area. At the end of project activities, a layer of litter and duff would occur over at least 50 percent of the activity area. In all treatment units, retain 80 to 100 percent of existing CWD (at least 20 inches in diameter and 10 feet long) on the ground.
- All existing large snags (20 inches or greater in diameter) would be retained in units unless they pose a safety concern.

While not eliminating effects to fungi, it is assumed by managing for habitat elements in stands to be thinned, adverse effects to sensitive fungi species can be reduced. Effects of relatively small-scale activities are not likely to significantly reduce the fungal species diversity that was in place prior to the disturbance (Durall et al. 1999). In certain areas in a stand, meso-habitat features would be impacted by skidding, felling of canopy trees, yarding tops, end-lining or pile burning, but mycelial networks can extend several meters through the forest floor, so conceivably localized impacts may impact or sever part of the fungal individual but would not necessarily impact the entire body of the organism. Furthermore, if vegetative and soil conditions are retained in places within the unit, spores stored in the soil provide a propagule for development of fungi after the disturbance. These impacted areas would recover in time and along with it the development of fungal communities (Dahlberg and Stenlid 1995).

**Cumulative Effects**

Impacts to known sites of S&M species are isolated and localized. There are no other Forest Service or private property projects occurring within the project area that could impact these known sites. Therefore, there are no cumulative effects associated with the Alternative 2 – Proposed Action alternative.

Provided PDFs described in this document are implemented, the Proposed Action adheres to the policy within the SRNF LRMP (USDA/USFS 1995) and FSM 2900 Invasive species management (USDA/USFS 2011) and the Forest National Strategic Framework for Invasive Species Management (USDA/USFS 2013).

The Sensitive Botanical species effects analysis and the actions proposed under Alternative 2 adhere to the policy within the SRNF LRMP and FSM 2670 (USDA/USFS 2005).

By managing known S&M sites, based on pre-disturbance and equivalent effort surveys adhering to S&M S&Gs per the 2001 Record of Decision (ROD) and the SRNF LRMP, microsite conditions would be maintained to provide for the persistence of these species.

**Invasive Non-Native Plants**

**Introduction**

Key to keeping invasive non-native plants at bay on SRNF is management of existing infestations and of the vectors that introduce and spread these plants on forest with particular emphasis on the management of satellite or leading edge occurrences. In regards to the latter, this is a rare opportunity to manage and possibly even eradicate occurrences before population numbers explode to a point of no return. The main emphasis of the Invasive Non-Native Plant section of this document is an evaluation of the risk of introduction and spread of invasive non-native plants from actions proposed under the action alternative,
Alternative 2. The level of risk is used as a measurement indicator to compare environmental consequences between alternatives. The risk evaluation leads to PDFs that are designed to mitigate project effects by reducing the risk of introduction and spread of invasive non-native plants from the existing condition of high to the desired condition of low.

Environmental Consequences

Methodology
In accordance with the policy within FSM 2900 Invasive species management (USDA/USFS 2011), the Forest shall abide by the following as a component of project decision document:

- Determine the risk of introducing, establishing, or spreading invasive species associated with any proposed action, as an integral component of project planning and analysis, and where necessary provide for alternatives or mitigation measures to reduce or eliminate that risk prior to project approval.
- Ensure that all Forest Service management activities are designed to minimize or eliminate the possibility of establishment or spread of invasive species on the National Forest System, or to adjacent areas.
- Make every effort to prevent the accidental spread of invasive species carried by contaminated vehicles, equipment, personnel, or materials (including plants, wood, plant/wood products, water, soil, rock, sand, gravel, mulch, seeds, grain, hay, straw, or other materials).
- Monitor all management activities for potential spread or establishment of invasive species in aquatic and terrestrial areas of the National Forest System.

Evaluating Risk
Risk is evaluated in an assessment for this project based on five indicators: 1) presence of known invasive plant species in the project area, 2) habitat vulnerability, 3) non-project-dependent vectors such as existing roads or trails, adjacent private property, 4) habitat alteration expected as a result of project implementation, and 5) increased vectors as a result of project implementation.

Roads are vulnerable settings for the introduction and spread of invasive non-native plant species. Invasive plants are highly adapted to settings that are chronically disturbed and with little to no shade. Seeds of these plants can be inadvertently introduced to new areas on vehicles or equipment (the latter used in road maintenance), attached to domestic animals, or imported on rock/gravel/straw or other material used on roads or for erosion control. Once introduced, seed banks produced by yellow star thistle can last a decade or more and germinate when subjected to scarification (alteration of the seed coat) by mechanical or thermal means.

An evaluation of the risk of introduction and spread from actions proposed under the action alternative, Alternative 2, follows (Table 24). The risk evaluation leads to PDFs that are designed to mitigate effects noted above by reducing the risk of introduction and spread from the existing condition of high to the desired condition of low. Alternative 1 (No Action Alternative) would score a high risk under Factor 1 due to the presence of yellow star thistle. It would also score high risk for Factors 2 and 3. Actions proposed under Alternative 2, on the other hand, include actions that could greatly increase the risk of introduction and spread by adding the high risks associated with Factors 4 and 5 if the PDFs and mitigations are not implemented.
Chapter 3. Environmental Consequences

Factor 1. Presence of known non-native invasive plant species identified as a forest concern.

- **HIGH Risk**: Because of surveys conducted by SRNF botanists, yellow star-thistle infestations were found to exist on edges of FSRs 02S50 and 02S48. Table 24 provides the location of these sites. Sites would be flagged in the field and identified by the INFESTATION ID. Note that UTMs are centroids of infestations. Mileposts were derived in ArcMap and are approximate.

### Table 24. Yellow star thistle infestations and their location within the project area.

<table>
<thead>
<tr>
<th>Infestation ID</th>
<th>Acres</th>
<th>NAD83X</th>
<th>NAD83Y</th>
<th>Road Number</th>
<th>Milepost</th>
<th>Notes</th>
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<td>0.22</td>
<td>471,943</td>
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<td>472,339</td>
<td>4,458,783</td>
<td>2S48</td>
<td>0.33 to 0.36</td>
<td></td>
</tr>
<tr>
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<td>4,458,803</td>
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<tr>
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<td>4,459,365</td>
<td>2S48</td>
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</tr>
</tbody>
</table>

Factor 2. Habitat vulnerability based on previous disturbance, plant cover, soil cover, shade, soil type, aspect/moisture.

- **LOW Risk**: Forested areas with high canopy cover.
- **HIGH Risk**: Oak woodlands, forested (harvested) areas with low canopy cover, early seral communities, road edges, and burned areas.

The project area possesses attributes that are conducive to yellow star-thistle introduction and spread. These attributes include relatively open habitats including oak woodlands, areas of reduced canopy and overall vegetative cover, areas of ground disturbance due to past logging, road construction, road maintenance, and private land developments. There are also burned areas as a result of the 2008 Mad River Complex fires. Yellow star thistle is intolerant of shade and readily invades open and disturbed settings. A majority of the project area is forested, which is not considered a habitat type vulnerable to noxious weeds that might occur in the area.

Factor 3. Non-project-dependent vectors such as existing roads and trails, traffic use, livestock/wildlife migrations, wind patterns, drainage flow directions.

- **HIGH Risk**: Roads, wind patterns, livestock grazing and wildlife movement

Roads are a primary vector for the introduction and spread of weeds (Gelbard and Harrison 2003). Use of roads associated with the project area, especially those adjacent to known occurrences of invasive species, can lead to a high risk of spread of invasive non-native plant species. Yellow star thistle is wind-dispersed, and as such can disperse over long distances.
Areas where livestock concentrate such as water troughs are subject to sometimes-intense ground disturbance, which creates a setting conducive for invasive plant establishment. Livestock can also serve as vectors for transport of yellow star-thistle seed, via seeds embedded in mud attached to hoofs. The 1st 48 Project lies within the Van Horn grazing allotment, and as such is subject to spread of noxious weeds via livestock activities.

**Factor 4. Habitat alteration expected as a result of the project such as logging prescriptions, road construction, fuels prescriptions, change in grazing management or recreation use, intensity and extent of disturbance.**

- **LOW Risk:** Activities that maintain more than 60 percent canopy cover and remnant understory vegetation.
- **MODERATE Risk:** Activities that maintain 40 percent to 60 percent canopy cover and remnant understory vegetation.
- **HIGH Risk:** Activities resulting in less than 40 percent canopy cover and remnant understory vegetation.

In general, invasive non-native plant species establish and recruit in areas of ground disturbance, especially where forest canopy is diminished. Logging, temporary and permanent road construction, fuels prescriptions, and the machinery used to perform these activities can create disturbed soils, reductions in vegetative ground cover, and reductions in canopy. The conditions created are conducive to the introduction and spread of noxious weeds.

Where complete removal of vegetation is expected (e.g., shrub/vegetation removal in fuel corridors, or landing development), the risk of introduction and spread is considered to be HIGH. Where partial removal of vegetation in forested habitats results in an average canopy closure of 40 to 60 percent, the risk of spread into the setting is MODERATE in the short-term until such time that the canopy fills in the gaps and understory vegetation and where canopy cover is greater than 60 percent, the risk is considered LOW.

**Factor 5. Increased vectors as a result of project implementation such as road construction, facility construction, amount of project-related traffic.**

- **MODERATE Risk:** Other areas of project.
- **HIGH Risk:** Increased traffic on 2S50 and 2S48 including the use of machinery associated with project implementation, and use of landings and turnouts along these roads.

**Risk Determination**

Given yellow star-thistles ecology and roadside distribution within the project area, the evaluation of the 5 factors above result in a moderate to high risk of introducing and spreading yellow star thistle within the project area. Hence, the following PDFs are designed to mitigation measures to reduce or eliminate that risk prior to project approval.

**Alternative 1 – No Action**

**Direct Effects**

If left unmanaged, invasive non-native plant species directly threaten ecosystems by displacing native species.
Indirect Effects
Indirectly, over time they can reduce species diversity, and degrade wildlife and fisheries habitat. Yellow star thistle has been shown to be toxic to horses, leading to injury or death, and as such can indirectly degrade rangelands and lower private property values (DiTomaso et al. 2007). In addition to degrading rangelands and lowering property values, widespread infestation of yellow star thistle can indirectly lead to soil erosion and siltation in streams.

Cumulative Effects
Failure to take action now under the Proposed Action, would over time, lead to the spread of invasive non-native plants into currently uninfested areas, primarily along roadsides and forest and grassland openings. The rate of spread would accelerate over time, as the seed source increases and expands. Without the application of control treatments at this point, a threshold would be reached at some future time, where the extent of controlling the widespread distribution of these non-native plant populations would become cost prohibitive. The outcome would be these non-native invasive plant species would become a permanent fixture on the landscape, causing subsequent loss of biodiversity and quality forage for open range.

Alternative 2 – Proposed Action
Direct Effects
Project design features described in Chapter 2 of the EA are designed to reduce the risk of introduction and spread of invasive non-native plant species from a risk of high to a risk of low and, as such, direct effects under Alternative 2 are less. These design features include removing existing infestations and lessening the chance of spreading them via actions proposed.

Indirect Effects
Project design features outlined above are designed to reduce the risk of introduction and spread of invasive non-native plant species from a risk of high to a risk of low and, as such, the risk of degrading wildlife and fisheries habitat, and degrading rangelands and property values are reduced. Hence, indirect effects under Alternative 2 are comparatively lower than under Alternative 1.

Cumulative Effects
The spatial extent of the cumulative effects analysis is the project area within which the greatest concern exists for the introduction and spread of invasive non-native plants by actions occurring during the implementation of the roadside fuelbreak. The temporal time span would be the implementation time span of the project. Management of the direct and indirect effects via the PDFs that would mitigate effects by reducing the risk of introduction and spread, as Alternative 2 would remove the source of infestation and, hence, lead to beneficial cumulative effects.
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Finding of No Significant Impact

As the responsible official, I am responsible for evaluating the effects of the project relative to the definition of significance established by the Council on Environmental Quality (CEQ) regulations (40 CFR 1508.13). I have reviewed and considered the environmental assessment (EA) and documentation included in the project record, and I have determined the Proposed Action would not have a significant effect on the quality of the human environment. As a result, no environmental impact statement would be prepared. My rationale for this finding is as follows, organized by sub-section of the CEQ definition of significance cited above.

Context
For the Proposed Action and the No Action Alternative, the context of the following disclosure of environmental effects is based on the environmental analysis completed in preparation of this EA, summarized below.

Intensity
Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis of this EA and the references in the project record. The effects of this project have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits. My finding of no significant impact is based on the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b).

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect would be beneficial.

Fire, Fuels and Vegetation. The Proposed Action would have a positive response to thinning from below from implementing the Proposed Action, since subordinate trees (suppressed, intermediate and select co-dominant trees) would be removed to allow trees of the upper canopy (dominant and predominant trees with fully developed crowns) to utilize the additional growing space. Thinning from below would increase the residual size of trees left in a stand (Agee and Skinner 2005; Smith et al. 1997). Crowns would expand into the desired shaded fuelbreak condition.

Reducing stand density at this time would also allow these stands to quickly develop more resilience to disturbances such as wind, heavy snow and ice, bark beetles, and fire. Thinning, whether from below or throughout the diameter classes (with the exception of predominant and dominant trees), increases spacing and reduces stand densities, resulting in less inter-tree competition, which increases individual tree vigor, resulting in stands that are more resilient to insects, disease, wildland fire, and drought (Agee and Skinner 2005, Fettig et al. 2007, Hessburg et al. 2016, van Mantgem et al. 2009, Vernon 2017).

As the Proposed Action would reduce ladder fuels, canopy base heights would be increased. Canopy densities would be decreased through thinning activities, and to a potentially noticeable extent a reduction in fuel ladders, would also occur through the same activities. These, in combination, would help to reduce flame length, resistance to control and the potential for a ground fire to transition into a crown fire.
One of the most threatened species is the California black oak (*Quercus Kelloggii*), which is vulnerable to being overtopped and crowded out by Douglas-fir. One of the biggest deficits on the landscape is the old upland oak woodland (CR). Thinning around these remnant oak trees being over topped and shaded out by faster growing Douglas-fir, would enable them to receive more sunlight promoting the growth of fuller crowns, which would increase their health and resistance to disturbance.

**Invasive Plant Species.** The policy, which guides the management of invasive species on National Forest System (NFS) lands, requires that land management activities not foster the introduction and spread of invasive species. Gertrude to the Proposed Action, the following policies from FSM 2900 (Invasive Species Management) apply. Project design features (PDFs) described in *Chapter 2* of the EA are designed to reduce the risk of introduction and spread of invasive non-native plant species from a risk of high to a risk of low and, as such, direct effects under the Proposed Action (Alternative 2) are less.

**Soil Resources.** The Proposed Action was designed to be consistent with the SRNF Land and resource management plan (LRMP or forest plan) and associated standards and guidelines (S&G), including soil quality standards (SQS) maintaining soil productivity in compliance with the National Forest Management Act (NFMA). Implementing project-specific mitigation measures would minimize effects to help ensure compliance with these LRMP provisions, and it is thus deduced that long-term soil productivity would be maintained within this project area.

Current existing detrimental effects of past actions are minimal in extent area. The Proposed Action by itself would not produce significant amounts of adverse direct or indirect soil impacts, using 15 percent of the area in detrimental soil conditions collectively as the threshold used to determine if soil impacts are significant, per current management direction. There are no reasonably foreseeable future actions, which would produce significant impairment of soil quality or productivity. Thus there are no additive significant effects of past, present, and foreseeable future actions expected, and therefore by definition no significant cumulative effects for soil resources.

2. *The degree to which the Proposed Action affects public health or safety.*

**Clean Air Act of 1970.** The Clean Air Act of 1970 and its amendments provide for the protection and enhancement of the nation’s air resources. The implementation of the Proposed Action would not exceed the federal and state ambient air quality standards to protect public health. Jackpot burning and underburning in the oak woodlands would be implemented seasonally. As each entry may be implemented over several seasons and would small in size, and handpiles would be covered with kraft waxed paper to minimize smoke production during burning, project design and mitigation measures would address public health and safety concerns. The project design incorporates operational provisions to ensure safe motorized access. Additionally, burn plan would be developed identifying specific tactics to reduce smoke emissions, including identifying sensitive smoke receptors and when favorable wind directions would promote smoke dispersal prior to scheduling burn ignition.

**Clean Water Act.** The protection of water quality and quantity is an important part of the mission of the US Forest Service (USFS or Forest Service; USDA Forest Service 2015). Management activities on NFS lands must be planned and implemented to protect the hydrologic functions of forest watersheds, including the volume, timing, and quality of streamflow. The alternatives, as proposed, would comply with the Clean Water Act, Porter-Cologne Water Quality Control Act, applicable water quality control plans, and the North Coast Regional Water Quality Control Board waiver of waste discharge requirements. A waiver application would be filed after the Decision Notice is signed.
The Basin Plan contains water quality objectives, implementation plans for meeting those objectives, and other policies of the State Water Quality Control Board and the federal government, which are applicable to timber and fuel treatment projects. The water quality standards in the Basin Plan that most closely apply to this Proposed Action are sediment. The standard for sediment states that sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Due to limited project activities in riparian reserves and 60-plus percent canopy retention, stream temperature would not be affected. The Proposed Action avoids constructing new roads (and temporary roads). For the project as a whole, there are 141 acres of riparian reserves deemed equipment exclusion zones. Of this, 90 acres are “inner” riparian reserves, (within 80 feet of the stream) which will only have fuel treatments by hand. There are 51 acres of “outer” riparian reserves, which are equipment exclusion zones, but trees may be yarded out using a cable. There are 3.7 miles of intermittent streams and one mile of perennial streams within the project units. The streams coming off South Fork Mountain are high gradient, steeply incised, with mostly stable banks and little true riparian vegetation.

The 1st 48 Project lies within the Upper Mad subarea (comparable to the Upper Mad River 5th-field watershed), which produces only six percent of the sediment within the larger Mad River Watershed. For the Upper Mad River Watershed, the total sediment is estimated at 234 tons per square mile per year with an average of 38 percent being from management related sources. The TMDL target for sediment in the Upper Mad subarea was set at 173 tons. This would mean a reduction of 26 percent for the Upper Mad watershed. The Environmental Protection Agency (EPA) specified that in order to meet a 26 percent reduction in total sediment within the Upper Mad watershed, management-related sediment must be reduced by 68 percent over time. Activities within the proposed project are designed to minimize and in some areas reduce management related sediment and move towards meeting the EPA sediment load allocation.

Wildland-Urban Interface. The reduction in fire hazards would enhance public safety for those living within the wildland-urban interface (WUI), as the Proposed Action is designed to allowing for efficient wildfire containment and control. Between 2006 and 2011, about 600 assessments were completed by the Forest Service on wildfires that burned into areas where hazardous fuels reduction treatments had previously been conducted (Stein et al. 2013). These assessments evaluated the effects of prescribed fire as well as mechanical and chemical treatments on fire behavior and fire suppression actions. The data indicate that 90 percent of treatments reported in the database have helped to reduce wildfire intensity, allowing better control by firefighters. In most of these cases, as fires moved from untreated locations to areas treated by thinning, mowing, or prescribed burning, the fire behavior changed from active crown fires (burning an entire upper story of the forest) to passive crown fires (where only a single tree or small group of trees burned), or from passive crown fires to surface fires (burning only dry grass, shrubs, pine needles, and other flammable materials on the ground) (DellaSala et al. 2004, Stein et al. 2013).

3. **Unique characteristics of the geographic area such as the proximity to historical or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.**

Caves. The Federal Cave Resources Protection Act of 1988 (102 Stat. 4546; 16 USC 4301 et seq.) provides that Federal lands be managed to protect and maintain, to the extent practical, significant caves. There are no known caves within the project area. Therefore, there would be no effect to this resource from implementing the Proposed Action.
**Wetlands and Floodplains.** No floodplains associated with Executive Order 11988 or wetlands per Executive Order 11990 exist within the project area. Therefore, there would be no effect to these resources from implementing the Proposed Action.

**Parklands and Prime Farmlands.** There are no parklands or prime farmlands within or immediately adjacent to the project area. Therefore, there would be no effect to these resources from implementing the Proposed Action.

**Research Natural Areas.** Research Natural Areas (RNA) are areas allocated for research, education and to protect biodiversity on National Forest System lands. There are no RNAs within the project area. Therefore, there would no effect to these resources.

**Wilderness Areas.** Wildernesses areas are managed according to the Wilderness Act of 1964, the California Wilderness Act of 1984, and regulations pursuant to those acts and the Forest Service Manual. There are no wilderness area designated within the project area. Therefore, there would be no effect to these resources.

**Wild and Scenic Rivers.** There are no designated and/or recommended National Wild and Scenic Rivers or adjacent corridors of land classified as recreational (KNF LRMP 4-156) within the project area per the National Wild and Scenic Rivers Act of 1968, designated by the Secretary of the Interior on January 19, 1981. Therefore, there would be no effect to these resources.

**Norther Spotted Owl Critical Habitat.** On December 4, 2012, the final 2012 NSO Critical Habitat rule was published. Critical habitat consists of those areas that have physical or biological features essential to the conservation of the species. The 2012 NSO Revised Critical Habitat Rule states “we encourage land managers to consider implementation of forest management practices recommended in the Revised Recovery Plan to restore natural ecological processes where they have been disrupted or suppressed (e.g., natural fire regimes), and application of ecological forestry management practices ....”. In the 2012 Critical Habitat Rule, the US Fish and Wildlife Service (USFWS) acknowledged that “Compared to other zones (in the Klamath and Northern California Interior Coast Ranges), additional foraging habitat for this zone showed greater divergence from nesting habitat, with much lower canopy cover and tree size.”

Approximately 36,267 acres of the action area occur within the Unit 11, Interior California Coast Subunits 1 and 2 of the 2012 NSO Critical Habitat. There are 12 units to be treated for hazardous fuel reduction (152 acres), 4 units to be oak woodland restoration (37 acres), 8 units of plantation thins (108 acres) and 65 units (530 acres) of fuelbreak construction that would occur in NSO CHU. A total of 786 acres of NSO nesting/roosting/foraging/dispersal habitat and 34 acres non-habitat would be treated between the two subunits of CHU. In the Interior California Coast subunit 1, fuelbreak construction would occur in 39 acres of low-quality foraging habitat. In the Interior California Coast Subunit 2, hazardous fuel reduction would occur in 49 acres of low-quality nesting/roosting habitat, 28 acres of moderate-quality nesting/roosting habitat, 12 acres of moderate-quality foraging habitat, 41 acres of low-quality foraging habitat, and 37 acres of dispersal-only habitat. Oak woodland restoration would occur on approximately 37 acres of dispersal-only habitat. Plantation thins would occur on 108 acres of dispersal-only habitat. Fuelbreak construction would occur in approximately 85 acres of moderate-quality nesting/roosting habitat, 159 acres of low-quality nesting/roosting habitat, 136 acres of moderate-quality foraging habitat, and 95 acres of low-quality foraging habitat would be modified, but would maintain current habitat function within NSO CHU.
Post treatment monitoring was conducted by the Level 1 Team on the Kelsey Peak Project, as well as on similar projects elsewhere on the forest. All the units exceeded canopy closure requirements, and protected predominant trees, snags, and downed logs. The units are still functional habitat and should respond well to the treatments. It was agreed by the Level 1 Team these types of treatments would have a beneficial effect on the future habitat conditions of the area and creating more alternative habitats for owls to use as additional treatments occur on the landscape.

**Late Successional Reserve.** A very small portion of the 1st 48 Project is located within the South Fork Late-Successional Reserve (LSR; RC-330). The entire South Fork LSR is 80,451 acres, with the majority located on the Shasta-Trinity National Forest (STNF). Of that, only 1,057 acres located on the Six Rivers National Forest (SRNF), and the 1st 48 Project affects only 73 acres located on the westernmost boundary of the entire LSR. The South Fork LSR is a land allocation established in the NWFP, incorporated into both the SRNF and STNF LRMPs, allocated to be managed to protect and enhance late-successional forest ecosystems through prescribed understory fire, and TFB. General management direction for LSR lands is found on pages 4-34 to 4-39 of the SRNF LRMP (USDA 1995). The STNF included the South Fork LSR in the 1999 Forest-Wide Late-Successional Reserve Assessment (LRSA; USDA 1999), which identifies general current conditions, general desired conditions, and management recommendations that would move the LSRs, including the South Fork LSR, toward desired conditions. One of these desired conditions is the reduction of risk to large-scale disturbance.

In 2009, the STNF received a letter of clarification from the Regional Ecosystem Office (REO) related to hazard reduction thinning activities proposed in LSRs in order to reduce the risk of large-scale disturbance. The REO had reviewed the LRSA for the STNF and concluded that fuel treatments proposed in the LSRs that thin suppressed, intermediate and some co-dominant trees are consistent with the S&Gs under the NWFP (USDA REO letter, October 18, 2009).

The 1st 48 Project area was identified as a landscape where existing features and conditions give firefighters a good chance of keeping exterior wildfire from entering; or conversely interior wildfire from exiting the area. Under the LSRA and LRMP direction, proposed silvicultural activities are aimed at reducing risk (potential loss due to wildfire) in 59 acres of younger white fir stands adjacent to FSR 2S23 along the ridgetop within the South Fork LSR.

Project objectives are to reduce the stand density with a thin from below (TFB) of primarily white fir to reduce fuel and add space between crowns. The trees targeted for removal in the early mature white fir stands have a diameter range of 14 to 24 inches, and are less than 120 to 150 years old. Some trees in this age class are larger than 24 inches dbh and may be removed to meet crown spacing objectives.

Additionally, there are approximately 14 acres of Douglas-fir or ponderosa pine dominated stands within the LSR that are early and mid-mature or are late mature stands, which have had previous entries of individual tree harvest. The trees targeted for removal in these stands are similar to the white fir stands in terms of age and diameter range. In the patches of mid-mature and remnant late-mature seral forest, (Table 9), trees range from 70 to 120 years in age, with diameters ranging from 12 to 32 inch dbh. As the Proposed Action targets those trees with under-developed crowns, which are typically suppressed and/or intermediate trees less than 150 years old, and retains trees with the fullest crowns characteristic of co-dominant, dominant and pre-dominant trees, late seral characteristics would maintained

**SRNF LRMP Retention and Partial Retention Management Areas – Visual Quality Objectives.** There are 275 acres within project area that fall within the visual quality objective (VQO) Retention management area and 234 acres within partial retention management area, while the remainder of the
Finding of No Significant Impact

The majority of the project area has experienced alterations in visual quality from road and log landing construction and even-age timber harvest management. The 1st 48 Project would retain variable forest canopy closure over 60 percent, limits new landing construction to existing flat openings and does not involve new road construction. The removal of boundary flagging and placing stump marks away from viewpoints would ensure the Proposed Action complies with land and resource management plan (LRMP or forest plan) standards and guidelines (S&Gs). The proposed treatments would blend well with adjacent lands not proposed for treatment and would conserve the scenic quality and integrity of the project area.

Trail 8E20 (or Wiregrass) commonly referred to as the “Jeep Trail” is a Special Vehicle Designation trail (i.e., four-wheel-drive non-highway legal vehicle wider than 50 inches/all-wheeled vehicles 50-inches wide or less) that is 1.29 miles long, located in T. 2S, R. 8E. The Forest Service, national resource management (NRM database) indicates: 8E20 trail was added to the NFST (National Forest System trails) under Lower Trinity/Mad River Motorized Travel Management Record of Decision in April 2010. This trail is displayed on the revised motor vehicle use map (MVUM) for that area. The trail would be graded within its existing footprint and temporarily closed to public use during logging operations to ensure public safety. Other than the short-term disruption in public use, grading and constructing waterbars would be visually evident in the short-term, likely one season.

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

The project area lies within the upper Mad River watershed, which encompasses 120 square miles (24% of the basin) from the headwaters of the Mad River to Robert Matthews Dam, which impounds runoff from the upper watershed in Ruth Lake Reservoir (the only existing impoundment on the Mad River), built in 1961 by the Humboldt Bay Municipal Water District (HBMWD). The reservoir has a storage capacity of about 48,030 acre-feet and was designed to provide a safe yield of 75 million gallons per day (mgd; 230 acre-feet/day), approximately 8 percent of the total annual runoff for the watershed.

Prior to construction of Matthews Dam, late summer and early fall flows in the Mad River above Pilot Creek were intermittent. At the former US Geological Survey (USGS) gage near Forest Glen (No. 11480500 located approximately 9 miles downstream of Matthews Dam), mean daily flow for the month of August from 1953 to 1961 ranged from 2 to 8 cubic feet per second (cfs), with an average of 4 cfs. Currently the HBMWD manages the release of water from Ruth Reservoir to meet domestic and industrial water needs as well as instream flow requirements for the protection of listed fish species (HBMWD 2004).

The extent, duration and intensity of proposed activities under Alternative 2 are not sufficient to adversely affect in-stream flows. Evapotranspiration rates would not be further altered, nor would sufficient ground compaction occur to alter rates of surface runoff. The proposed treatments would not result in changes to spatial and temporal hydrology both due to the limited magnitude of the treatments and the very small and localized spatial extent of the treatments. Therefore, the timing, magnitude, and duration of flows would not be altered. Instream flows and fluvial processes would continue to occur at the rates under which the stream system evolved. Habitat diversity, channel stability, and water quality would continue to be moderate to high.
5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.**

**Asbestos Airborne Toxic Control Measure (ATCM) for Surface Application.** The ATCM rule was adopted by the California Air Resource Board (CARB) in 1990 and amended in 2000. The amendment lowered the asbestos content to 0.25 percent for asbestos-bearing ultramafic rock materials used for surfacing applications subjected to vehicular, pedestrian or non-pedestrian use, such as cycling and horseback riding. In remote areas, the naturally occurring asbestos (NOA) content can be as high as 1 percent without concern.

The SRNF has samples and tests for presence of Naturally Occurring Asbestos as close as 10 miles from the project area. Two of the 42 samples within a 20-mile radius from the project area contained asbestos at 0.5 percent in small serpentinite outcrops. The project area contains no similar outcrops. No ultramafic bedrock and therefore, no naturally occurring asbestos occur in the project area. No groundwater resources would be developed or are existing within the project area. The Proposed Action applies low-intensity mechanical, manual and prescribed burning treatment methods. The treatment prescriptions and mitigation measures incorporated have been applied on numerous projects across the SRNF with predictable effects and outcomes.

**Executive Order 12898, Environmental Justice.** This federal order requires an assessment of whether there would be disproportionate effects to minority or low-income populations. Although there are minorities and low-income populations living in the North Coast California area, they would benefit from the proposal.

Environmental Justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner, by government programs and activities affecting human health or the environment. There would be no discernable differences between the Proposed Action and No Action Alternatives regarding effects on minorities or the civil rights of any American citizen.

The Proposed Action does not have a disproportionately high and adverse human health effects, high or adverse environmental effects, substantial environmental hazard, or affects to differential patterns of consumption of natural resources. Extensive scoping did not reveal any issues or concerns associated with the principles of Environmental Justice. No mitigation measures to offset or ameliorate adverse effects to these populations have been identified.

**Relationships between local, short-term, uses of the human environment and maintenance or enhancement of long-term productivity.** Short-term uses are expected to change the human environment during mechanical, manual, prescribed burning and logging/hauling operations. Long-term effects should not appreciably change the human environment after final entry fuel reduction operations have concluded, as proposal treatment prescriptions are low-intensity, and planned for phased entries to minimize disturbance to nearby neighbors and natural resources.

The availability of natural resources contributes to the quality of life for many county residents. Many community members rely on natural resources for substance food gathering and jobs. These communities are directly influenced by forest-management job opportunities and supply of natural resources from forest ecosystems. Implementation of the Proposed Action would cause no unavoidable or other indirect social/economic adverse effects.
6. The degree to which the action may establish precedent for future actions with significant effects or represents a decision in principle about a future consideration.

Irreversible or Irretrievable Commitments of Resources. Irreversible commitment of resources refers to a loss of non-renewable resources, such as mineral extraction, heritage (cultural) resources, or to those factors, which are renewable only over long time spans, such as soil productivity. Under the No Action Alternative, there would be no irreversible or irretrievable commitment of resources.

Irretrievable commitment applies to losses that are temporary, such as use of renewable natural resources. The production lost would be irretrievable, but the action would not be irreversible. Vegetation removed as commodity byproducts under the Proposed Action, is considered an irretrievable impact. Forest conditions would return, as tree growth over one or more decades would feature increased canopy closure and development of healthy, sustainable stand densities resilient to natural processes serving ESA wildlife habitat or soil resources.

Soils. Current existing detrimental effects of past actions are minimal in extent area. The Proposed Action by itself would not produce significant amounts of adverse direct or indirect soil impacts, using 15 percent of the area in detrimental soil conditions collectively as the threshold used to determine if soil impacts are significant, per current management direction. There are no reasonably foreseeable future actions, which would produce significant impairment of soil quality or productivity. Thus there are no additive significant effects of past, present, and foreseeable future actions expected, and therefore by definition no significant cumulative effects for soil resources.

The Proposed Action is design consistent with the regulatory framework outlined above. Forest plan S&Gs and SQS are intended to comply with NFMA, maintaining soil productivity. Standards and guidelines and SQS indicators were used as the context to describe and analyze the extent and magnitude of expected soil impacts, spatially and temporally. Implementing project-specific PDFs are intended to help ensure compliance with these LRMP provisions, and it is thus deduced that long-term soil productivity is maintained within this project area.

Adverse Environmental Effects that cannot be Avoided. The Proposed Action involves adverse environmental effects to soil resources that cannot be wholly avoided or mitigated. New temporary roads and landings are the most impactful features associated with activities, in particular ground-based (tractor) operations. No new temporary roads are proposed with this project, in agreement with the Collaborative. The majority of landings are old landings to be reutilized, but a number of new landings would also be created. These would have severe compaction, and thus have reduced infiltration and be prone to producing runoff; drainage features are required to control runoff and avoid adverse impacts (BMPs). Being “temporary” means that they will need to be rehabilitated once their use is finished. PDFs herein stipulate that rehabilitation will include de-compaction via ripping (furrowing using conventional rock- rippers common on logging equipment) or “dibbling” meaning working the ground with an excavator bucket (common method in other areas, also called “potato patch”). This would be followed by recontouring to the approximate original terrain in cases where the feature was “constructed” by blading topsoil to create a favorable grade or bench (constructed using cut & fill).

The proposed landings are mostly roadside on gentle grade, so little blading should be necessary to make them usable, and thus little to no recontouring is expected to be necessary; however, some form of decompaction would be necessary. These areas would also be rendered bare, so some form of soil cover may be required to prevent erosion, either organic mulch, slash, and/or seeding to establish vegetation. In most cases, old access roads and landings are in favorable locations to be re-utilized, which will minimize
new disturbance and cumulative effects. Even with rehabilitation measures, new and reutilized temporary roads and landings would still have long-term effects left to slowly recover naturally over time.

Skid trails would be created as necessary to operate the mechanical ground-based units. These would also have compaction, but not as severe as temporary roads and landings. These may or may not have “detrimental” levels of compaction, depending on traffic intensity. A few passes with a tracked grapple-skidder will generally not produce a detrimental degree of compaction if soils are dry. Most soils have a moderate compaction risk (table 2), but some have a high compaction risk, namely Kistirn (SMU 260), Hugo (SMU 265-266), and Hecker (SMU 250-256); these intersect with many of the ground-based units (Appendix C). Thus it is conservatively assumed that skid trail compaction would be detrimental, and these equipment trails in combination with temporary roads and landings; limited to <15 percent of the unit area as part of the layout plan to ensure this aerial extent is not exceeded (PDF). If equipment trails are deeply rutted, they may be decompacted by ripping if necessary to promote natural revegetation.

Implementation of the Proposed Action would cause no other known unavoidable or other indirect adverse effects, other than the effects already stated.

Energy Requirements of Alternatives. Under the Proposed Action, various amounts of fossil fuels, and human labor would be expended. Fossil fuel energy would not be retrievable. None of them are in short supply and their use would not have an adverse effect upon continued availability of these resources.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

Vegetation. The Proposed Action differs from past actions, in that historic timber harvest (pre-1990s) consisted of clearcut or shelterwood logging, broadcast burning, and planting with Douglas-fir seedlings. The actions proposed here are to reduce hazardous fuels and to construct shaded fuelbreaks to promote resiliency of stands from fire effects. These treatments would not detract or stall these stands in development of structure to mid-mature/late-mature and understory re-initiation and would not alter the current distribution of seral or development stages (also called structural stages) within the analysis area.

Similar thinning projects are being carried out within this watershed. The 2009 Beaverslide and the 2013 Kelsey Peak Timber Sale and Fuelbreak Project have portions recently implemented. Other foreseeable actions within the analysis area are additional hazardous fuel reduction projects and shaded fuelbreak construction and maintenance.

In terms of past, proposed, ongoing, and foreseeable actions, this project would have no cumulative effects to the vegetation structural stages within the South Zone. The current distribution has been molded by past activities, which removed older forest types, and by past wildfires. This project would improve the distribution of structural stages over the long-term for species needing older forest habitat for part or all of their life cycle.

The Proposed Action would retain all dominant trees and pre-dominant trees, which includes those with defects. Most co-dominant trees would also be retained. The thinning from below prescription would not alter existing seral stage condition, and it would in fact, increase growth on the remaining trees to accelerate development of trees into late seral size classes. This would promote an increase in the amount (acres) of late seral stands as an incremental step toward achieving the minimum Douglas-fir Recommended Management Range (RMR) threshold.
Finding of No Significant Impact

**Fire and Fuels.** The absence of recent mixed-severity fire has been a likely factor in the rather uniform, even-aged, single-layer structure of these Douglas-fir stands, as well as the continued loss of black oak through competition from Douglas-fir. Fire suppression since the early 1900s means that these sites have likely missed several fire events that would have created more horizontal and structural diversity in the early- and mid-mature stands (Weisberg 2004, Taylor and Skinner 2003).

In the northern part of the planning area, ponderosa pine and ponderosa pine/black oak stands are prevalent. Fire scar evidence indicates that these stands were historically maintained at low densities by frequent fire regimes. Many of these stands contain large, old specimens of both of these species. Stand densities and ladder fuels have increased to the point that there is a risk of losing them to a stand-replacing fire.

The Proposed Action would employ TFB (Tappeiner et al. 2007) in early and early/mid-mature Douglas-fir/black oak stands ranging in age from 70 to 80 years, early mature white fir stands, and young Douglas-fir or ponderosa pine plantations. These stands are generally single-layered and consist of even-aged patches of varying age. A positive response to thinning from below from implementing the Proposed Action is expected, since subordinate trees (suppressed, intermediate and select co-dominant trees) would be removed to allow trees of the upper canopy (which have more fully developed crowns) to utilize the additional growing space. Thinning from below increases the residual size of trees left in a stand (Agee and Skinner 2005; Smith et al. 1997). Crowns would expand into the desired shaded fuelbreak condition.

Reducing stand density at this time would allow these stands to quickly develop more resilience to disturbances such as wind, heavy snow and ice, bark beetles, and fire. Thinning, whether from below or throughout the diameter classes (with the exception of predominant and dominant trees), increases spacing and reduces stand densities, resulting in less inter-tree competition, which increases individual tree vigor, resulting in stands that are more resilient to insects, disease, wildland fire, and drought (Agee and Skinner 2005; Fettig et al. 2007; Hessburg et al. 2016; van Mantgem et al. 2009; Vernon 2017).

Similarly, retaining the trees with the largest crowns may initially stimulate growth response of some brush species. However, the resulting increase in crown growth would reduce available sunlight from reaching the forest floor within a few years, which would in turn, reduce understory vegetation growth, including brush species that might contribute to ladder fuel development.

**Watershed Resources.** The 1st 48 Project area is not within Key Watershed under the NWFP. Barry Creek Mad River is designated a Priority Watershed under watershed condition framework (WCF). The Proposed Action is small in acreage and widely dispersed across the landscape alongside open roads in narrow 300-foot strips, existing roadside plantations and an oak woodland stand. Thinning to establish shaded fuelbreaks would retain forest overstory canopies at 60-plus percent, functioning to provide sufficient shade from solar radiation to prevent increases in water temperature.

Thinning of trees (ladder and crown fuels) prescriptions would be restricted to the outer portion of the riparian reserves to retain tree root systems that hold soil and stream channels in place, functioning to minimize soil erosion and potential for increased sedimentation to protect water quality. Alternative 2 incorporates design features to retain large woody debris and avoids thinning of trees within inner riparian reserve buffers to also ensure future down wood recruitment is sufficient to maintain suitable stream habitat conditions.

**Soil Resources.** Current existing detrimental effects of past actions are minimal in extent area. The Proposed Action alternative by itself would not produce significant amounts of adverse direct or indirect
soil impacts, using 15 percent of the area in detrimental soil conditions collectively as the threshold used to determine if soil impacts are significant, per current management direction. There are no reasonably foreseeable future actions, which would produce significant impairment of soil quality or productivity. Thus there are no additive significant effects of past, present, and foreseeable future actions expected, and therefore by definition no significant cumulative effects for soil resources.

The Proposed Action is design consistent with the regulatory framework outlined above. Forest Plan S&Gs and SQS are intended to comply with NFMA, maintaining soil productivity. Standards and guidelines and SQS indicators were used as the context to describe and analyze the extent and magnitude of expected soil impacts, spatially and temporally. Implementing project-specific PDFs are intended to help ensure compliance with these LRMP provisions, and it is thus deduced that long-term soil productivity is maintained within this project area.

**Geologic Resources.** Surveys identified eight active landslides within the project area. There are no other Forest Service or private land activities occurring within these sites. Cumulative effects are minimal to none for risk of increased rate of landslide activity. Landslide activity has been shown to increase about 10 years after all vegetation has been removed by fire or harvest due to loss of root strength. The project would not remove all vegetation, thereby preserving root strength in the long-term and would not increase landslide activity. Concentrated flow from skid trails will not occur due to application of skid trial remediation as per S&Gs and pose no long-term risk. If S&Gs, BMPs, and project design features (PDFs) are followed, negative effects to slope stability should be minimal or absent as compared to the likelihood that extensive landslide reactivation would be in the event of stand-replacing fire across much of the landscape.

**Invasive Plant Species.** Management of the direct and indirect effects to invasive plant species via the PDFs that would mitigate effects by reducing the risk of introduction and spread, as Alternative 2 would remove the source of infestation and, hence, lead to beneficial cumulative effects.

**8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.**

In order to comply with the regulatory framework regarding the protection of cultural resources, pre-field research was conducted consisting of examination of previous archaeological surveys in the planning area, site records, maps, and GIS data. This data indicated that seven of those surveys were conducted within the Area of Potential Effect (APE), defined as the project’s treatment units. These surveys have been carried out between 1978 and 2012.

The surveys resulted in the identification of 10 archaeological site, none of which is located within the APE. Archaeological surveys were conducted within the project’s APE between October 2016 and August 2017 and recorded in a CRIR on file in the Heritage Department of the SRNF Supervisor’s Office. Two archaeological sites were identified because of the archaeological surveys. Standard resource protection measures as defined in the R5 PA would be applied to fully protect archaeological sites within the APE.

**9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973 (ESA).**

The Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.) requires any action authorized by a federal agency to not jeopardize the continued existence of a threatened or endangered species, or result in
the destruction or adverse modification of the critical habitat of such species. Section 7 of the ESA, as amended, requires the responsible federal agency to consult with the USFWS and the National Marine Fisheries Service (NMFS) concerning endangered and threatened species under their jurisdiction as follows:

**Threatened and Endangered Wildlife Resources.** Informal consultation with the U.S. Fish and Wildlife Service (FWS) was initiated through the interagency Level 1 Process. The 1st 48 Project was designed to ensure no adverse impacts to listed species would occur. The Level 1 team determined that the project was not likely to adversely affect the northern spotted owl or designated NSO Critical Habitat. The FWS concurred with this determination.

**Threatened and Endangered Botanical Resources.** No federally listed plant species are known to occur, nor does suitable habitat exist in the project area.

**Threatened and Endangered Aquatic Species.** Three species of Threatened and Endangered (TE) salmonids are found in the Mad River watershed. Northern California steelhead trout (*Oncorhynchus mykiss*) are found in the mainstem Mad River up to Matthews Dam with Critical Habitat being designated up to County Line Creek. Chinook (California Coastal ESU; *O. tshawytscha*) and coho (Southern Oregon/Northern California ESU, *O. kisutch*) are found in the mainstem Mad River up to “Bug Creek Falls” (approximately 27 miles downstream from Matthews Dam). As the proposed roadside treatment areas are located upstream of the Ruth Lake Dam, Threatened, Endangered and Forest Service Sensitive (TES) anadromous fish species cannot reach the project area and therefore the Proposed Action would have no effect on the anadromous TE species and their habitats.

**10. Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.**

**Aquatic Conservation Strategy.** The 1st 48 Project was developed in alignment with the Aquatic Conservation Strategy (ACS) reflected in the Record of Decision (ROD), and S&Gs of the Northwest Forest Plan (NWFP; USDA and USDI 1994) as incorporated into the SRNF LRMP (USDA Forest Service 1995) and the KNP LRMP (USDA Forest Service 2010). The project is designed to fulfill specific objectives regarding the forest goals in the management of aquatic and riparian resources (SRNF IV-107), and to be consistent with the nine ACS objectives and the May 22, 2007 Memorandum. Implementation of the Proposed Action would not retard or prevent attainment of ACS objectives at the HUC 6th and larger scales in the short-term. Rather, it would promote attainment of ACS objectives in the long-term. Cumulative watershed effects (CWE) would remain below threshold for adverse watershed effects.
Chapter 4. Consultation and Coordination

Preparers and Contributors

Forest Service Interdisciplinary Team
This section identifies the primary individuals (Table 25) who were involved in the development of the FEIS for the 1st 48 Roadside Fuelbreak Collaborative Project (1st 48 Project).

Table 25. Interdisciplinary team (IDT) members.

<table>
<thead>
<tr>
<th>Interdisciplinary Team Member</th>
<th>Role or Resource Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merv L. George Jr.</td>
<td>Responsible Official</td>
</tr>
<tr>
<td>Dan Dill</td>
<td>Line Officer/Team Leader</td>
</tr>
<tr>
<td>Carol Spinos</td>
<td>Environmental Planner, Writer/Editor</td>
</tr>
<tr>
<td>Krista Smith</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Brenda Devlin</td>
<td>Wildlife</td>
</tr>
<tr>
<td>Bryan Yost</td>
<td>Wildlife Consultation</td>
</tr>
<tr>
<td>Karen Kenfield</td>
<td>Fisheries/Consultation/Editor</td>
</tr>
<tr>
<td>Adam Dresser</td>
<td>Hydrology</td>
</tr>
<tr>
<td>Carolyn Cook</td>
<td>Hydrology</td>
</tr>
<tr>
<td>Nancy Curran</td>
<td>Fire and Fuels/ Air</td>
</tr>
<tr>
<td>Bridget Litten</td>
<td>Public Affairs/Editor</td>
</tr>
<tr>
<td>John McRae</td>
<td>Botany and Noxious Weeds</td>
</tr>
<tr>
<td>Doreen Hrivnak</td>
<td>Heritage</td>
</tr>
<tr>
<td>Jennifer Dyer</td>
<td>Heritage Consultation</td>
</tr>
<tr>
<td>Jennifer Peterson</td>
<td>Geographic Information Systems (analysis and mapping)</td>
</tr>
<tr>
<td>Christy Prescott</td>
<td>Recreation/Visuals</td>
</tr>
<tr>
<td>Kristen Lark</td>
<td>Vegetation and Fuels</td>
</tr>
<tr>
<td>Jeff Jones</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Dave Young</td>
<td>Soils</td>
</tr>
<tr>
<td>Natalie Cabrera</td>
<td>Geology</td>
</tr>
<tr>
<td>Chase Bloom</td>
<td>Transportation</td>
</tr>
<tr>
<td>Jeff Jones</td>
<td>Vegetation/Range</td>
</tr>
<tr>
<td>Shirley Rech</td>
<td>Forestry</td>
</tr>
</tbody>
</table>

The following members of the Trinity County Collaborative working group co-developed, participated in planning interdisciplinary meetings and contributed to the preparation of the 1st 48 Project Draft Environmental Assessment, as listed in Table 26.

Table 26. Trinity County Collaborative working group members.

<table>
<thead>
<tr>
<th>TCC Members</th>
<th>TCC Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larry Glass</td>
<td>Bob Morris</td>
</tr>
<tr>
<td>Tom Walz</td>
<td>Clarence Rose</td>
</tr>
<tr>
<td>Susan Bower</td>
<td>Jerry Cousins</td>
</tr>
<tr>
<td>Dee Sanders</td>
<td>Alex Cousins</td>
</tr>
<tr>
<td>Arnold Whitridge</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 4. Consultation and Coordination

Federal, State, and Local Agencies
The Forest Service also consulted with federal, state and local agencies, and local tribes during the development of this environmental assessment:

- National Marine Fisheries Service, California Coastal Branch
- US Fish and Wildlife Service
- State Historic Preservation Officer
- Environmental Protection Agency
- North Coast Regional Water Quality Control Board

Tribes
- Bear River Band of Rohnerville Rancheria
- Wiyot Tribe
- Round Valley Tribe
- Lassic Band of Wylacki-Wintoon Family Group
- Eel River Nation of Sovereign Wylacki
Bibliography

Forest Service Reports


Literature Cited


The National Strategy: The Final Phase in the Development of the National Cohesive Wildland Fires Management Strategy. April 2014. USDI and USDA.


Trinity County Community Wildfire Protection Plan. 2010.


USDA and USDI. 1994a. Record of Decision for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl.

USDA and USDI. 1994b. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, Volume I.


Appendix A. Response to Comments

Scoping
This section discloses the response to public comments received during the 30-day Scoping period held between April 14 and May 5, 2017, in compliance with the National Environmental Policy Act (NEPA). On April 25, 2017, the Forest Service and a representative from the Trinity County Collaborative (TCC) jointly hosted a public meeting at the Ruth Community Center, in Mad River, California. The objective of the public meeting was to invite public participation in selecting key road systems to establish defensible space used to define the project area and refine treatment methods. Ten members of the local community attended the public meeting.

Summary of Comments Received
In response to scoping notifications (letter, posting on the Six Rivers National Forest (SRNF or forest) website and email), the Responsible Official received written comments from one agency, five (5) organizations, and two individuals. Table 27 provides a compiled listing of the names and locations of the commenters, the organization or entity each commenter represents, and the type and date of the comment submitted.

<table>
<thead>
<tr>
<th>Comment ID Code</th>
<th>Commenter</th>
<th>Entity</th>
<th>Location</th>
<th>Type</th>
<th>Date of Comment</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Patsy Lewis</td>
<td>Individual</td>
<td>Mad River, CA</td>
<td>Meeting handout form</td>
<td>April 25, 2017</td>
</tr>
<tr>
<td>2</td>
<td>Kimberly Baker, Public Land Advocate</td>
<td>Environmental Protection Information Center (EPIC)</td>
<td>Arcata, CA</td>
<td>Email</td>
<td>May 5, 2017</td>
</tr>
<tr>
<td>3</td>
<td>Dean Prat, Senior Engineering Geologist</td>
<td>North Coast Regional Water Quality Control Board (NCRWCB) Northern Nonpoint Source and Forestry Unit</td>
<td>Santa Rosa, CA</td>
<td>Email</td>
<td>May 9, 2017</td>
</tr>
<tr>
<td>4</td>
<td>John Elgin, Chairperson; LWW Board of Directors</td>
<td>Lassic Band of Wylacki-Wintoon Family Group, Inc. (LWW)</td>
<td>Mad River, CA</td>
<td>Email</td>
<td>April 27, 2017</td>
</tr>
<tr>
<td>5</td>
<td>Karen Wilson</td>
<td>Individual</td>
<td>Vallejo, CA</td>
<td>Email</td>
<td>May 5, 2017</td>
</tr>
<tr>
<td>6</td>
<td>Denise Boggs, Executive Director</td>
<td>Conservation Congress (CC)</td>
<td>Chico, CA</td>
<td>Email</td>
<td>May 1, 2017</td>
</tr>
<tr>
<td>7</td>
<td>Larry Glass, Executive Director</td>
<td>Safe Alternatives for our Forest Environment (SAFE)</td>
<td>Hayfork, CA</td>
<td>Email</td>
<td>?</td>
</tr>
<tr>
<td>8</td>
<td>Gerard MJ van Hees, Northern California Representative</td>
<td>American Forest Resource Council (AFRC)</td>
<td>Weed, CA</td>
<td>Email</td>
<td>May 4, 2017</td>
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Response to Scoping Comments

Introduction
The Council on Environmental Quality (CEQ) regulation 40 CFR 1503.4 states that an agency preparing an environmental assessment (EA) shall assess and consider comments both individually and collectively. The

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following includes a narrative of public comment statements received, followed by the Forest Service responses, organized by resource topic in alphabetical order. The comment statement is taken from the written comments. Copies of the written comments received are available upon request, located in the Project File at the Six Rivers National Forest’s Supervisor’s Office, 1330 Bayshore Way, Eureka, CA, 95501.

The discussion is organized by topic, presented in alphabetical order as follows:

- Aquatic Resources (AR)
- Botany Resources – Noxious Weeds (BRNW)
- Fire & Fuels (FF)
- General (G)
- Soil Resources (SR)
- Vegetative Resources (VR)
- Water Resources (WR)
- Wildlife Resources (WLH)

### Aquatic Resources (AR)

1. **Spring Chinook Salmon and Wild-Mad Rd**—a dirt road that last year was used for extreme heavy log-hauling in rain. Please inform me of road conditions on this road, as I expect the USFS to provide me with access when weather permits, and to not allow degradation of a refugia key 1 watershed. Just because it is far from Supervisors’ Offices and Ranger Stations, and falls within 2 different National Forests, it is a major responsibility to maintain the portion of this road that drains into the only cold waters on the South Fork Trinity River that can still support summering-over of Spring Chinook Salmon (Karen Wilson, Individual, p. 1).

**Response**: Given the location of the project, it is anticipated that hauling would occur on the ridgetop South Fork Mountain road (Route 23) or county road 501, both of which connect to Hwy 36. Nonetheless, if circumstances arise where hauling does occur east over Route 30, wet weather standards on either the Six Rivers or the Shasta Trinity national forests would be followed. The Six Rivers National Forest wet weather operating standards (WWOS) guidance defines the wet weather operating season as typically ranging from October 16 and to around May 14, but wet weather conditions can happen anytime of the year (e.g., during summer thunderstorms). These WWOS meets the National best management practices to reduce impacts to water quality in order to be in compliance with the Clean Water Act, therefore it is unlikely that spring Chinook in the South Fork Trinity would be affected.

2. **Please provide more information on repairing roads 2S51 and 2S52. If they are causing sediment problems, which water bodies and/or fish species are being impacted? And to what degree?** (Denise Boggs, CC, p. 3).

**Response**: Roads in the project area would be maintained and in some cases repaired prior to project activities. This would cause a slight reduction in sediment production from these roads. When the project no longer needs these roads, they would be maintained again (bladed, culverts cleaned, waterbars constructed) and left in a better condition than before the project. The Proposed Action would implement road maintenance including grading and placement of waterbars, including FSR 2S51, as a risk reduction to minimize future sedimentation, along with rectifying legacy sediment sources on FSR 2S52 and 2S53.
Forest Service Road 2S54 would be decommissioned and removed from the transportation system. This involves removal of all culverts and associated fill, constructing permanent dips or waterbars to control drainage, and blocking the road with a barrier. Decommissioning may introduce a small amount of sediment during earthmoving and possibly the first winter following, but would be diminimus and short-lived.

Resident Rainbow trout are found within the upper Mad River mainstem. Previous surveys of Littlefield Creek found no fish during the summer. In 2016, juvenile rainbow trout were spotted in the intermittent pools. It is unknown as to whether or not spawning occurs within Littlefield Creek or if the juvenile fish hatched in the mainstem Mad River and moved into the tributary only to be trapped when the flows went subsurface. It is unlikely that the amount of sediment entering the channel during the first winters flow would have an effect on the rainbow trout.

3. We are extremely concerned about logging and/or treatment activities within Riparian Reserves. This is a 303(d) listed watershed listed for sediment. The upcoming NEPA document should provide information on how many acres of treatment is proposed, where the RR’s are, what types of RR’s are proposed for treatment and the current condition of each RR to be treated. Please follow the recommended buffers within the Aquatic Conservation Strategy (ACS).

Management direction for wetlands and riparian areas is to insure high quality aquatic habitat and functioning riparian ecosystems now and in the future (LRMP III-4). Riparian areas create cooler microclimates. As acknowledged in the statements from the Upper Mad River Watershed Analysis (WA) logging, road construction, road density and a lack of road maintenance are severely impacting the aquatic health of watersheds in the planning area. The project could worsen the watershed condition requiring he need to follow the Clean Water Act, TMDL Plans and ACS. Riparian ecosystems are the interface between the aquatic and terrestrial ecosystems. Riparian areas provide habitat for a greater number of wildlife species than do any other habitat types. At least 250 wildlife species use riparian areas for breeding, feeding and resting and as travel lanes and connectors between habitat types. Riparian vegetation is important to fish habitat (LRMP III-4)(Kimberly Baker, EPIC, pp. 2 and 3).

Response: Between 80 and 160 feet of watercourses, equipment would be excluded, although fuels treatments would be permitted retaining canopy cover at or above 60 percent. These buffer widths are slightly greater than those called for in the Northwest Forest Plan.

4. Riparian ecosystems are the interface between the aquatic and terrestrial ecosystems. Riparian areas provide habitat for a greater number of wildlife species than do any other habitat types. At least 250 wildlife species use riparian areas for breeding, feeding and resting and as travel lanes and connectors between habitat types. Riparian vegetation is important to fish habitat (LRMP III-4). The forthcoming NEPA document should disclose impacts of RR treatments on wildlife (Kimberly Baker, EPIC, p. 3).

Response: The Proposed Action would treat limited acres within Riparian Reserves. For the project as a whole, there are 141 acres of Riparian Reserves spread out across multiple small tributaries. There are 3.7 miles of intermittent streams and one mile of perennial streams within the project units. The streams coming off South Fork Mountain are high gradient, steeply incised, with mostly stable banks. The project also includes areas near Littlefield Creek and Jonathan Creek. These streams are low gradient, with substantial floodplains or terraces, have less stable banks and more true riparian vegetation (primarily willow). The project would not reduce the forest canopy below 60 percent, and even this would be temporary as the trees that are left behind are expected to grow faster and close gaps in the canopy. There
would be no logging and associated ground disturbing activities within 80 to 160 feet of any watercourse although there will be fuels treatment by hand. Within 80 to 160 feet of streams, canopy reduction would be even less because only fuel treatment by hand would be allowed. There would be no effect on stream shading and stream temperatures would not be elevated due to project activities.

The project primarily follows existing roads within the project area. Little true riparian habitat exists within the units along both Littlefield and Johnathan Creek. However, in the long-term project implementation has the potential to slightly improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to Riparian Reserves. Implementation of the project would maintain and improve riparian habitat conditions.

Resident Rainbow trout are found within the upper Mad River main-stem. Previous surveys of Littlefield Creek found no fish during the summer. In 2016, juvenile rainbow trout were spotted in the intermittent pools in the Ruth fire burned area. The proposed fuel reduction action would reduce the likelihood of an additional fire burning on new streamside vegetation coming in after the fire.

Botany Resources – Noxious Weeds (BRNW)

5. Please disclose how proposed project activities will avoid the spread of invasive non-native species (Kimberly Baker, EPIC, p. 3).

Response: Invasive Non-Native Plants – Evaluation of Risk: Risk of introduction and spread of invasive non-native plants is evaluated in an assessment for the 1st 48 Project based on five indicators: 1) presence of known invasive plant species in the project area, 2) habitat vulnerability, 3) non-project-dependent vectors such as existing roads or trails, adjacent private property, 4) habitat alteration expected as a result of project implementation, and 5) increased vectors as a result of project implementation. The risk evaluation leads to project design features that are designed to mitigated effects noted above by reducing the risk of introduction and spread from the existing condition of high due to proposed actions, to the desired condition of low risk. In keeping with Forest Service policy on Invasive Species Management (FSM 2900); the following project design features are identified to reduce the risk of introduction and spread from its current risk rating of high to a low risk. Priority areas for treatment along 2S50 and 2S48 would be flagged in the field prior to treatment.

- All mechanical equipment used in the project, including equipment related to road maintenance, shall be pressured washed prior to operating on the Forest.
- All mechanical equipment used in the project shall be washed after operating if moving from an infested to an un-infested area.
- Treatment of mechanical units shall follow a progression of work schedule, whereby treatment occurs first where invasive plants are limited to non-existent before moving to heavily infested areas (e.g. the lower infested stretch of 2S48). If progression of work is not feasible, equipment operating in infested road segments shall be cleaned before relocating. Progression of work applies to road maintenance associated with this project as well.
- Avoid yarding/skidding through yellow star-thistle infestations.
- Immediately before using existing landings occupied by yellow star thistle, mechanically remove the plants to the edge of the landing, away from where equipment would be operating; pile and subsequently burn. Use native material to mulch landings following their use.
Avoid masticating sections of 2S50 and 2S48 occupied yellow star thistle.

Where yellow star-thistle infestations are present, surface blade 2S48 in such a way that bladed material in not reincorporated into the road travel way, but rather is push completely off the travel way to prevent it from re-establishment.

In the Fall, following surface blading, manually pull or use tools to remove individual plants, removing as much of the roots as possible.

Pile treated plants and burn where treated, or if plant numbers are few, incorporate plant material into a nearby burn pile.

Include treated areas in the prescribed burn footprint.

If practicable, stockpile wood chips generated on site for application to treated yellow star thistle sites.

Successful control of yellow star thistle would necessitate periodic monitoring and evaluation of treatment efficacy. If present after initial treatment, manually pull or use tools to remove individual plants in the late spring of the year (before fruiting/seeding) ensuring removal of the roots as much as possible. Pile treated plants and burn where treated, or if plant numbers are few, incorporate plant material into a nearby burn pile. Monitor annually and retreat as necessary and until no plants persist.

**Progression of Work.** The following Units occur in the vicinity of yellow star thistle infestations and as such should be treated last in order to reduce the risk of introduction and spread: 308, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 418 and 421. If this progression of work cannot be implemented equipment shall be cleaned prior to operating in any of the units associated with the section of these road segments.

**Fire & Fuels (FF)**

6. *Hoping you have a copy of a well-researched, comprehensive, and still up-to-date Report on a Literature Search Pertaining to Fuelbreaks and Fire Behavior, By Kenneth C. Baldwin for Trinity RCD Council. I suggest that an evaluation of fire behavior during the 2015 Trinity Fires, especially as it relates to existing fuelbreaks, be added to the literature on the subject. Since fire resilience is desired, please be aware of the recommendations made by Prof. James K. Agee, April 25, 2008 Klamath Fire Ecology Conference in Orleans, CA, that fuels treatments most likely to create fire resilience in the mixed-fire regime forests of the Klamath Mountains are in order (Karen Wilson, Individual, p. 2):*

- Reduce surface fuels
- Increase canopy base height
- Keep the big trees
- Reduce canopy density

**Response:** Although the Six Rivers National Forest has yet not analyzed fire behavior of the 2015 Trinity Fires, representatives from the USFS, Northern Province Ecology program have been coordinating a rapid assessment team to assess fuel treatment effectiveness over the past 5 years across the northern region. Although the following study is not specific to the project area, the study methodology is robust and findings indicating general efficacy of fuel treatments in reducing fire severity and tree mortality is valid to this project area, according to the Fuels Forester at the Mad River Ranger District.
“After the institution of fire suppression in the early 20th century (and the later development of Smokey-the-Bear educational efforts), fire became a comparatively rare phenomenon in California forests, reaching its nadir in the 1960s to early 1980s, when fire rotations in the Sierra Nevada and NW California ranged from 600–900+ years (Miller et al., 2009, 2011). Since the mid-1980s however, drier mixed conifer and yellow pine forests across the western United States have experienced a notable increase in fire frequency, mean and maximum size, and annual burned area. Some regions have experienced proportional increases in fire severity and some have not, but the overall area of high severity (stand-replacing) fire in these forest types is also rising (Miller et al., 2009, 2011; Dillon et al., 2011). In concert with these fire trends, numbers of fire-caused human fatalities and destroyed and damaged homes are also mounting. This reversal in fire trends comes even as federal and state governments deploy tens-of-thousands of fire fighters and spend billions of dollars annually on fire management (Stephens and Ruth, 2005). Overall, our results support the central conclusions we made in an earlier paper that treated the Angora Fire on its own (Safford et al., 2009). These include the general efficacy of completed fuel treatments in reducing fire severity and tree mortality and the reduced loss of biomass/carbon from fire in treated areas” (H.D. Safford, J.T. Stevens, K. Merriam, M.D. Meyer, A. M. Lattimer 2012).

The attachment provided addressing research from 2005, predominantly addresses ponderosa pine forest types, not present in the 1st 48 Project area.

The Forest Service does not have a copy of recommendations stated by Prof. James K. Agee, April 25, 2008 Klamath Fire Ecology Conference in Orleans, or his comments on Jim Agee’s 2008 conference talk. If these notes are available, or copies are available and provided to the Forest Service during the 30-day comment period on this draft EA, the Forest Service will consider his recommendations.

7. We acknowledge the hysteria surrounding wildfire in the WUI but people who choose to live in these areas need to understand their responsibility in protecting their property. There are many papers out now speaking to the efficacy of fuel breaks and how they don’t work in general.

Attached is a recent study of fuel effectiveness. **Beyond Fuel Treatment Effectiveness: Characterizing Interactions between Fire and Treatments** in the USA. Fire scientists have been saying for a long time, one of the common assumptions of on-going fuel reduction projects like thinning and even prescribed burning is that it will reduce the spread of wildfires and make communities safe. However, there are many problems with fuel reductions. Thinning is not as effective as prescribed burning, but it is the most widely used method in the West (there is a lot of prescribed burning in the Southeast). Plus, thinning and/or prescribed burning effectiveness is relatively short lived—because shrubs, grasses, and small trees—the fine fuels that carry a fire—tend to regrow relatively quickly negating fuel reductions. Assuming the fuel reduction is even effective, especially as the time since treatment lengthens (an assumption that is questionable in many instances) the probability that a fire will actually encounter a fuel reduction is relatively low.

What they found is that only 6.8% of fuel reductions were ever encountered by a fire during the study period. And that of course does not mean that the fuel reduction had any influence on the fire for a host of reasons, including the largest blazes are driven by climate/weather conditions that overwhelm any fuel reduction effectiveness. So some subset of 6.8% can even be considered effective at all, and only under more moderate fire weather conditions. What this implies is that the vast majority of all
fuel reductions are a waste of time and effort because most will never encounter a fire during their effective period—if they work at all. Again this paper makes the point that strategic reductions of fuels around homes and the edge of communities is the only strategy that makes any sense.

We cannot predict where and when a fire will occur, but we can agree that we don’t want homes to burn down. So a focus on reducing fuels immediately adjacent to homes makes both economic and ecological sense. If we reduce the flammability of homes, we can allow fires to burn in much of the rest of the forest without having to suppress them. It would be encouraging if the Forest Service would hold fieldtrips and workshops to help people understand how to fire proof their homes using fire-wise principles developed by the Forest Service. The bottom line is wildfire is here to stay especially in a changing climate. People need to learn to live with fire instead of fearing it and fighting it. Fire proofing homes works as has been shown again and again. Fuel breaks don’t work in general as has been shown again and again. So what makes more sense to do? Protect your home or build more fuelbreaks? (Denise Boggs, CC, pp. 1 and 2).

**Response:** Mad River Ranger District has numerous recent examples of fuel reduction effectiveness; Mad Ridge Fuelbreak, which bisects a large portion of the Mad River Ranger District, and spans from the Dinsmore area to south of Ruth, has served local communities for over a decade since initial treatments were completed about 2006. During the lightning siege of 2008, two fires were started within or near the fuelbreak; one fire was less than 0.1 acre and the other less than 5 acres. In both cases the fuelbreak slowed the fire progress, allowing for safe and effective suppression with minimum resources. In 2009, a lightning fire on Mad Ridge was held to 0.7 acres.

In the 2015 Mad River Complex and the 2017 Ruth Complex, Mad Ridge Fuelbreak served as an anchor point from which firefighting resources were able to construct fireline to stop the lateral spread of fire. A small scale administrative fuel reduction project around the Ruth Guard Station and adjacent to the Ruth Community Church contributed to stopping the progress of the 2011 Ruth Fire from progressing north along County Road 501 toward the Ruth Store. Strategic fuelbreak placement in conjunction with home ownership fuel reduction best serves both communities and firefighters. The 1st 48 Project addresses concerns of many local homeowners in the Ruth community by creating primary lateral fuelbreaks from the top of South Fork Mountain down toward the valley floor.

8. When considering prescriptions for manual treatments please include limbing and pruning of brush species rather than complete removal, this includes Manzanita. Please consider species preference of more desirable fire resistant plants and trees so as to culture fire resilience into the future (Kimberly Baker, EPIC, pp. 3 and 4).

**Response:** Starting with the construction of the Mad Ridge Fuelbreak in 2003, and subsequent fuel reduction projects since then, older shrubs and/or shrub islands have been retained with brush treatment specifications incorporated into standard fuelbreak construction guidelines. Old growth manzanita is routinely targeted for retention, with lower limbs being pruned during lop and scatter operations.

9. Shaded Fuelbreaks need less maintenance, and are most effective. In severely burned areas, shade is not possible, so provide documentation for more frequent maintenance if not shaded. Unless maintained approximately every 5 years, any fuelbreaks have no effect. Please provide records for previous fuelbreak maintenance along ridgetop (Karen Wilson, Individual, p. 2).

**Response:** In severely burned areas, initial treatments would involve cutting, piling and burning slash and brush. First entry treatments would include retaining dominant sprouting hardwoods and conifers for
future culturing. Mad Ridge Fuelbreak continues to be maintained either by mastication or lop and scatter operations since completion of initial treatments of thinning, piling and burning around 2006. There are areas within the Mad Ridge Fuelbreak that have been converted from an oak and manzanita brush field to an oak woodland with native grass understory. U.S. Forest Service appropriated funds, force account personnel and equipment, or external funding from various organizations and partners such as the Trinity County Resource Advisory Committee (RAC), California Deer Association, and Joint Chiefs’ Landscape Restoration Project have all contributed to fuelbreak maintenance.

**General (G)**

10. *I think it’s great that you’re including the community* (Patsy Lewis, Individual, p. 2).

**Response:** The Forest Service’s mission is to care for the land and serve our communities. Thank you for your support.

11. *The Forest Service roads listed in the scoping letter need to include their road classification. Are they Class 2 roads or Class 3 roads? How far away are they from the nearest communities and/or homes in the area? What types of vehicles traverse jeep trail 8E01 and how close is it to a community or home?* (Denise Boggs, CC, p. 2).

**Response:** With exception of the units located along Route 23, the roads selected to establish a fuelbreak network defining the Project area abut private lands and Ruth Lake.

The following roads are to be used at their existing maintenance levels:

- **Maintenance Level 2**
  - 2S02 MP 0.0-2.0
  - 2S02C MP 0.0-0.4
  - 2S47 MP 0.0-2.55
  - 2S48 MP 0.0-4.79
  - 2S48C MP 0.0-0.44
  - 2S49 MP 0.0-0.63
  - 2S50 MP 0.0-1.07
  - 2S51 MP 0.0-1.44
  - 2S52 MP 0.0-1.31
  - 2S53 MP 0.0-2.0

- **Maintenance Level 1**
  - 2S02B MP 0.0-0.2 would be maintained to Maintenance Level 2 standards for access during operations, then returned to maintenance level 1 status and closed when the project is completed.
12. *We request additional information on the 147 acres of hazardous fuels reduction ... (Denise Boggs, CC, p. 3)*.

**Response:** The Forest Service hosted a field trip and public meetings during the development of the Proposed Action and during the Scoping period to help people understand fire-wise principles developed by the Forest Service and to encourage participation in project planning and monitoring. The observations associated with the effectiveness of fuelbreaks by those involved in fire suppression locally, indicate from first-hand experience, a change in fire behavior when forests are “pre-treated” allowing for more rapid containment.

The Forest Service agrees a comprehensive “all-lands” approach is warranted, including strategic reductions of fuels around homes on private property and around the edge of communities. However, the 1st 48 Project represents a “proof of concept” proposed by the Trinity County Collaborative, whereby zones of agreement are to limit treatments alongside existing, open Forest Service roads. Although the Forest Service recognizes and appreciates predicting where and when a wildfire will ignite is uncertain, the outcome to lives and our environment warrant a conservative approach, assuming probable ignition.

13. *Safe Alternatives for our Forest Environment (SAFE) supports the 1st 48 Collaborative Shaded Roadside and Plantation Fuelbreak Project (1st 48). Through the Trinity Collaborative, SAFE has had extensive input into this project and we believe it is well-designed to achieve the outcome of reducing the risk of “high severity burns in forests where past management practices have increased risks related to wildfire.” It also supports “the economic vitality and safety of rural communities and ecological resilience of forest resources. ”SAFE believes this project will “provide residents and visitors travel zones that allow for safer evacuations during wildfires, allow for faster wild land firefighter response, and reduce the threat of roadside fire-starts resulting in the loss of high value forest resources.” SAFE also believes the project will create valuable control lines for wildfires and reintroduction of intentional fire to the forest. It has been a unique opportunity and pleasure to work so closely with Ranger Dill and his staff on this precedent-setting project. SAFE believes that the successful implementation of this project will, over the long run, benefit and protect the environment and ecosystems that we care so much about. Thank you for this great opportunity (Larry Glass, SAFE, p. 1).*

**Response:** The Forest Service’s mission is to care for the land and serve our communities. Thank you for your support.

14. *EPIC appreciates the collaborative nature of the project and the focus on roadside and plantations. We ask you to consider leaving all predominant and dominant trees on the landscape and to follow the ACS recommended buffer widths. Please limit landing construction and machine piling. Thank you for the consideration (Kimberly Baker, EPIC, p.4).*

**Response:** The Proposed Action is designed to retain all predominant trees and dominant trees, as their characteristics best respond to the purpose and need for maintaining adequate shade to deter brush response. The project is also designed to not retard or prevent attainment of ACS objectives, by protecting forest elements and avoiding equipment entry into Riparian Reserves. New landing construction is limited to existing forest openings on flat terrain, most exist but require expansion (up to ½ acre total across the project area).
15. Thank you for retaining all predominant trees. The scoping notice states, “Healthy vigorous trees with greatest crown potential will be retained”. However, large trees with defects are valuable habitat. Please consider retaining dominant trees, which are providing habitat elements that take a long time to develop. “The watershed is currently at or below the minimum. Recommended Management Range RMR) for the late mature seral stage, and below the minimum RMR for old-growth in the Douglas-fir series. Therefore, management actions in these seral stages will be limited in order to maintain the current acreage and increase acreage over time.” Upper Mad River Watershed Analysis (WA) pg. 35 (Kimberly Baker; EPIC, pp. 1 and 2).

Response: The majority of stands proposed for treatment are classified as early to mid-mature seral stages. The Proposed Action would retain all dominant trees and pre-dominant trees, which includes those with defects. Most co-dominant trees would also be retained. The thinning from below prescription would not alter existing seral stage condition, and it would in fact, increase growth on the remaining trees to accelerate development of trees into late seral size classes. This would promote an increase in the amount (acres) of late seral stands as an incremental step toward achieving the minimum Douglas-fir RMR threshold.

16. Other projects within the area and coordination with Shasta-Trinity National Forest – I again ask to be kept informed of projects and activities affecting the Upper River portion of the South Fork Trinity River. This includes projects such as Kelsey and Cedar Gap because they are adjacent and affect roads. Who can I contact during any approved Winter Operating Periods? (Karen Wilson, Individual, p. 1).

Response: The Forest Service will contact you as a follow up so we can better understand your interests for notifications.

17. My concerns are all along the South Fork Mountain Ridge, generally south of Pickett Peak. Roadless Areas and RNA – recognize there is a significant Chinquapin Roadless Area just over the ridge-top. The disruption should be minimized (Karen Wilson, Individual, p. 1).

Response: The project area does not enter any research natural areas (RNAs) or roadless area management area allocations per the SRNF LRMP. Therefore there would be no disruption to these important natural environments.

18. 8E20 – Does this project proposed to make this a “highway” and encourage travel on a trail that does not show up on Six River’s Visitor Map (Karen Wilson, Individual, p. 1).

Response: The Trail 8E20 (or Wiregrass) commonly referred to as the “Jeep Trail” is a “Special Vehicle Designation” trail (Four wheel drive non-highway legal vehicle wider than 50 inches/all-wheeled vehicles 50 inches wide or less) that is 1.29 miles long, located in. T.2S, R.8E.

The USFS, national resource management (NRM database) indicates: 8E20 trail was added to the NFST (national forest system trails) under LT/MR Motorized Travel Management, Record of Decision in April 2010. As the forest visitor map predates the LT/MR TM decision, it has not been updated to reflect this change. This trail is displayed on the revised motor vehicle use map (MVUM) for that area, which does reflect the 2010 decision.

The trail would be graded within its existing footprint and temporarily closed to public use during logging operations to ensure public safety. Other than the short-term disruption in public use, grading and
constructing waterbars would be visually evident in the short-term; likely one season. The Forest Service has no plans to improve the trail physically or to promote increased use.

19. There are many ways to design a timber sale that allows a purchaser the ability to deliver logs to their mill in an efficient manner, while also adhering to the necessary practices that are designed to protect the environmental resources present on Forest Service forestland. AFRC wants to go on record in support of the 1st 48 Project if it is economically feasible to remove commercial volume. Thank you for the opportunity to comment on the proposed project and please keep us informed on the progress of NEPA. We are also interested in any field trips that may be set up for this project (Gerard MJ van Hees, AFRC, p. 3).

**Response:** The Proposed Action is designed to be a break-even, economically feasible operation for units deemed commercially viable due to thin from below forest byproducts (sawlog volume equivalent to 5 mbf/acre stand average). There is no requirement for costly road reconstruction or new construction. The units planned for hazardous fuels reduction are a mix of break-even and below cost treatments, depending on whether or not sufficient size/amount of pole material and firewood is present to carry a viable commercial forest products sale.

**Soil Resources (SR)**

20. Planning should consider the current problems with the road system. Please consider not using machine piling within the project area or analyze and disclose the amount and location where it would be considered. Limit or do not construct new landings. Landing construction has deleterious impacts and will degrade the hydrological, soil, terrestrial habitat and connectivity values of these lands. Overall, please provide details concerning how the proposed project activities will mitigate damage to the soils (Kimberly Baker, EPIC, p. 3).

**Response:** Proposed activities would necessarily create soil disturbance. Soil disturbance is not inherently good or bad. The types of soil disturbance that are of potential concern include compaction, displacement, and severe burning, which vary by type of activity and intensity of treatments. Each of these have severity and extent components that are evaluated in combination, to assess potential adverse impacts to soils of the activity area. The LRMP defines “detrimental” soil disturbance and extent thresholds of concern. When soil impacts are severe enough to constitute “detrimental” disturbance, they then should not occupy greater than 15 percent area, which is assumed to be a large enough area to potentially affect soil productivity. The LRMP has standards and guidelines pertaining to soils, as well as Soil Quality Standards to be implemented. Project specific design features (PDFs) were also developed to help ensure compliance with LRMP provisions.

Some detrimental soil disturbance is allowable per the LRMP. Detrimental compaction is expected in landings and some of the more highly trafficked skid trails near landings; decompaction treatments are recommended for rehabilitation to improve soil hydrologic function, but these specific areas left in detrimental condition would still satisfy LRMP soil requirements in terms of percent area. Machine piling methods proposed are not expected to create significant soil displacement or severe compaction effects, unlike historic practices.
Vegetation Resources (VR)

21. How old are the plantations proposed for thinning? How old are the natural stands proposed for thinning? Will a diameter limit be placed on the trees marked for removal (we encourage this and recommend 15” DBH)? What percentage of canopy cover will be left? (Denise Boggs, CC, p. 2).

Response: Plantations range from 30 to 45 years old. Natural stands range from 100 to 250 years old, with the older stands having dominant or predominant trees that would be retained. There is no diameter limit proposed for the project, as the thin from below prescription already targets smaller tree diameters in order to meet the desired condition. In addition, a 15-inch dbh limit would fail to consider treating those trees that contribute to stand structural conditions that need to be treated, such as large height-to-crown ratios or overlapping crowns, in order to meet components of the Proposed Action that contribute to the “underlying need for increasing canopy base height of live crowns…and…separating intertwined tree crowns”. Residual canopy cover is an average of 60 percent across all treatment types.

22. Blown-down ridgetop and edges—important to recognize and evaluate the potential for the strong winds in storms to make edges and ridgetops more vulnerable. Southern exposure vs Northern—generally the area under consideration has southern exposure and my perspective is from the side of the ridge with northeastern exposure. At this elevation, there is quite a difference in snow retention and moisture, besides the fact that it is roadless (Karen Wilson, Individual, p. 1).

Response: The thinning intensity design of the thin from below prescription maintains an average of 60 percent or greater canopy cover with a relatively uniform crown spacing, as these forest stands are exposed to prevailing winds. The proposed treatment would maintain the largest trees with best crowns, which are the most resilient to winds, snow and ice. Thinning would improve the ability of these stands to withstand the typical winter wind, ice, and heavy snow storms in the Coast Ranges and Klamath Mountains, although there may be a short-term increase in susceptibility to wind storms in the denser stands on exposed sites.

Over time, thinning promotes a lower height-to-diameter ratio, which improves the ability of a tree to withstand heavy snow and ice loads, especially if they are associated with dynamic loadings associated with high winds (Oliver and Larson 1990). However, some blow-down is still to be expected, and these events are expected to provide additional coarse woody debris and diversity to stands, while still maintaining an adequate growing stock for future management objectives, including wildlife habitat.

23. AFRC would like to see forest health thinning increased wherever possible. Please provide a table that includes all stands in the project area. For each stand, please provide the current and projected conditions including percent of maximum stand density index (see below). Also, please include the reason why stands are/are not proposed for treatment. When considering areas with restrictions on canopy reduction, long-term benefits to forest health should be weighed against any short-term reductions in canopy closure (Gerard MJ van Hees, AFRC, p. 2).

Response: Stands included for proposed treatment constitute a continuous linear feature along identified strategic roads and ridgetops. No stands in the continuous linear feature were dropped from treatment during the analysis, although the treatment prescription may have changed. During the planning process, consideration to forest health was weighed against the purpose and need to establish roadside shaded fuelbreaks for the long-term, whereby reductions in canopy is sufficient to maintain healthy, live trees, but not lowered to the extent to cause a heavy brush response or trigger blowdown.
24. An important Regional objective is to reduce the probability of large-scale tree mortality by reducing high-stand densities. The forested area within the 2017 Waterman Project planning area have stand densities that exceed biological potential and are especially susceptible to tree mortality during drought conditions. Stand Density Index (SDI) is an excellent measure of stand stocking density and vigor and can be used to determine effective tree stocking densities over time to meet forest health objectives. To accomplish this, the project’s thinning should be designed to ensure that stocking density does not exceed an upper limit of 60% of maximum SDI for at least the next 20 years.

Example: Maximum SDI is 550. Current average SDI is 548. An SDI of 330 is 60 percent of maximum (550). Thin to tree stocking levels below SDI 220 that will ensure density does not exceed SDI 330 (60% of SDI_max) after twenty years of growth.

AFRC recommends and supports this silvicultural prescription based on one thinning entry every 20 years. This would reduce the number of entries over time and provide added assurance against future drought. Heavier thinning would meet forest health objectives for a longer timeframe, create conditions more conducive to the establishment and growth of shade intolerant species, and provide sufficient value (saw timber) for economically efficient projects that can pay their way out of the woods. This approach has been widely used and was endorsed by former Regional Forester Jack Blackwell. See attached Regional Forester letter “Conifer Forest Density Management for Multiple Objectives, 7/14/2004.” When considering areas with restrictions on canopy reduction, long-term benefits to forest health should be weighed against any short-term reductions in canopy closure (Gerard MJ van Hees, AFRC, p. 2).

Response: Prescriptions were designed through a collaborative process to result in an effective shaded fuelbreak and to reduce fuel loading of hazardous fuels, while meeting the project design features of the other affected resources. With this in mind, thinning prescriptions took into account many factors beyond only the existing stand density, to meet the objective of an effective shaded fuelbreak.

The maximum stand density index (SDI) value used for Douglas-fir was 547. Stand density indexes ranged from 139 to 707, averaging 349. A 60 percent SDI value is 328. Approximately 70 percent of the stands had an SDI that was over 60 percent. The maximum SDI value used for white fir was 759. A 60 percent value is 455. Over 65 percent of the white fir stands in the planning area had SDI values greater than 60 percent, and 14 percent were just slightly lower than 60 percent maximum SDI. Proposed thinning prescriptions have a residual canopy cover at an average of 60 percent across all treatment types in order to maintain current characteristics of nesting/roosting and foraging habitat for the northern spotted owl immediately post-project, and also to retard brush response and establishment and growth of shade intolerant species in the shaded fuelbreak.

25. Currently there are planned 107 acres of harvest of forest products in plantations. Economics need to be considered due to the small average diameter of these stands (Gerard MJ van Hees, AFRC, p. 2).

Response: Plantations proposed for treatment contribute to the development of the shaded fuelbreak. While some merchantable material, such as firewood and pole, would be generated from the plantations, economics was not a main factor in determining the need for treatment. Additionally, a variety of methods would be used to treat the proposed units other than the traditional timber sale, such as existing cooperator agreements that have an economic correlation to values other than directly to sawlog prices.

26. The analysis in the EA needs to display how long the treatments will be effective in meeting the designed purpose and need. In order to meet the desired condition for ecological restoration and fuels...
management the treatments will need to be intensive enough to be effective for a considerable period of time. Forest health is a major concern on the Six Rivers National Forest and forests throughout the West. Regional Forester priorities were stated in the August 10, 2016 letter “FY17 Priorities, Program Direction, Operating Budget, and Performance Contributions.” Regional response to tree mortality from insect and disease is the first priority listed. AFRC supports thinning over stocked stands to improve forest health. It makes sense to treat as many acres as possible when planning projects in the area (Gerard MJ van Hees, AFRC, p. 2).

Response: The project area was determined and the treatment prescriptions were designed through a collaborative process to result in an effective shaded fuelbreak and to reduce fuel loading of hazardous fuels, while meeting the project design features of the other affected resources. With this in mind, thinning prescriptions took into account many factors beyond only the existing stand density, to meet the objective of an effective shaded fuelbreak. In order to treat as many acres as possible, no stands in the continuous linear feature were dropped from treatment during the analysis, although the treatment prescription may have changed. Intensity of treatments were in part affected by maintaining residual canopy cover at an average of 60 percent across all treatment types in order to maintain current characteristics of nesting/roosting and foraging habitat for the northern spotted owl immediately post-project, and also to retard brush response in the shaded fuelbreak.

Water Resources

27. The project proposes to reduce road related sediment sources by repairing roads 2S51 and 2S52, and decommission road 2S54 (Gerard MJ van Hees, AFRC, p. 2).

Response: The Proposed Action would implement road maintenance including grading and placement of waterbars, including FSR 2S51, as a risk reduction to minimize future sedimentation, along with rectifying legacy sediment sources on FSR 2S52 and 2S53. The Proposed Action would also decommission Forest Service Road (FSR) 2S54. This ML 2 road is 1.95-miles long, and has four low-water crossings and three culverted stream crossings. Two of the culverted crossings have small fills (150 and 318 cubic yards). One crossing is larger (800 cubic yards).

28. We are extremely concerned about logging and/or treatment activities within Riparian Reserves. This is a 303(d) listed watershed listed for sediment. The upcoming NEPA document should provide information on how many acres of treatment is proposed, where the RR’s are, what types of RR’s are proposed for treatment and the current condition of each RR to be treated. Please follow the recommended buffers within the Aquatic Conservation Strategy (ACS). Management direction for wetlands and riparian areas is to insure high quality aquatic habitat and functioning riparian ecosystems now and in the future (LRMP III-4). Riparian areas create cooler microclimates. As acknowledged in the statements from the Upper Mad River Watershed Analysis (WA) logging, road construction, road density and a lack of road maintenance are severely impacting the aquatic health of watersheds in the planning area. The project could worsen the watershed condition requiring the need to follow the Clean Water Act, TMDL Plans and ACS (Kimberly Baker, EPIC, pp. 2 and 3).

Response: This project would not worsen the condition of the watershed. Only 823 acres or 1.7 percent would be treated within the 48, 127 acre 6th field watershed scale, used to determine cumulative effects to water resources. The forest canopy cover would remain at or above 60%. In addition, this project would decommission Forest Service Road (FSR) 2S54. This decommissioned Forest Service Road (FSR) would
be left in a maintenance-free condition (i.e., drainage structures are removed and natural drainage patterns restored), and would cause localized sediment production to go down.

29. As background, state law assigns responsibility for protection of water quality within north coast watersheds to the Regional Water Board. The Regional Water Board implements and enforces the Porter-Cologne Water Quality Control Act ("Porter-Cologne Act," California Water Code §13000 et seq.) and the Water Quality Control Plan for the North Coast Region (Basin Plan). All forest projects must comply with all substantive and procedural requirements of the Porter-Cologne Act and the Basin Plan. The Waiver waives certain activities conducted on NFS Lands from the waste discharge requirements of Article 4 (commencing with Section 13260) of Chapter 4, Division 7 of the California Water Code, except as provided within the Waiver. In order to receive coverage under the Waiver, the Project must meet specific eligibility criteria and conditions. A guidance document and pertinent forms are available for review and can be downloaded at the following web address: www.waterboards.ca.gov/northcoast/water_issues/programs/timber_operations/timber_waiver/. The Basin Plan contains water quality objectives, implementation plans for meeting those objectives, and other policies, including State Water Resources Control Board and federal policies, which are applicable to operations on NFS lands within California. The Project must be designed and implemented to meet the water quality standards outlined in the Basin Plan. Additionally, the Project must be in compliance with any total maximum daily load (TMDL) that has been developed for the watersheds in which the Project will occur. Please accept the following comments based on the information provided in the Project scoping letter (Dean Prat, NCRWCB, pp. 2 and 3).

- The Basin Plan contains water quality objectives, implementation plans for meeting those objectives, and other policies, including State Water Resources Control Board and federal policies, which are applicable to operations on NFS lands within California. The Project must be designed and implemented to meet the water quality standards outlined in the Basin Plan. Additionally, the Project must be in compliance with any total maximum daily load (TMDL) that has been developed for the watersheds in which the Project will occur.
- For project enrollment, the Waiver states that after project approval by the USFS and at least 30 days prior to commencement of on-the-ground activities, a Notice of Intent (NOI) and Waiver Application shall be filed with the Regional Water Board. The NOI certifies that the USFS understands and intends to comply with the Waiver. A letter granting coverage must be received by the USFS prior to initiating activities.
- This Waiver requires that all active and potential legacy sediment sites be identified, inventoried, prioritized, scheduled, and implemented for treatment for all Category B projects and/or through the Watershed Restoration Action Plan (WRAP). If the USFS does not have a WRAP for the sixth field subwatershed where a Category B activity is proposed for coverage under this Waiver, the USFS must propose treatments of all existing legacy sediment sites within the Project area as part of the proposed Project. Grazing allotments are exempt from the requirement to identify and treat legacy sediment sites.
- The USFS shall include specific on-the-ground prescriptions designed to meet the USFS Best Management Practices (BMP) within the environmental document prepared pursuant to the National Environmental Policy Act (NEPA). The specific prescriptions shall also be included in all contracts, grazing permits, agreements, and other instruments used to direct the activities of contractors, grazing permitees, USFS personnel, volunteers, or any other third
parties specified in this Waiver. The intent is to provide clarity and transparency in how the BMPs will be implemented and to facilitate the monitoring of BMP implementation.

- In addition to providing specific on-the-ground prescriptions, the USFS shall provide copies of this Waiver to contractors and grazing permittees, and USFS volunteers and any other third parties specified in this Waiver, and notify them of their responsibilities to comply with the Waiver.

- USFS shall manage and maintain designated riparian zones to ensure retention of adequate vegetative cover that results in natural shade conditions, within 300 feet slope distance on each side of fish-bearing streams, 150 feet slope distance on each side of perennial streams, and 100 feet slope distance on each side of intermittent streams, or the site potential tree height distance on each side of the stream, whichever is greatest (per North West Forest Plan (NWFP) Aquatic Conservation Strategy (ACS)). Reference to the NWFP ACS includes any modifications to those documents during the life of this Waiver, so long as the modifications are equally or more protective of water quality, as determined by the Executive Officer. Timely implementation is necessary for sediment and temperature TMDL compliance. Site-specific potential effective shade is defined as the shade on a watercourse equivalent to that provided by topography and potential vegetation conditions at a site. Exceptions to this condition will be considered. In order for Regional Water Board staff to determine the adequacy of the justification for an exception, the justification must identify the proposed canopy reduction and expected recovery time, provide an estimate of the pre-and post-project shade or solar impacts, and explain how such an exception will result in a net long-term benefit to water quality and stream temperatures.

- Measures to mitigate water quality impacts should be included in the design of the Project. The 2015 Category B Waiver Application Procedures (page 29, item “i”) state that an application must contain:

  “Copies of relevant portions of all environmental documents that set out the details of a project, especially on-the-ground prescriptions, including supporting documents that describe in detail the activities and management practices that will be taken to reduce potential water quality impacts to less than significant levels (e.g., NEPA documents, wet weather operations standards, technical reports, design criteria, assessments, watershed restoration plans).”

**Response:** This project is designed to be in full compliance with the terms and conditions of The Waiver of Waste Discharge Requirements for Nonpoint Source Discharges Related to Certain Federal Land Management Activities on National Forest System Lands in the North Coast Region (Order No. R1-2015-0021). Meeting the terms and conditions of The Waiver, along with implementation of Best Management Practices (BMPs), are how the Forest Service shows compliance with the TMDL developed for the Mad River Watershed.

This project would be in full compliance with the terms and conditions of The Waiver of Waste Discharge Requirements for Nonpoint Source Discharges Related to Certain Federal Land Management Activities on National Forest System Lands in the North Coast Region (Order No. R1-2015-0021). Once the planning document is signed, the Forest Service will request coverage for the project under Category B of The Waiver.

There is a Watershed Restoration Action Plan (WRAP) for Barry Creek – Mad River (180101020202). Nevertheless, all legacy sediment sites in the project area would be treated. These include active erosion
sources originating from National Forest System roads (2S52 and 2S53) which would be treated. In addition, all roads in the project area would receive road maintenance. While not large enough or concentrated enough to be considered legacy sediment sources, it is anticipated that sediment production would be decreased following maintenance.

The BMPs for this project are disclosed in Appendix C of the EA. These BMPs would be implemented to ensure 100 percent implementation in each unit. Effectiveness monitoring would be done after at least one winter as part of the Best Management Practices Evaluation Program (BMPEP).

Copies of the Waiver shall be given to the contractor prior to implementation.

This project has designated Riparian Reserves of 160 feet on each side of streams (320 feet for fish-bearing streams). In all cases, the inner 80 feet (80 feet on each side) will have only fuels treatment by hand. The Riparian Reserve boundary (160 feet on each side, 320 feet for fish-bearing) will function as an equipment exclusion zone. No equipment would be allowed to enter Riparian Reserves except on existing roads. Because only fuels treatment by hand would occur within the inner Riparian Reserve, and the outer Riparian Reserve would not be reduced below 60% canopy cover, there would be no effect on stream shading or temperature.

Along the south side of Littlefield Creek (which is considered fish-bearing) there is a large, flat terrace which road 2S02 travels on. In this area, fuels treatment by hand would occur on the stream side of the road, and thinning would occur on the other side. In some cases the road is closer than 160 feet to the stream but no sediment is expected to reach the stream due to the flatness of the terrain. This area was heavily burned by the Ruth Fire, removing the forest canopy, so there would be no effect on shade from project activities.

When the time comes to apply for enrollment under Category B of the Waiver the North Coast Regional Water Quality Board will be sent a copy of this NEPA document, relevant specialist reports, an erosion control plan, the wet weather operations plan, and the watershed restoration action plan.

Between 80 and 160 feet of watercourses, equipment would be excluded, although fuels treatments would be permitted so long as canopy cover remains at or above 60%. These buffer widths are slightly greater than those called for in the Northwest Forest Plan and would maintain water quality and current stream temperature.

30. We don’t support logging in riparian areas in general and especially the “test harvest” within the interior 80 feet of Riparian Reserves. Logging in riparian areas will not make them more resilient to fire. If the Forest Service pursues this a lot more information will be needed and likely a LRMP amendment (Denise Boggs, CC, P. 2).

**Response:** The “test harvest” has been dropped from the Proposed Action. Only manual fuels treatment would occur within 80 feet of watercourses; limited to less than 6-inch dbh within 25 feet where Riparian Reserves intersect roads.

**Wildlife Resources (WLR)**

31. Thank you for retaining all predominant trees. The scoping notice states, “Healthy vigorous trees with greatest crown potential will be retained”. However, large trees with defects are valuable habitat. Please consider retaining dominant trees, which are providing habitat elements that take a
long time to develop. We ask you to consider leaving all predominant and dominant trees on the landscape. (Kimberly Baker, EPIC, pp. 3 and 4).

**Response:** The project would not remove potential threatened, endangered, and sensitive species nest trees (predominant trees) or affect the canopy around potential nest trees in suitable habitat. Directional falling would be used to protect all predominant trees. All predominant trees would be retained. Thinning from below, while maintaining a minimum of 60 percent or greater canopy cover, is the best management prescription to maintain and recruit the habitat variables critical to nesting/roosting habitat (e.g., large old trees and codominant and intermediate conifers with crown space in the canopy for crown development) while at the same time improving forest health and reducing risk to wildfire and insects and disease. Removal of the codominant trees would only occur when stem densities needs reduced for proper heath of another adjacent codominant tree or when culturing around resident black oak trees.

32. *The Upper Mad River Watershed Analysis at page 16 indicates that Northern Spotted Owls (NSO), Northern Goshawks, Western Pond Turtles and Pacific Fishers are present in the watershed and that Martens, Willow Flycatchers and Del Norte Salamanders are suspected in the planning area for this project. The forthcoming NEPA document should address the effects of treatments on Sensitive, Management Indicator and Survey and Manage species (Kimberly Baker, EPIC, p. 3).*

**Response:** All Riparian Reserves would be buffered on both sides of stream channels (non-fish bearing buffers are 160 feet, fish-bearing buffers are 320 feet or two site potential tree heights), unless intersecting with road networks. In the case of Littlefield Creek, the no-cut buffer (“inner Riparian Reserves”) south of the stream would extend to the edge of the road, which is less than 160 feet in many areas, but this buffer is still considered adequate to prevent impacts to the stream because the area is so flat. Canopy closure in the outer riparian reserve buffers would be maintained at 60 percent or greater. No tree removal is permitted within the inner riparian reserve buffers. Exceptions include hand-cut trees less than 6-inch dbh within 25 feet where Riparian Reserves intersect roads.

Little to no true riparian habitat exists within the units within the project area. However, in the long-term project implementation has the potential to improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to Riparian Reserves. Project activities would not occur within riparian habitat. Implementation of the project would maintain and improve riparian habitat conditions.

All Forest Service Sensitive wildlife species known or thought to occur in the project area (based on habitat and range), were evaluated for this project. It was determined that the project would have no impact on certain Forest Service Sensitive species, based on either the lack of habitat, lack of detections during surveys, or the fact that habitat would not be impacted. Surveys have been conducted for NSO, northern goshawks, and forest carnivores. NSO and fisher have been detected and mitigation protection measures would be implemented.

Direct, indirect and cumulative effects to Management Indicator Species (MIS) and Migratory Bird Species (MBS) are disclosed in the MIS and MBS reports (Smith 2017; located in the project file). MIS and MBS were addressed based on their potential to occur within the project area based on habitat suitability, survey results, or incidental sighting records.

No wildlife Survey and Manage Species occur within the 1st 48 project area; therefore no pre-project surveys are required. This project is in compliance with the 2001 Record of Decision and Standards and
Guidelines for Amendments to Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA and USDI 2001), the April 25, 2013 9th Circuit Court Order in Conservation Northwest [and others] v. Sherman, No. 11-35729 No. 08-1067-JCC (W.D. Wash) and the February 18, 2014 District Court Order in Conservation Northwest [and others] v. Robert Bonnie [and others], No. C08-1067-JCC (W.D. Wash.).

Project design standards would minimize potential impacts to TES, MIS, and MBS. The project is designed to improve habitat conditions through the acceleration of late-successional habitat characteristics, while still maintaining current functional habitat. Although there would be minor habitat degradation for understory species through the removal of brush and understory trees, in the long term the reduction of fuel ladders in these areas would improve adjacent habitat areas resilience to fire disturbance. Overstory canopy closure would be maintained at 60 percent or greater, ground disturbance would be limited to existing roads and skid trails, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80 to 100 percent of the average numbers found within mature and old growth stands within the Forest.

33. Is any part of the project area in designated critical habitat for the NSO? Are there any NSO ACs in the project area? If so please provide us with the habitat suitability of each AC (N/R/F/D %), as well as occupancy status and whether or not 2012 protocol surveys have been conducted (Denise Boggs, CC, p. 2).

Response: The whole project is within Critical Habitat within the subunits ICCS 1 and ICCS 2. There are eight (8) identified northern spotted owl activity centers located within the First 48 planning area. Northern spotted owl protocol surveys were conducted in all suitable habitats for the First 48 Project in 2017, with the second year of surveys scheduled for 2018. In addition, northern spotted owl surveys were conducted within the planning area in the early and mid-1990s. Only one AC (347) was occupied during the 2017 surveys.

An analysis of habitat suitability has been conducted for each AC to determine the amount of nesting/roosting and foraging that is currently available and the percent proposed for treatment. Please note, dispersal habitat is not addressed at the AC level but for Critical Habitat at the landscape level. Impacts to NSO ACs, suitable habitat, and Critical Habitat were fully analyzed and displayed in the Biological Assessment (Smith 2017).

All predominant and dominant trees would be retained. Suppressed, intermediate, and some codominant trees (under specific conditions) would be removed. Large snags and downed wood would be maintained at the 80 to 100 percent level and canopy would be maintained at minimum of 60% in treated areas.

No suitable or Critical habitat removal or downgrading would occur under the 1st 48 Project except for landing construction. Twelve landings, up to approximately 0.25 acres in size would be constructed in NRF (CHU PCE 2 and PCE3) for a total of 5 acres, 3 acres of low-quality foraging habitat and 2 acres of low-quality nesting/roosting habitat, with negligible amounts of habitat reduction in any one area. The majority of landings that would be used for this project are existing openings that would only need minor expansion and brushing for safe operations; therefore, 5 acres of nesting/roosting/foraging habitat removed is an overestimate. All landings would occur within the outer 1.3-mile radius of the affected ACs. The maximum amount of nesting/roosting and foraging habitat that would be removed in any one AC is 1.75 acres and 1 acres, respectively, 0.25 acres in any one area.
No AC would have treatments over 19 percent of the nesting/roosting habitat or over 25 percent of the foraging habitat. Thinning may modify nesting/roosting or foraging habitat but would maintain current habitat function immediately post-project. The project is expected to have beneficial effects by accelerating the development of forest structure to mature conditions more quickly than if left untreated, as well as reducing the risk of stand-replacing wild fire.

No activities would occur in high-quality nesting/roosting habitat or in 100-plus-acre nest groves of any AC, and no activities would occur within 0.25 mile of any AC during the breeding season.

No AC would have thinning or fuelbreak treatments over 19 percent of the nesting/roosting habitat within any one AC. Thinning may modify nesting/roosting habitat but would maintain current habitat function immediately post-project. The project is expected to have beneficial effects by accelerating the development of forest structure to mature conditions more quickly than if left untreated, as well as lowering risk of stand-replacing wild fire.

The total treatments within any one AC would vary from 0 to 25 percent of the available foraging habitat within 0.5 mile and 0.4 to 13 percent within 1.3 miles of the center (treatment acres/percentages within 1.3 miles include the acres within 0.5 miles; Table 11). Only small amounts of foraging habitat would be lost due to new landing construction. A total of 3 acres foraging habitat removed within the action area, 1-acre maximum in any one AC. This loss would be negligible in any one given area and would resemble small forest openings after the roads and landings have been decommissioned.

Treatments would result in a greater assurance of long-term maintenance of existing late-successional habitat within the action area. Fuel treatments in strategic areas along high-use roads would reduce the risk of fire ignitions along high use roads and provide greater protection to adjacent late-successional habitat. This will protect and enhance owl suitable and Critical Habitat in the long run.

34. “Project-level planning should consider connectivity between LSRs.” WA pg. 38 (Kimberly Baker, EPIC, p. 2).

Response: The project involves thinning stands to improve fire resilience. No habitat removal will occur; therefore, connectivity between LSRs will not be affected. The project is designed to improve habitat conditions through the acceleration of late-successional habitat characteristics, while still maintaining currently functional late-successional habitat. Although there would be minor habitat degradation through the removal of brush and understory trees, in the long term the reduction of fuel ladders in these areas would improve adjacent habitat areas resilience to fire disturbance.

Overstory canopy closure would be maintained at 60 percent or greater, ground disturbance would be limited to existing roads and skid trails, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80 to 100 percent of the average numbers found within mature and old growth stands within the Forest, providing for connectivity between LSRs.

35. “A rigorous timber program over the past 40 years has reduced the amount of late-successional habitat in the watershed, which has most likely reduced the amount of late-successional species.” WA pg. 50 (Kimberly Baker, EPIC, p. 2).

Response: Approximately 75 acres of the project occurs in a Late-Successional Reserve (LSR), specifically LSR 330. The STNF LSRA (1999) determined that this area of the LSR was deficient in late-successional habitat. Portions of the LSR were previously harvested; therefore, extensive stands of dense
plantations exist that not only create a fuels hazard, they also do not provide suitable habitat for late-successional species such as NSO. Plantations and young natural stands are even-aged and lack the horizontal and vertical diversity components associated with late-mature stands. Young stands have the potential to achieve rapid diameter and height growth with thinning treatments. Silvicultural prescriptions can be applied to younger stands in order to accelerate their development toward late seral conditions. These treatments could increase the amount of late seral vegetation sooner than would occur naturally. The LSRA indicated the proposed area needs extensive fuels treatments to protect the LSR as well as extensive habitat restoration. The project would maintain and improve habitat conditions within the LSR.

Treatments would result in a greater assurance of long-term maintenance of existing late-successional habitat within the action area. Fuel treatments in strategic areas along high-use roads would reduce the risk of fire ignitions along high use roads and provide greater protection to adjacent late-successional habitat. Therefore, the project would maintain and improve habitat conditions within the LSR.

36. The Six Rivers Land Resource Management Plan (LRMP) at II-1 states, The Forest will be managed to maintain ecosystem components, structure and processes. Both reserved and matrix areas perform an important role in maintaining biodiversity. Forests in the matrix function as connectivity between reserved areas and provide habitat for a variety of organisms associated with both late successional and younger forests. South Fork Mountain provides important wildlife habitat connectivity. This reiterates the need to keep canopy and the largest trees (Kimberly Baker, EPIC, p. 2).

Response: The project involves thinning stands to improve fire resilience. No habitat removal would occur; therefore, habitat connectivity would not be affected. The project would provide both short and long-term benefits to wildlife by protecting current habitat and improving/restoring lower quality or non-habitat. The 1st 48 Project will restore and accelerate development of important habitat characteristic for the spotted owl. This includes plantations and overstocked stands that, if treated, would increase the available habitats for the spotted owl and help reduce inter-specific competition between the barred owl and the spotted owl. Treatment of these stands would have an immediate benefit to the spotted owl. The project would maintain a canopy closure of 60 percent or greater.

37. Please survey the area to NSO protocol and consider Activity Center deficits in planning prescriptions. We are concerned about cumulative impacts from the Beaverslide and Kelsey projects. Please provide information on owl occupancy and reproductive status within project area and what is known in the Upper Mad River watershed (Kimberly Baker, EPIC, p. 2).

Response: Northern spotted owl protocol surveys were conducted in all suitable habitats for the 1st 48 Project in 2017, with the second year of surveys scheduled for 2018. In addition, northern spotted owl surveys were conducted within the planning area in the early and mid-1990s. Only one AC (347) was occupied during the 2017 surveys within the 1st 48 planning area.

Regarding all the past impacts from land uses (mining, timber harvest, and road constructions), the 1st 48 Project would facilitate restoration by thinning plantations and young natural stands. The beneficial cumulative effects include the reduction of habitat fragmentation and the development of late-seral conditions.

The 1st 48 Project was designed to maintain current characteristics of nesting/roosting and foraging habitat but, more importantly, will create the currently lacking, critically important habitat characteristics for nesting/roosting and foraging habitat. It is expected that current habitat function would be maintained in all treatment areas immediately post-project (as was seen in the post-treatment review of the
Appendix A. Response to Comments

Beaverslide Project); however, approximately 90% of the NRF in the project area AA would not have any treatment. Therefore, “adequate alternative habitat” as suggested by Forsman (2011) remains available in the AA for owl use. The project would develop functional habitat that is currently lacking in the stands.

The wildlife analysis area used for cumulative effects is the Upper Mad River Watershed (UMRW), which is a 5th-field watershed consisting of 102,926 acres. There are 25,178 acres of nesting/roosting and 24,762 acres of foraging in the Upper Mad River Watershed. Currently three (3) timber sales occur within the watershed on the Mad River District: Little Doe/Little Gulch, Kelsey Peak and Beaverslide. The Action Area for Beaverslide overlaps with the First 48 project, but no treatments overlap or occur within any AC associated with the First 48 project. The Shasta Trinity Salvage Project also overlaps with the 1st 48 Project, but no treatments overlap or occur within any affected AC.

The action areas for the 1st 48 project and the Kelsey peak project overlap. No timber sale units for Kelsey Peak are within the overlap; however, 638 acres of the Kelsey fuels corridor overlaps into the 1st 48 project. The Kelsey fuels corridor connects directly into the 1st 48 shaded fuelbreak creating an extended fuelbreak near the town of Ruth.

The Kelsey Peak Project has proposed treatments in 414 acres and 2,175 acres of nesting/roosting and foraging respectively. This equates to 3 percent NR being treated and 10 percent F combined for the two projects being treated within the UMRW. All acres of these treatment will maintain its current habitat function except for a negligible amount removed for landings that resemble small forest openings and will be decommissioned post-project. This leaves 97 percent and 90 percent of the available nesting/roosting and foraging habitat, respectively, untreated and available as alternative habitat for the use by spotted owls.

Within or overlapping the boundaries of the Upper Mad River Watershed there are over 85 northern spotted owl activity centers. Since the two projects are immediately adjacent to each other, four activity centers overlap Kelsey and 1st 48. The maximum combined percent treated of N/R in any AC is 19 percent and 36 percent of F. All treated areas would remain suitable post-treatment.

Because the effects of thinning and fuel treatments are primarily beneficial to NSO, similar projects (Beaverslide and Kelsey) in the area should be considered to have achieved the desired conditions and provided positive cumulative effects to the area, as recommended by the Recovery Plan and the CHU Rule.

38. NSO – Concerns about noise and other disruptions in habitat for Northern Spotted Owls, and other wildlife, especially rare, threatened and endangered (Karen Wilson, Individual, p. 1)

Response: Noise and smoke-generating activities that occur within or adjacent to suitable northern spotted owl habitat has the potential to disturb nesting owls. To avoid disturbance, design features and limited operating periods (LOPs) would be implemented as described in the project design features. The LOP from February 1 through July 31 within 0.25 miles of known activity centers will avoid impacts the NSO during the breeding season. Surveys to protocol would continue for the life of the project or additional seasonal restrictions would be imposed on any treatment in or within 0.25 miles of nesting/roosting habitat. A September 15 LOP would be used in occupied or nesting/roosting habitat if no surveys are conducted.

39. The Upper Mad River Watershed Analysis at page 16 indicates that Northern Spotted Owls (NSO), Northern Goshawks, Western Pond Turtles and Pacific Fishers are present in the watershed and that Martens, Willow Flycatchers and Del Norte Salamanders are suspected in the planning area for this
Appendix A. Response to Comments

The forthcoming NEPA document should address the effects of treatments on Sensitive, Management Indicator and Survey and Manage species.

Response: Under the National Forest Management Act (NFMA), 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” (P.L 94-588, Sec 6 (g) (3) (B)). The 1982 regulations implementing NFMA require that “Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area.” (36 CFR 219.19).

Forest Service Sensitive (FSS) Species. All Forest Service Sensitive wildlife species known or thought to occur in the project area (based on habitat and range), were evaluated for this project. It was determined that the project would have no impact on certain Forest Service Sensitive species, based on either the lack of habitat, lack of detections during surveys, or the fact that habitat would not be impacted. Species that would not be affected by this project include the bald eagle (Haliaeetus leucocephalus), Townsend's big-eared bat (Corynornithus townsendii), fringed myotis (Myotis thysanodes), California wolverine (Gulo gulo lutes), Humboldt marten (Martes caurina), pallid bat (Antrozous pallidus), western bumblebee (Bombus occidentalis), western pond turtle (Clemmys marmorata), foothill yellow-legged frog (Rana boylii) southern torrent salamander (Rhyacotriton variegatus), and northern red-legged frog (Rana aurora aurora). Willow flycatcher was removed from the Sensitive Species list for the Six Rivers as it was determined that the species did not breed on the Forest.

- **Pacific Fisher (Martes pennanti pacifica, also a Federal Candidate Species).** Surveys for fisher were conducted and fisher were detected in the project area. Of the 13,686 acres of fisher denning habitat within the action area, approximately 321 acres of low and moderate quality denning habitat would be treated. No high-quality habitat would be treated. The amount of fisher denning habitat within the action area proposed for treatment would be approximately 2 percent (98% of the denning habitat in the action area would not receive any treatment). Characteristics for denning would be maintained and the stands would still function as denning habitat immediately post-project. Canopy closure in the outer riparian reserve buffers would be maintained at 60 percent or greater.

- **Northern Goshawk (Accipiter gentilis).** Surveys were conducted in the 1st 48 Project area in 2017. No goshawks were detected.

Management Indicator Species. Management Indicator Species is a concept used by the agency to serve as a barometer for species viability at the Forest level. Population changes of MIS are believed to indicate the effects of management activities. The SRNF LRMP uses MIS to assess potential effects of project activities on the various habitats and habitat assemblages with which these species are associated. The 1st 48 Project would not adversely impact MIS. Although shaded fuelbreak construction would degrade habitat for species such as the Pacific wren and ruffed grouse, the majority of the project would improve/restore habitat conditions for all MIS by thinning young, homogenous stands, accelerating the development of multi-storied conditions and other late successional habitat characteristics.

Overstory canopy closure would be maintained at 60 percent or greater, ground disturbance would be limited to existing roads and skid trails, vegetation species diversity and composition would be maintained, and retention of snags and downed logs would be retained at 80 to 100 percent of the average numbers found within mature and old growth stands within the Forest.
Little to no true riparian habitat exists within the units given the lack of riparian vegetation associated ephemeral and intermittent stream courses within the project area. However, in the long-term project implementation has the potential to improve riparian habitat conditions through the release of conifer and hardwoods/shrubs from thinning, generating a secondary canopy. The project would maintain high levels of coniferous canopy closure within the project area adjacent to riparian reserves. Project activities would not occur within riparian habitat. Implementation of the project would maintain and improve riparian habitat conditions.

Jackpot burning may also cause short-term habitat degradation through the loss of small woody debris; however, burning would occur under specific weather and moisture condition designed to minimize damage to the residual stand, maintain large woody debris, and maintain at least 50 percent of the duff layer.

**Survey and Manage Wildlife Species.** The 1st 48 Project is outside of the range of the Del Norte salamander. No wildlife Survey and Manage (S&M) species occur within the 1st 48 Project; therefore, no pre-project surveys were conducted. This project is in compliance with the 2001 Record of Decision and Standards and Guidelines for Amendments to Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA and USDI 2001), the April 25, 2013 9th Circuit Court Order in Conservation Northwest [and others] v. Sherman, No. 11-35729 No. 08-1067-JCC (W.D. Wash) and the February 18, 2014 District Court Order in Conservation Northwest [and others] v. Robert Bonnie [and others], No. C08-1067-JCC (W.D. Wash.).

40. *Wildlife Corridors where are these located in the Project area? (Karen Wilson, Individual, p. 1).*

**Response:** The Forest does not designate specific wildlife corridors, but rather facilitates wildlife dispersal through maintaining functional habitat in all treated areas. No habitat removal will occur; therefore, habitat connectivity will not be affected.

In addition, all riparian reserves have equipment exclusion buffers established from 160 to 320 feet within thin from below and hazardous fuels reduction units.
Appendix B. Proposed Activities

Table 28 through Table 31 display the 36 units in the shaded fuelbreak (up to 318 acres total) with sufficient tree sizes and quantity of forest by-products to support an economically viable commercial sale of timber and poles. This opportunity would generate revenue to offset hazard fuel reduction (HFR) and other manual, prescribed burning and fuelbreak maintenance activities. Ground-based logging systems would be used to remove whole trees to landing sites on less than 35 percent slopes. Cable logging systems would be used to remove whole trees on steeper slopes.

Logging systems are proposed based on site conditions and existing road infrastructure. Ground or cable based systems would be used where units are accessible from either National Forest System (NFS) roads or existing skid roads off system roads. Ground-based yarding systems would be used to skid logs on slopes up to 35 percent, using either tracked or rubber-tired skidders. Cable yarding systems would be used on steeper ground (slopes greater than 35 percent). There is no new temporary road construction. Existing non-system roads are generally old jeep roads or temporary roads constructed for past harvest activities. These roads require re-opening and blading prior to use. Road reconstruction, as defined by Forest Service Manual 7700, would not be required.

Landing would be needed to log the proposed units based on intensive field reconnaissance. Actual locations for new landings may vary slightly and are subject to agreement by the Forest Service and timber purchaser under the Timber Sale Contract or other agreements. All landings would comply with best management practices (BMPs) and project design features. Existing landings and skid trails would be used to the fullest extent possible. New landings may be constructed where necessary to facilitate logging operations. New and existing landings would be located either within, or adjacent to, treatment units.

Table 28. Summary of the proposed shaded fuelbreak activities by unit.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Acres</th>
<th>Stand Type</th>
<th>Potential Utilization</th>
<th>Logging System</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>3</td>
<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Cable</td>
</tr>
<tr>
<td>111</td>
<td>5</td>
<td>Shaded Fuelbreak</td>
<td>Pole</td>
<td>Ground</td>
</tr>
<tr>
<td>112</td>
<td>3</td>
<td>Shaded Fuelbreak</td>
<td>Pole</td>
<td>Cable</td>
</tr>
<tr>
<td>205</td>
<td>7</td>
<td>Shaded Fuelbreak</td>
<td>Pole</td>
<td>Cable</td>
</tr>
<tr>
<td>206</td>
<td>3</td>
<td>Shaded Fuelbreak</td>
<td>Pole</td>
<td>Cable</td>
</tr>
<tr>
<td>311</td>
<td>2</td>
<td>Shaded Fuelbreak</td>
<td>Pole</td>
<td>Ground</td>
</tr>
<tr>
<td>312</td>
<td>8</td>
<td>Shaded Fuelbreak</td>
<td>Pole</td>
<td>Cable</td>
</tr>
<tr>
<td>405</td>
<td>12</td>
<td>Shaded Fuelbreak</td>
<td>Pole</td>
<td>Ground</td>
</tr>
<tr>
<td>406</td>
<td>4</td>
<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Ground</td>
</tr>
<tr>
<td>408</td>
<td>6</td>
<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Cable</td>
</tr>
<tr>
<td>410</td>
<td>9</td>
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<td>Cable</td>
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<td>415</td>
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<td>417</td>
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<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Ground</td>
</tr>
<tr>
<td>419</td>
<td>17</td>
<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Ground</td>
</tr>
<tr>
<td>421</td>
<td>2</td>
<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Ground</td>
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<tr>
<td>422</td>
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<tr>
<td>423</td>
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<tr>
<td>424</td>
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<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Ground</td>
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<tr>
<td>509</td>
<td>13</td>
<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Cable</td>
</tr>
</tbody>
</table>
Appendix B. Proposed Activities

<table>
<thead>
<tr>
<th>Unit</th>
<th>Acres</th>
<th>Stand Type</th>
<th>Potential Utilization</th>
<th>Logging System</th>
</tr>
</thead>
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<td>611</td>
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<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Ground</td>
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<tr>
<td>614</td>
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<td>Ground</td>
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<tr>
<td>616</td>
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<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Ground</td>
</tr>
<tr>
<td>617</td>
<td>7</td>
<td>Shaded Fuelbreak</td>
<td>Saw log</td>
<td>Cable</td>
</tr>
</tbody>
</table>

**Total Acres** 202

Table 29. Summary of the proposed commercial thin activities by unit and logging system (cable).

<table>
<thead>
<tr>
<th>Unit</th>
<th>Acres</th>
<th>Stand Type</th>
<th>Potential Utilization</th>
<th>Logging System</th>
<th>Fuels Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>2</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>104</td>
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<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>107</td>
<td>0.5</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>108</td>
<td>3</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>201</td>
<td>3</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>204</td>
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<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>302</td>
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<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>305</td>
<td>2</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
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<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
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<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>501</td>
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<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>503</td>
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<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
</tr>
<tr>
<td>504</td>
<td>4</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Cable</td>
<td>WTY / HPB / Chip</td>
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</tbody>
</table>

**Total Acres** 43.5

Table 30. Summary of the proposed commercial thin activities by unit and logging system (ground).

<table>
<thead>
<tr>
<th>Unit</th>
<th>Acres</th>
<th>Stand Type</th>
<th>Potential Utilization</th>
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<th>Fuels Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>3</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>102</td>
<td>4</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>105</td>
<td>5</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>106</td>
<td>8</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>109</td>
<td>11</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>202</td>
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<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>203</td>
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<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>301</td>
<td>4</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>303</td>
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<tr>
<td>304</td>
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<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
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<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>401</td>
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<td>Ground</td>
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<td>Ground</td>
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<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
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<tr>
<td>413</td>
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<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
</tbody>
</table>

15 WTY = whole tree yard and yard tops; HPB = hand pile and burn; GPB = grapple pile and burn; M=mastication; Chip = roadside chipping; S = lop and scatter; TFB = thin from below
## Appendix B. Proposed Activities

### Draft Environmental Assessment

<table>
<thead>
<tr>
<th>Unit</th>
<th>Acres</th>
<th>Stand Type</th>
<th>Potential Utilization</th>
<th>Logging System</th>
<th>Fuels Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>502</td>
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<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>505</td>
<td>1</td>
<td>Shaded Fuelbreak</td>
<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
<td>801</td>
<td>15</td>
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<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
<tr>
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<td>WTY / GPB / M / Chip</td>
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<td>WTY / GPB / M / Chip</td>
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<tr>
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<td>WTY / GPB / M / Chip</td>
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<td>27</td>
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<td>CT</td>
<td>Ground</td>
<td>WTY / GPB / M / Chip</td>
</tr>
</tbody>
</table>

**Total Acres**: 273.75

### Table 31. Plantations – developing shaded fuelbreak treatment methods by unit.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Acres</th>
<th>Stand Type</th>
<th>Potential Utilization</th>
<th>Logging System</th>
<th>Fuels Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>409</td>
<td>15</td>
<td>Plantations</td>
<td>TSI Pole</td>
<td>Ground</td>
<td>TFB / WTY / LS / GPB/M</td>
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<tr>
<td>508</td>
<td>12</td>
<td>Plantations</td>
<td>TSI</td>
<td>Ground</td>
<td>LS / GPB/M</td>
</tr>
<tr>
<td>510</td>
<td>8</td>
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<td>TSI</td>
<td>Cable</td>
<td>LS / HPB</td>
</tr>
<tr>
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<td>Cable</td>
<td>LS / HPB</td>
</tr>
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<td>TSI</td>
<td>Ground</td>
<td>LS / GPB / M</td>
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<tr>
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<td>LS / HPB</td>
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<td>WTY / LS / GPB / M</td>
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<tr>
<td>612</td>
<td>2</td>
<td>Plantations</td>
<td>TSI</td>
<td>Ground</td>
<td>LS / GPB / M</td>
</tr>
</tbody>
</table>

**Total Acres**: 108
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Appendix C. Best Management Practices

Prevention – Terrestrial Invasive Plants (USDA/USFS 2014)

GP5. Actions conducted or authorized by written permit by the Forest Service operating on and outside the road prism (including public works, special-uses, and service contracts) will require cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands.

GP6. Each unit shall identify sites for Forest Service vehicle cleaning and equip the sites sufficiently (i.e., high-pressure hose) to ensure mud or vegetative material trapped in tires or on the carriage of the vehicle can be effectively removed.

GP7. If there is a moderate to high risk of spreading invasives from an infested area to an uninfested area during operations and alternate project design features are not feasible to reduce risk of spread, equipment/machinery shall be cleaned prior to leaving the infested area and operating elsewhere.

GP8. When needed to control soil erosion, use mulch from chipped or masticated material or mulch native material or certified weed-free straw (see www.cal-ipc.org/ip/prevention for a weed-free forage and straw supplier list).

GP9. Rock, sand or other material to be used for projects conducted or authorized by the Forest Service shall originate from a weed-free source. Rock source shall be inspected by staff trained in invasive plant identification or if source is off-forest, contractor shall provide documentation that material is weed-free.

GP10. Material excavated at a project site that is contaminated with invasive plants can be a. reused at the site, b. stockpiled on site or c. relocated to an area that is already contaminated. During transport of contaminated soil or sand, cover material with an impervious material.

GP15. Locate activity boundaries or areas of concentrated use to exclude areas infested with invasive plants. Activity boundaries include staging areas, parking areas, trailheads, river access points, roadside pullouts, and timber harvest landings.

Timber and Fuels

TF1. In planning fuel treatment projects proximal to settings with invasive plants (e.g., road edges), consider the risk of invasive plants spreading into the treatment area. Where the risk of spread into the treatment area is moderate to high (e.g., invasive plant cover is relatively high along the road edge where treatment is planned to occur), incorporate design features to reduce the spread of invasives. Examples of such features are below.

- For manual/hand-removal treatments or mechanical treatments, remove only enough vegetation and ground cover in the treatment area to accomplish fuel management/resource objectives; retain patches of shrubs and ground cover.

TF2. Prior to implementation of timber operations, where the risk of spread is moderate to high, via contractor or force account, treat invasive plant-infested road medians, landings, processing areas or other clearings used in the course of project implementation proximal in time before the start of operations. Treatment may include machine removal, weed whacking, or hand treatments. Invasive plants or shrubs
removed shall be located on the edge of the clearing out of the way of operations to avoid retrieval on equipment.

TF4. Where the risk of invasive plant spread and establishment is moderate to high in association, with landings, processing or staging areas… after their use, employ one of the following measures to cover the disturbed area:

- Distribute masticated material or mulch native plant material/wood straw to a depth of approximately 3 to 5 inches,
- Distribute logging-related slash (e.g., tops, bark, limbs) that is crushed/condensed in such a manner that this material is close to the ground providing moderate to high shade to the ground, and
- If feasible/practicable, decompact/rip and revegetate area with suitable native planting stock that optimizes resistance to invasive plant establishment (e.g., tree stock, early-successional/disturbance tolerant shrubs).

TF5. If applicable, implement timber as well as subsequent fuels activities according to a progression of work, which prioritizes operating in relatively invasive plant-free sections of the planning area before moving equipment and general operations to areas of the project where invasive plants are present. As an example, along a given primary Forest Service route, first conduct work in those units located in the upper watershed where invasive plant cover is lower before operating machinery in units off the portion of the road in the lower watershed position where invasive plants are more common.

Roads

RD5. Incorporate, where applicable, the following into Forest road decommissioning projects to reduce the risk of an existing invasive plants occurrence from spreading occurrence to unoccupied areas as a result of project implementation:

- Where there is a risk of spread of invasive plants from an existing occurrence on or along the road to be decommissioned into unoccupied wildland settings (e.g., in settings where the vegetative ground and canopy cover in the adjacent habitat is minimal), remove entire plant (including roots) mechanically or manually prior to decommissioning,
- Mechanically or manually remove any invasive plant occurrence (remove entire plant) at the intersection of the decommissioned road and Forest system road.
  - Apply ground cover in the form of native mulch/finely masticated material or mulch material spread to depth of 6 inches over the area where plants were removed, or ,
  - If feasible, decompact/rip and revegetate area with suitable native planting stock that optimizes resistance to invasive plant establishment (e.g., tree stock, early-successional/disturbance tolerant shrubs).

Soils

Various types of soil disturbance (compaction, displacement, severe burning, etc.) may affect key soil functions in different ways on different soils and sites. Both degree and extent of disturbance are important considerations that must be evaluated together to assess potential adverse impacts on soil functions for the activity area.
Soil Quality Standards (LRMP, Appendix L)

SQS provide threshold values to identify when changes in soil properties or conditions become detrimental. Areas of detrimental soil disturbance should not be of a size or extent that would result in a significant change in production potential for the activity area, generally assumed to be 15 percent of the area. Some standards are qualitative and some are quantitative. Six Rivers SQS use the following soil properties, conditions, and threshold values to evaluate management effects on the key soil functions of soil productivity and hydrologic function:

1. Soil cover for erosion prevention is sufficient to prevent the rate of accelerated soil erosion from exceeding the rate of soil formation (which is unknown and unknowable; number 2 is assumed to meet this objective unless stated otherwise for particular sites).

2. The kind, amount and distribution of soil cover necessary to avoid detrimental accelerated soil erosion is guided by the Region 5 Erosion Hazard Rating system (R5 FSH 2509.22) and locally adapted standard erosion models and measurements.

3. Soil porosity is at least 90 percent of the total porosity found under undisturbed or natural conditions. Porosity is evaluated between 4 and 8 inches below the surface. (compaction standard, 10% reduction in total porosity is “detrimental”).

4. Organic matter is present in sufficient amounts to prevent significant short or long-term nutrient cycle deficits, and to help avoid adverse physical soil characteristics (kinds and amounts of organic matter follow).

5. Soil organic matter in the upper 12 inches of soil is at least 85 percent of the total soil organic matter found under undisturbed conditions for the same or similar soils. (displacement standard; notably this is highly uncertain in measuring or implementing).

6. Litter and duff occurs over at least 50 percent of the activity area. Use the presence of living vegetation that could contribute significant annual litterfall to compensate for conditions when post-disturbance litter and duff coverage is less than 50 percent.

7. 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 [as defined]. Attempt to protect logs in decomposition classes 3-5 from burning and mechanical disturbance. Large woody material requirements may be waived in strategic fuelbreak areas.

8. Infiltration and permeability are not reduced to ratings of 6 or 8 as defined in the R5 EHR system. (soil hydrologic function standard; “water movement” rating in EHR).

9. Soil reaction class, buffering or exchange capacities, or biological populations are not altered to the degree that significantly affects soil productivity, soil hydrologic function, or the health of humans and animals [soil chemical and biological standard; this is another unknowable and non-implementable standard; notably the language this was taken from in the old R5 Supplement tied this to “materials added to the soil” will not have this effect, originally intended for fertilizer or herbicide applications].
Water Quality


Plan-2. Project Planning and Analysis (incorporates BMPs into project design and implementation).

Fire-1. Wildland Fire Management Planning (incorporates BMPs into project burn plans).

Fire-2. Use of Prescribed Fire (details methods to reduce impacts to soil and water from fire).

Fire-3. Wildland Fire Control and Suppression (details methods to reduce impacts to soil and water from suppression activities such as fireline construction).

Fire-4. Wildland Fire Suppression Damage Rehabilitation (details methods to repair or rehabilitate fire suppression activities such as fireline construction).

Road-4. Road Operations and Maintenance (details methods to avoid or minimize effects to water quality from road use. Includes wet weather operations).

Road-6. Road Storage and decommissioning (techniques to close a road and place it in a free-draining, more natural, maintenance-free condition)

Road-7. Stream Crossings (techniques to mitigate effects to soil and water from constructing or reconstructing waterbody crossings).

Road-9. Parking and Staging Areas (methods to minimize effects from parking or staging areas such as landings).

Road-10. Equipment Refueling and servicing (guidelines to avoid soil or water contamination from fuel or other chemicals associated with maintenance of heavy equipment).

Veg-1. Vegetation Management Planning (incorporates BMPs into vegetation management projects).

Veg-2. Erosion Prevention and Control (techniques to avoid or minimize effects to soil and water from mechanical vegetation treatments).

Veg-3. Aquatic Management Zones (methods to avoid or minimize effects to soil and water in Riparian Reserves).

Veg-4. Ground-Based Skidding and Yarding Operations (techniques to minimize site disturbance and avoid or minimize sediment production from ground-based operations).

Veg-5. Cable and Aerial Yarding Operations (techniques to minimize site disturbance and avoid or minimize sediment production from skyline operations).

Veg-6. Landings (techniques to avoid or minimize effects to soil and water specific to the construction and use of log landings).

Veg-8. Mechanical Site Treatment (techniques to minimize site disturbance and avoid or minimize sediment production from mechanical thinning and fuel treatments).

Water Uses-3. Administrative Water Developments (techniques to avoid or minimize effects to water quality when drafting from streams or ponds).