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Final Environmental Impact Statement

Hi-Grouse Project

Goosenest Ranger District, Klamath National Forest
Siskiyou County, California

Sections 23, 25–28, 32–36, T44N, R2E; Sections 1–4, 9–13, T43N, R2E; Section 31, T44N, R3E; Sections 6, 7, and 18, T43N, R3E (Mount Diablo Meridian)

Left: View of large lodgepole pine stand heavily affected by bark beetle in the project area

Right: Lodgepole pine stand viewed from Tennant Road #77

Left: White fir stands viewed from Road 44N61

Final Environmental Impact Statement

Hi-Grouse Project

Goosenest Ranger District, Klamath National Forest, Siskiyou County, California

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Abstract: The Goosenest Ranger District of the Klamath National Forest proposes to treat ponderosa pine and mixed conifer stands to improve long-term forest health and reduce fuels within the Goosenest Adaptive Management Area.

The Forest Service initially developed four alternatives, including: the no action (alternative 1), the proposed action (alternative 2) from public scoping, and two additional alternatives created in response to significant issues that were raised during public scoping. Alternative 2 was later dropped from detailed study after further analysis showed this alternative would not comply with the Forest Plan (see section 2.4 for the discussion of alternatives considered but eliminated from detailed study).

Alternative 4, the modified proposed action and preferred alternative, proposes to improve long-term stand health and reduce fuels on 3,847 acres by thinning 2,429 acres of ponderosa pine/white fir stands, thinning 970 acres of lodgepole pine stands, thinning 99 acres of plantations, planting 644 acres of tree seedlings in gaps within thinned areas, and creating fuel management zones on approximately 300 acres along forest highways and roads. Alternative 4 fuels treatments include machine piling of fuels, as needed, outside of landing areas. During consultation with USDI Fish and Wildlife, two road segments (44N80A and 44N62A) within northern spotted owl critical habitat were identified as a concern. These two road segments were previously physically closed (barricaded) from use. Alternative 4 proposes to further reduce impacts to late-successional and other species habitat by removing (decommissioning) 44N80A and 44N62A from the Forest system.

Alternative 3 is similar to alternative 4, except alternative 3 proposes treatment on 3,568 acres, leaving a higher basal area post-thinning. When compared to alternative 4, alternative 3 treats 673 acres of the 984-acre lodgepole stand in the western portion of the planning area. Alternative 3 does not include planting, machine piling outside of landing areas, or changes to the Forest system roads. See chapter 2 and appendix A (maps A-5 and A-6) for detailed discussions of alternatives.

Alternative 4 was identified as the preferred alternative in the draft environmental impact statement (DEIS). Public and other agency comments on the DEIS are addressed in the Hi-Grouse Project Final Environmental Impact Statement (FEIS) in appendix B.

Summary

The Klamath National Forest proposes the Hi-Grouse Project to reduce fuel hazards and manage vegetation to restore forest health on about 3,850 acres located in Northern California in the southeast portion of the Goosenest Ranger District, Siskiyou County, California. This final environmental impact statement (FEIS) considers the environmental effects of thinning and burning on National Forest System land (see appendix A for the vicinity map A-1, management area map A-2, and modified proposed action map A-6).

This action is needed to address differences between the existing conditions and the desired conditions described in the Forest Plan (page 4-131) (USDA Forest Service 1995a) and for the Goosenest Adaptive Management Area (pages 6-8 to 6-9) (USDA Forest Service 1996). See FEIS section 1.3 for management direction and existing condition descriptions and corresponding map A-3 in appendix A.

Within the project area, white fir stands are overstocked and susceptible to mortality from *annosus* root rot; mixed conifer stands are overstocked with dense white fir that are inhibiting the growth and survival of high elevation ponderosa pine; a large lodgepole stand has increasing mortality from mountain pine beetle and disease; and fuels loadings are high with dense ground and ladder fuels (section 1.3 of FEIS).

The proposed project is designed to improve and maintain sustainable habitat for species associated with late-successional forests, promote restoration of historic forest composition and structure, and promote restoration of fuels-related historic fire regime (sections 1.5 and 2.2.3 of FEIS).

A variety of efforts was made to involve the public (section 1.7 of FEIS). Native American representatives were contacted with a letter (July 24, 2007) that described the project and requested comments. Scoping letters were sent to representatives from two federally recognized tribes, the Pit River Tribe and the Klamath Tribe, resulting in a field trip on September 7, 2007 with members of both tribes. Additional Tribal Consultation meetings were held on January 23, 2009, with the Pit River Tribes at the Pit River Tribal Council Room in Burney, California; and on January 28, 2009, with the Klamath Tribes at the Goosenest Ranger District Office in Macdoel, California. Tribes expressed concerns regarding the need for vegetation management, access, and cultural plants; these were considered in the development of action alternatives.

The District consulted with USDI Fish and Wildlife Service and conferred with the California Department of Fish and Game regarding other species within the project area. District personnel met with a representative from the Klamath Siskiyou Wildlands Center for field visits early in the project development stage on July 5, 2006; and later on August 9, 2007, to discuss site specific concerns for the Hi-Grouse Project Area. Forest personnel met with representatives from the American Forest Resource Council, Sierra Pacific Industries, Siskiyou County, and the California Forestry Association on August 26, 2008, to discuss forest monitoring and field review the Hi-Grouse Project Area.

The project was listed in the Forest's Schedule of Proposed Actions in July 2008. Scoping letters were mailed on December 11, 2008, to individuals, organizations, and other government agencies that had indicated interest in similar district projects. A notice of intent to prepare an environmental impact statement for the project was published in the *Federal Register* on December 19, 2008(73 FR 77595).

The notice of availability (NOA) was published in the *Federal Register* on May 28, 2010 (75 FR 30022), that began the 45-day comment period of the Hi-Grouse Project DEIS. Seven comments on the DEIS were received. The comments, responses, and the full letters are provided in appendix B of the FEIS.

Issues

Two issues concerning the proposed activities were identified as significant for this project; this led the agency to develop two additional alternatives (section 1.8 of FEIS).

Significant Issue #1: There is a concern that the proposed activities could remove the best remaining wildlife habitat for species associated with late-successional habitat within the project area, specifically removing and or altering habitat for northern spotted owl and northern goshawk (e.g., degrade or downgrade habitat).

Indicators: Acres treated in nesting, roosting, and/or foraging habitats across the project area and basal area maintained within individual stands.

Alternative 3 responds to this significant issue through use of less intensive thinning treatments throughout the project area to maintain higher tree densities (basal area) and canopy closure.

Alternative 4 responds to this significant issue through use of less intensive thinning treatments within northern spotted owl and northern goshawk nesting and roosting areas to maintain higher basal area and canopy closure. Thinning treatments outside nesting and roosting areas would further reduce basal area and canopy closure to improve overall long-term stand health.

Significant Issue #2: There is a disagreement about whether or not a sufficient amount of the lodgepole stand is treated to protect values at risk.

Indicators: Acres treated by treatment type.

Alternative 4 responds to this significant issue by treating the entire lodgepole stand to improve stand health and reduce fuel loadings.

Alternatives

The original proposed action from scoping (alternative 2) included ponderosa pine and mixed conifer restoration and re-establishment treatments which were later determined to remove northern goshawk (NGH) foraging habitat to levels below Forest Plan standard and guideline 8-20. The original proposed action was eliminated from detailed study.

Alternative 4 incorporated many of the same thinning-from-below treatments as the original proposed action; however, the alternative did not include the ponderosa pine and mixed conifer restoration and re-establishment. During consultation with USDI Fish and Wildlife Service, two road segments (44N80A and 44N62A) within northern spotted owl (NSO) critical habitat were identified as a concern. These two road segments were previously physically closed (barricaded) from use. Alternative 4 proposes to further reduce impacts to late-successional and other species habitat by removing (decommissioning) 44N80A and 44N62A from the Forest system.

Alternative 4 (modified proposed action) was developed to response to both issues 1 and 2 through lighter thinning treatments within NSO and NGH nesting and roosting areas, and treatment of the entire diseased and dying lodgepole pine stand in the western portion of the project area (section 2.2.3 of FEIS). This alternative would authorize approximately 3,850 acres of vegetation treatments across the 7,450-acre project area. Variable density thinning (commercial and non-commercial) is proposed for approximately 2,429 acres of white fir, ponderosa pine/mixed conifer, and red fir stands. These treatments include removing clumps of trees creating small openings to improve understory vegetation. Alternative 4 expanded treatments to improve forest health in lodgepole pine by proposing treatments on the entire stand of diseased and dying lodgepole pine trees. The lodgepole pine prescription will thin the overstory

lodgepole pine by removing trees infected with dwarf mistletoe and/or beetles. The existing understory will be thinned to promote the healthy trees. Due to the use of whole-tree yarding, machine piling outside of landing areas will be uncommon and will only be done in units with heavy accumulations of fuels (either natural or past treatment-generated) where hand piling would be cost prohibitive. Where possible, machine piling outside landing units will be from existing skid or off-trail access and will be limited to one pass. Fuel abatement includes pile burning and underburning on about 1,540 acres. Additionally, fuel management zones will be created along 13 miles (totaling approximately 480 acres) along Forest Roads 15 and 77. All applicable project design features will be implemented to mitigate adverse environmental impacts from this alternative to forest resources, address project objectives, and comply with the Forest Plan (section 2.2.5 of FEIS).

Alternative 3 was developed in response to significant issue #1 (section 1.8) through use of light thinning treatments throughout the project area to maintain higher tree densities (basal area) and canopy closure, and limits creating openings to areas with greater proportion of ponderosa pine to enhance NGH foraging habitat (section 2.2.2 of FEIS). This alternative would authorize approximately 3,568 acres of vegetation treatments. It differs from the alternative 4 by the following actions: use of a lighter level of thinning-from-below throughout the project area and limiting the creation of small openings to only areas with a greater proportion of ponderosa pine; approximately 335 fewer acres of thinning-from-below; approximately 300 fewer acres of lodgepole pine thinning and fuels reduction; no machine piling would occur outside landing areas; 0.7 miles of temporary road will be used, and no roads will be removed from the Forest system.

Under alternative 1 (no action) no actions would be implemented and the purpose and need of this project would not be met.

The modified proposed action map is located in appendix A, map 6. Larger scale, detailed maps are available on request.

Table S-1 compares all the alternatives and lists the fuels treatments associated with each silvicultural treatment.

The project is expected to be active over about the next 7 to 10 years, or from the time the decision is made to full implementation. See section 2.2.4 and appendix C for descriptions of treatments.

Table S-1 Comparison of alternatives

Silviculture Treatments[1] ***Fuels Treatments***	**Alternative 1 (No Action)**	**Alternative 3**	**Alternative 4**
Thinning-from-Below (Acres)	0	2,094	2,429
Overall Fuels Abatement[2] *(Acres)*		*2,094*	*2,429*
Mowing (Acres)		*254*	*346*
Underburning (Acres)		*789*	*1,495*
Post-Treatment Evaluation of Planting (Acres)		*0*	*644*
Lodgepole Pine Thinning/Fuels Reduction (Acres)	0	673	970
Overall Fuels Abatement[2] *(Acres)*		*673*	*970*
Mowing (Acres)		*428*	*728*
Plantation Thinning With Overall Fuels Abatement[2] (Acres)	0	99	99
Machine Piling Outside of Landing Sites (yes/no)	na	no	yes
Underburning Only (Acres)	0	426	42
Fuel Management Zones[3] (Miles/Approximate Acres)	0	13/480	13/480
(Acres Outside Other Treatments)		(300)	(300)
Total Project Area Acres Proposed For Treatment (Acres)	**0**	**3, 568**	**3, 847**
Transportation	**Alternative 1 (No Action)**	**Alternative 3**	**Alternative 4**
Construction of Temporary Roads (Miles)	0	0.7	1.3
Temporary Use of Non-System Roads (Miles)	0	1.6	1.9
Haul Use of Existing System Roads (Miles) Maintenance as Needed	0	39.2	41.2
Haul Use of Existing Non-System Roads (Miles) Maintenance as Needed	0	4.8	5.0
Road Closure of 44N80a and 44N62a (Miles)	0	0	1.5

[1] Some treatments overlap; e.g., thinning followed with fuels abatement and underburning, FMZs overlap with other treatments.

Major Conclusions

This project is intended to reduce the potential for damaging wildfire and maintain and restore older forest habitat. Direct, indirect, and cumulative effects are addressed for each resource area potentially affected by the project. Resource analysis resulted in the following conclusions (see chapter 3 of FEIS).

Alternative 1 (no action) alternative would lead to increased accumulation of ground fuels which could lead to increased high-intensity wildfires in the future.

The action alternatives address the purpose and need for this project and incorporate Forest Plan standards and guidelines to meet or move toward meeting the desired conditions identified in the Forest Plan and meet related laws and regulations.

Thinning in the action alternatives will reduce tree densities, decreasing stand susceptibility to bark beetle infestations. Tree and stand growth would be enhanced while improving long-term understory plant diversity (section 3.2.1 of FEIS).Thinning treatments, followed by fuels treatments (mowing, pile and underburning) will decrease the hazardous fuels within the project area. The potential for crown fire would decrease across about 40 percent of the project area under alternative 3, and decrease across about 50 percent of the project area under alternative 4. The potential for less damaging surface fire would be increased. The fuel management zones would create defensible space for firefighters, and reduce the potential for fire to burn into the late successional stands (section 3.2.2 of FEIS).

Variability in thinning treatments and project design features, such as no treatment clumps, will continue to provide for species cover needs while improving foraging opportunities for many species. The project is not likely to adversely affect any federally listed species or Region 5 sensitive species and complies with Forest Plan management direction. Management indicator species that prefer late-successional habitat would benefit the most from alternative 4, followed by alternative 3, then alternative 1 (section 3.2.3 of FEIS).

Alternatives 3 and 4 would cause short-term, low-intensity adverse effects to scenery in foreground views during project activities. Scenic character attribute changes would improve scenic stability under the action alternatives over the long term (section 3.4.3 of FEIS).

Under alternatives 3 and 4 temporary roads would be closed after use. Access to the project area for Forest visitors would be maintained on the open road system.. Alternative 4 includes closure of the approximate 1.5 miles of spur roads, 44N80A and 44N62A, and would not affect the overall access to the project area for Forest visitors (section 3.4.4 of FEIS).

Effects Related to the Significant Issues and Project Purpose and Need

Following is a brief summary of the effects as related to the significant issues and purpose and needs identified for the Hi-Grouse Project (section 2.6 of FEIS). Tables S-2 and S-3 summarize effects related to significant issue #1 and the purpose and need to improve and maintain habitat for species associated with late-successional forests.

Significant Issue #1: There is a concern that the proposed activities could remove the best remaining wildlife habitat for species associated with late-successional habitat within the project area, specifically removing and or altering habitat for northern spotted owl and northern goshawk (e.g., degrade or downgrade habitat).

> *Indicators:* Acres treated in nesting, roosting, and/or foraging habitats across the project area and basal area maintained within individual stands.
>
> Alternative 3 responds to this significant issue through use of less intensive thinning treatments throughout the project area that would maintain higher tree densities (basal area) and canopy closure.
>
> Alternative 4 responds to this significant issue through use of less intensive thinning treatments within northern spotted owl and northern goshawk nesting and roosting areas to maintain higher basal area and canopy closure. Thinning treatments outside nesting and roosting areas would further reduce basal area and canopy closure to improve overall long-term stand health.

Alternatives 3 and 4 avoid treatment in the higher quality NSO and NGH nesting and roosting habitat. Some low quality NSO nesting and roosting habitat would be treated with a light thinning that would essentially maintain the existing canopy cover and 180 square feet of basal area per acre. Also, some NSO nesting and roosting habitat in red fir would have hand thinning of understory trees followed by underburning.

In alternative 3 light thinning would maintain, but degrade, some NSO foraging habitat. In alternative 4 thinning in NSO foraging habitat would cause degradation or downgrading of NSO foraging habitat in white fir/ponderosa pine units with more intensive thinning treatments. These thinning treatments may reduce canopy cover slightly below 40 percent in the short term, but would also improve some aspects of foraging by allowing owls to maneuver better through stands that are currently very dense.

The determination for NSO under both alternatives 3 and 4 is: **may affect, but not likely to adversely affect NSO; and may affect, and not likely to adversely affect NSO Critical Habitat**.

Table S-2 displays the amounts of habitat by alternative for the NSO Activity Center KL-3201, the 0.5-mile core area, and the 1.3-mile home range area. See section 3.2.3 of FEIS for analysis discussion of NSO.

Table S-2. Effects of alternatives on NSO habitat within KL-3201 Activity Center

	Existing Acres Habitat		Acres Habitat Degraded		Acres of Habitat Downgraded		Acres of Habitat Removed		Post Treatment Acres Habitat	
Habitat	**0.5**	**1.3**	**0.5**	**1.3**	**0.5**	**1.3**	**0.5**	**1.3**	**0.5**	**1.3**
Alternative 1 (No Action)										
Nesting/ Roosting	297	223	0	0	0	0	0	0	297	223
Foraging	166	2,005	0	0	0	0	0	0	166	2,005
Dispersal	0	5	0	0	0	0	0	0	0	5
Alternative 3										
Nesting/ Roosting	297	223	2	74	0	0	0.5	0.5	297*	223*
Foraging	166	2,005	46	556	0	0	0.5	6	166*	1,999
Dispersal	0	5	0	0	0	0	0	0	0	5
Alternative 4 (Modified Proposed Action)										
Nesting/ Roosting	297	223	2	74	0	0	0.5	0.5	296.5	222.5
Foraging	166	2,005	46	416	0	0	0	129	166	1,876
Dispersal	0	5	0	0	0	0	0	0	0	5

* 0.5 acres of habitat removed from landing, rounding does not show change.

There are five NGH territories that may be affected by project activities. Table S-3 displays the amounts of habitat by alternative for the five NGH territories that overlap the project area. See section 3.2.3.4 of FEIS for full analysis discussion of NGH.

Alternative 3 would maintain the existing amount of nesting and foraging habitat available to NGH across the project area in the short term and would comply with Forest Plan S&G 8-20. Habitat quality in the treated stands would be reduced in the short term. Treatments proposed would reduce the incidence of insect and disease mortality, reduce crown fire potential by 40 percent, prevent rapid future fuel build-up for approximately 20 years, and allow the reintroduction of fire within the treated areas. Over the long term, many of the untreated densely spaced stands that are currently infected with root disease and pine and fir engraver beetles would be expected to decline to the point that they would no longer provide habitat for NGH.

Habitat quality of nesting and foraging habitat for NGH would be reduced in four of the five territories and across the project area in the short term and would comply with Forest Plan S&G 8-20. Treatments proposed would reduce the incidence of insect and disease mortality, reduce the wildfire potential by 50 percent, prevent rapid future fuel build-up for approximately 20 years, and would allow for management reintroduction of fire within the treated areas. By reducing the risk of a stand-replacement fire within the project area and within NGH territories, thinning, fuel treatment zones, and underburning treatments proposed under alternative 4 should benefit NGH over the long term.

The determination for both alternatives 3 and 4 is: **may impact individual goshawks but would not likely result in a trend toward listing or loss of viability**.

Table S-3. Summary of changes to goshawk foraging habitat by territory and alternative

Territory (Alternative)	Primary Nest Zone (PNZ)						Foraging Area (FA)			
	Foraging		Nesting		Non-Habitat		Nesting/Foraging		Non-Habitat	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Rainbow										
Alt 1 Existing	90	18	222	44	192	38	714	47	794	53
Alt 3 Post-treatment	90	18	222	44	192	38	714	47	795	53
Alt 4 Post-treatment	92	18	220	44	192	38	714	47	795	53
Red Cap										
Alt 1 Existing	193	38	184	36	127	25	612	40	896	60
Alt 3 Post-treatment	193	38	184	36	127	25	612	40	896	60
Alt 4 Post-treatment	193	38	184	36	127	25	612	40	896	60
Davis										
Alt 1 Existing	256	51	238	47	10	2	1,215	81	293	19
Alt 3 Post-treatment	256	51	238	47	10	2	1,215	81	344	23
Alt 4 Post-treatment	264	52	230	46	10	2	1,026	68	482	32
Hi Ridge										
Alt 1 Existing	324	64	114	23	65	13	1,265	84	242	16
Alt 3 Post-treatment	324	64	114	23	65	13	1,265	84	243	16
Alt 4 Post-treatment	324	64	114	23	65	13	1,231	82	277	18
West Grouse										
Alt 1 Existing	322	64	63	13	117	23	1,191	79	317	21
Alt 3 Post-treatment	322	64	63	13	117	23	1,191	79	317	21
Alt 4 Post-treatment	312	62	63	13	127	25	1,143	76	365	24

Significant Issue #2: There is disagreement about whether or not a sufficient amount of the lodgepole stand is treated to protect values at risk.

Indicators: Acres treated by treatment type.

Alternative 4 responds to this significant issue by treating the entire lodgepole stand to improve stand health and reduce fuel loadings.

Alternative 3 would treat approximately two-thirds (673 acres) of the of the beetle-killed lodgepole pine area on the west side of the Hi-Grouse Project Area. Alternative 4 would treat essentially all of the beetle-killed lodgepole pine area (984 acres). Treatments are designed to reduce fuel loadings from the mortality and promote a stand composition of healthy small trees that would be more resilient to the mountain pine beetle in the future.

Table S-4 summarizes the alternative effects related to purpose and needs of forest composition and structure, and fuels-related historic fire regime needs.

Table S-4. Summary of alternative effects related to forest composition and structure and fuels-related historic fire regime

Purpose and Need	Alternative 1	Alternative 3	Alternative 4
Promote restoration of historic forest composition and structure			
Decrease stand density over most of the project area	No change	3,568 acres	3,847 acres
Increase proportion of ponderosa pine, sugar pine, and white pine on suitable sites to mimic historical stand conditions	No change	No planting	Plant up to 644 acres PP/MC where needed
Release understory in lodgepole pine stands to increase stand diversity and remove dead and dying trees to reduce current and future fuels	No change	673 acres	970 acres
Increase stand diversity to enhance overall vegetative diversity	No change	Increases through thinning and lodgepole thinning	Increases through thinning, lodgepole thinning, planting pine, and small openings within thinning treatments
Maintain aesthetic values	No change	Yes	Yes
Identify appropriate monitoring	No change	Yes	Yes
Promote restoration of fuels-related historic fire regime			
Mimic natural processes through management actions to promote healthy ecological conditions and replicate the role of natural disturbances	No change	Thinning and use of prescribed burning	Thinning with openings, inter-planting PP/MC, and use of prescribed burning
Treat heavy fuel loadings to reduce the threat of stand-replacing wildfire, protect old forest habitat components in the project area, and provide for firefighter safety	No change	3,568 acres, including 13 miles FMZ	3,847 acres, including 13 miles FMZ

The FEIS is not a decision document; it discloses the environmental consequences of implementing action alternatives or no action at this time. Based upon the effect of the alternatives, the responsible official will decide on the following main points:

- Whether or not to implement the treatments as described.
- Whether or not to implement the treatment of activity fuels (created through vegetation management or natural fuels).
- Whether or not to construct temporary road spurs to implement the above actions.

In addition to deciding whether or not the above activities occur, the responsible official will also choose the degree to which (if at all) activities are implemented. The final decision will be based on the information in this document and the supplementary information contained in the project record, consideration of public comments, how well the selected alternative meets the purpose and need for the project, and whether the selected alternative complies with agency policy, applicable State and federal laws, and Forest Plan direction (section 3.9 of FEIS).

Alternative 4, the modified proposed action, has been identified as the preferred alternative for the Hi-Grouse Project.

Summary of Changes from the Draft Environmental Impact Statement

Based on comments received on the DEIS from the public and other agencies (see appendix B) clarification, additional information, or corrections were made for the FEIS. Changes made to the FEIS include the following:

- Updates to section 1.7 and appendix B to incorporate notice of availability and comments on the DEIS.
- Clarification of noxious weed monitoring in section 2.3 to incorporate the Klamath National Forest efforts in implementing the objectives from the Northern Province Strategy for monitoring areas for noxious weeds.
- Adding updated road density information into section 3.2.3.8 to incorporate the decision from the Klamath National Forest Motorized Travel Management, signed August 13, 2010.
- Correction of the no action effects information disclosed at 3.2.5.2 for noxious weed cumulative effects.
- Additional information from the Air Quality Report added to section 3.4.6 to clarify emission sources.
- Adding section 4.1.4 with list of agencies, organizations, and individuals sent the DEIS documents.
- Adding appendix E with a narrative listing of projects considered for cumulative effects.
- Correction of minor typos and citations.

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Abbreviations and Acronyms

Ac	acres
AMA	adaptive management area
AQMD	air quality management district
BA	biological assessment
BE	biological evaluation
BMP	best management practices
CA	California
CANSAC	California and Nevada Smoke and Air Consortium
CARB	California Air Resource Board
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
ch/hr	chains per hour
CO_2	carbon dioxide
CWD	coarse wood debris
CWE	cumulative watershed effects
dbh	diameter breast height
DEIS	draft environmental impact statement
EIS	environmental impact statement
ERC	energy release component
FACTS	Forest Service Activity Tracking System
FEIS	final environmental impact statement
FFE	Fire Fuels Extension to the Forest Vegetation Simulator model
FMZ	fuel management zone
FOFEM	First Order Fire Effects Model
FSVeg	Forest Service vegetation database
ft	feet
FVS	Forest Vegetation Simulator model
GHGs	green house gases
GIS	geographic information system
GS#	Grass-shrub fire model input (1 or 2)
GTR	general technical report
HUC	hydrologic unit code
ICEMP	Interior Columbia Basin Project
IPCC	Intergovernmental Panel on Climate Change
KNF	Klamath National Forest
LRMP	land and resource management plan (Forest Plan)
LSR	late-successional reserve
MA	management area
mi	miles
MLH	Medicine Lake Highlands
MOU	memorandum of understanding
NEPA	National Environmental Policy Act
NFS	National Forest System
NGH	northern goshawk

NMFA	National Forest Management Act
NMHC	non-methane hydrocarbons
NNIS	nonnative invasive species
NOI	notice of intent
NOx	nitrogen oxides
NSO	northern spotted owl
NSO-F	northern spotted owl foraging habitat
NSO-NR	northern spotted owl nesting and roosting habitat
OHV	off-highway vehicle
OR	Oregon
PILT	payment in lieu of taxes
PM#	particulate matter less than 2.5 microns or less than 10 microns
ppm	parts per million
PSW	Pacific Southwest
R5	Region 5 of the Forest Service (California)
ROS	recreation opportunity spectrum
S&G	standards and guidelines
SCAPCD	Siskiyou County Air Pollution Control District
SQAS	soil quality analysis standards
TL	timber litter fuel model
TOC	threshold of concern
TU#	timber understory fuel model input (1-8)
UMZ	upper management zone
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFWS	United States Fish & Wildlife Service
VOCs	volatile organic carbons
VQO	visual quality objectives

Chapter 1 Purpose of and Need for Action

1.1 Document Structure

The Forest Service has prepared this final environmental impact statement (FEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This FEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the alternatives. The document is organized as described below.

Chapter 1. Purpose and Need for Action. The chapter includes information on the project background, the purpose of and need for the project, and the Agency's general proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2. Alternatives. This chapter provides a more detailed description of the Agency's modified proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes project design features applicable to alternatives. This chapter also provides a comparison of environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences. This chapter describes the current condition of the project (affected environment) and environmental effects of implementing the action alternatives. This analysis is organized by resource area.

Chapter 4. Consultation and Coordination. This chapter provides a list of preparers and agencies consulted during the development of the FEIS.

References. This section lists the documents cited in the preparation of this FEIS.

Index. The index provides page numbers for selected items of interest.

Appendices. The appendices provide more detailed information to support the analyses presented in the FEIS.

Supporting documentation, including resource reports are incorporated by reference, and located in the project available at the Goosenest Ranger District office in Macdoel, California. Most specialist reports are located on the Klamath website for your convenience at: www.fs.usda.gov/klamath (this link will take you to at the Forest webpage. From menu on the left side of the webpage, click on "Land & Resources Management"; then click on "Projects"; scroll down webpage to Hi-Grouse.)

1.2 Background

The Klamath National Forest (the Forest or KNF) initially proposed to treat approximately 5,085 acres in Siskiyou County in northern California. The proposed action has since been modified to treat approximately 3,850 acres. Please see a Chapter 2 for a more detailed of the proposed action (section 2.4.1) and modified proposed action (section 2.2.3). The Hi-Grouse Project Area covers approximately 7,450 acres and is located in the southeast portion of the Goosenest Ranger District, approximately 15 miles southeast of Macdoel, California. The Four Corners snowmobile trailhead is located just north of the project area. The legal description for the

project area is all or portions of: Township (T) 44 North (N), Range (R) 2 East (E), sections 23, 25–28, 32–36; T43N, R2E, sections 1–4, 9–13; T44N, R3E, section 31; T43N, R3E, sections 6, 7, and 18; Mount Diablo Meridian, Siskiyou County, California (see map A-1, appendix A). *Note:* All acreage and mileage figures in this document are approximate.

Over the past 100 years, railroads, livestock grazing, fire suppression, and logging have influenced forest conditions throughout northeastern California, including the project area (USDA Forest Service 1996). Changes from historic forest species composition, stand density, and disturbance regimes are common throughout the Goosenest Ranger District as documented in the Goosenest Adaptive Management Area Ecosystem Analysis (Ritchie 2005). The project area also falls within the Medicine Lake Highlands Plan area, which addresses visual and cultural concerns (USDA Forest Service 2007a).

Early logging removed mostly large pines, and left white fir. The removal of pine seed sources, combined with livestock grazing and post-logging fires, created ideal conditions for germination of true firs, which then became established and grew during the relatively wet early half of the 20th century. Selective logging within true fir types leads to the introduction and spread of *Heterobasidion annosum* root disease (abbreviated as "*annosus*"), which is now a major factor negatively impacting stand health. Insect and disease-related mortality is occurring in true fir and ponderosa pine stands. Mature lodgepole pine stands are experiencing heavy stand-replacing mortality due to the mountain pine beetle and natural mortality due to age. The high beetle populations are now infesting ponderosa pine within the white fir-pine type.

Fire Regime Condition Class (FRCC) analysis, a vegetation model used to compare historic and current fire conditions, shows almost all of the project area has missed several fire cycles, a severe departure from the historic fire return intervals (USDA Forest Service 2006a). There are now more trees, more fuels on the ground, and more continuity between surface fuels and forest canopy. Mortality is more common in some tree species, which adds to fuel loading. Forests were once self-sustaining, having more extensive and frequent lower intensity understory fire, and a healthier forest composition and structure (Ritchie 2005). FRCC will be discussed in further detail in chapter 3, Fuels, section 3.2.1.

1.3 Management Direction

National Forest management is guided by various laws, regulations, and policies that provide the framework for all levels of planning. These include (but are not limited to): Klamath National Forest Land and Resource Management Plan (Forest Plan) of 1995, as amended (includes standards and guidelines from the Northwest Forest Plan) (USDA Forest Service 1995a); Goosenest Adaptive Management Area (AMA) (USDA Forest Service 1996); section 7(a)(1) of the Endangered Species Act; Clean Water Act; and Clean Air Act.

The Forest Plan provides guidance for managing national forest system lands. Guidance from the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (April 13, 1994) is incorporated in the Forest Plan. The actions proposed in this project are designed to be consistent with the Forest Plan, including all plan amendments currently in effect.

The Forest Plan provides two types of management direction, Forest-wide direction and management area (MA) direction. Forest-wide direction, which applies to all MAs, is located on pages 4-3–4-66. (*Note*: All page references in this document refer to the version of the Forest

Plan that includes all amendments as of August 15, 2007; this version can be found at: http://www.fs.fed.us/r5/klamath/projects/forestmanagement/forestplan/index.shtml.)

Table 1.3-1 lists the MAs and acres found within the project boundary and relevant goals by MA as described in the Forest Plan. There are no riparian reserves present in the project area (see map A-2, appendix A). The entire project area lies within the Goosenest AMA. MAs included within the project area include general forest, partial retention visual quality objective, special habitat late-successional reserve (LSR), and special interest areas.

Table 1.3-1. Management areas

Management Area (Acres)	Pages in Forest Plan	Goals Pertinent to This Proposal
General Forest–17 (4,653 acres)	4-177–4-180	Provide a programmed, non-declining flow of timber products, sustainable through time. Maintain conifer stocking levels and high-growth rates commensurate with the capability of the site to produce fiber. Intensively manage young regenerated stands to maximize growth potential. Maintain stand health, as well as resilience to wildland fire, insects, disease, and other damage.
Partial Retention Visual Quality–15 (2,574 acres)	4-126–4-127	Provide attractive, forested landscapes where management activities remain visually subordinate to the character of the landscape. Manage for a sustained yield of wood products in areas capable for timber production. Maintain stand health, as well as resilience to wildland fire, insect, disease, and other damage.
Special Habitat Late-Successional Reserve–5 (152 acres)	4-84–4-89	Protect and enhance conditions of late-successional and old-growth forest ecosystems which serve as habitat for late-successional and old-growth species including the NSO.
Special Interest Area–7; Little Glass Mountain (71 acres)	4-97–4-100	Manage for ecological processes and the unique features for which the area was designated. The obsidian flow is the significance in the Little Glass Mountain area.
Goosenest Adaptive Management Area (7,450 acres)		Development of ecosystem management approaches, including use of prescribed burning and other silvicultural techniques, for management of pine forests, including objectives related to forest health, production and maintenance of late-successional forest and riparian habitat, and commercial timber production (NWFP Standard & Guideline D-14).

1.3.1 *White Fir/Ponderosa Pine Community*

Desired Condition: Pine-dominated stands that would withstand endemic levels of insects and disease and would be resilient after wildfire. White fir would be a small component of the stands and would generally be found in moist pockets on north-facing slopes (USDA Forest Service 1995a, pages 4-133, 4-134; 1996, page 6-8, numbers 19 through 22).

Existing Condition: White fir has grown-in densely in stands once dominated by ponderosa pine (see map A-3, appendix A). Stands now dominated by white fir are too dense to support healthy ponderosa pine. Much of the ponderosa pines have been killed by active bark beetle infestations, and the remaining pine is highly susceptible to insect attack. The S-type of *annosus* root disease infested several of the stands, putting them at risk for further mortality from this

Existing white fir/pine stand condition

disease. Snags along travelways may create hazardous conditions and as dead trees fall they create heavy fuel loadings.

Need for Change: To provide for long-term forest health and long-lived species, white fir needs to be significantly reduced. Areas with extensive pine mortality may need to be planted with pine to achieve the desired condition. Fuel treatments, including whole-tree yarding, biomass removal, lopping and scattering, piling and burning, underburning, and creating fuel management zones (FMZs), are methods to reduce heavy fuel loadings. These methods are described in chapter 2.

1.3.2 *Mixed Conifer*

Desired Condition: Although not dominant, ponderosa pine would be a significant and sustainable component. These stands would have a diverse assortment of diameter and age classes, high structural diversity, and old growth characteristics. Northern spotted owl (NSO) and northern goshawk (NGH) would have ample habitat. Small openings would provide for understory vegetation. These stands would be able to withstand endemic levels of insects and disease. The threat of stand-replacing wildfires would be reduced and localized fuel conditions improved due to surrounding fuels treatments (USDA Forest Service 1995a, pages 4-133, 4-134; 1996, pages 6-8 to 6-9, numbers 20, 22, 25 and 27).

Existing Condition: Many of these stands are overstocked, with white fir competition having a negative impact on the growth and survival of high elevation ponderosa pine. Many stands are growing in such dense conditions that individual tree diameter growth has been slowed and stands are less able to withstand endemic levels of insects and disease. Trees are unable to develop large primary limbs and full crowns. These conditions have resulted in a loss of important habitat features for NSO and NGH. Fuel loadings are extremely high and more ground and ladder fuels are present where there is mortality within the white fir. These conditions have resulted in an increased fire hazard (see map A-3, appendix A).

Need for Change: Overall stand density needs to be reduced to sustainable levels to improve tree survival and growth and to decrease susceptibility to endemic levels of insect and disease.

Future NSO and NGH nesting and foraging habitat needs to be developed in younger stands. Small openings are needed in dense stands to promote understory vegetation. Culturing around trees is needed to create future habitat features such as large primary limbs and full crowns. To improve the survival and growth of existing ponderosa pine, white fir needs to be removed in and around pockets of ponderosa pine. Fuel treatments are needed to reduce heavy fuel loadings and associated fire hazard. These methods are described in detail in chapter 2.

1.3.3 *Lodgepole Pine*

Desired Condition: Young, resilient, and overall healthy trees are desired in lodgepole stands. Forest species diversity would be present within existing lodgepole stands, including white fir, ponderosa pine, and aspen trees. When wildfires occur, conditions would reduce risk to firefighters and increase the chance of containment (USDA Forest Service 1995a, pages 4-133, 4-134; 1996, pages 6-8 to 6-9, numbers 21, 22 and 26).

Existing lodgepole pine stand condition

Existing Condition: Lodgepole-dominated stands are dense and growth has stagnated. Mortality is increasing within these mature stands from disease and beetle attacks. The stands have reached their natural life span and are prone to continued morality and stand structure deterioration. These stands have heavy fuels near areas with valuable wildlife habitat. Mixed among some of the lodgepole are individual trees and pockets of ponderosa pine, white fir, and aspen (see map A-3, appendix A).

Need for Change: Dead and dying trees need to be removed to decrease fire hazard. Biomass entries may be necessary to reduce the residual densities. To promote the expansion of aspen in existing aspen stands, adjacent competing conifers need to be removed. Fuel treatments, including whole-tree yarding, biomass removal, lopping and scattering, piling and burning, underburning, and creating FMZs, are methods to reduce heavy fuel loadings. These methods are described in chapter 2.

1.4 Purpose and Need for Action

The interdisciplinary team compared the desired conditions described in the Forest Plan with the existing condition in the project area and identified several resource conditions that indicated needs for change in the project area. There are three main categories to the purpose and need for this project, each with several components; these are:

Improve and maintain habitat for species associated with late-successional forests.

- Maintain sustainable owl habitat elements in the Goosenest AMA and the LSR MAs by promoting resiliency to fire, insect, and disease on the landscape, and by culturing young trees to increase growth and crowns for future suitable habitat.

Promote restoration of historic forest composition and structure

- Decrease stand density over most of the project area to reduce disease and insects to endemic levels, and provide for resilient stocking levels of desired species.
- Increase the proportion of ponderosa pine, sugar pine, and white pine on suitable sites to mimic historical stand conditions.
- Release understory in lodgepole pine stands to increase stand diversity and remove dead and soon-to-be dead trees to reduce current and future fuel accumulations.
- Increase stand diversity to enhance overall vegetative diversity.
- Maintain aesthetic values, especially along sensitive routes and areas seen from high places.
- Identify appropriate monitoring (learning) objectives related to project activities in line with the Goosenest AMA.

Promote restoration of fuels-related historic fire regime

- Mimic natural processes through management actions to promote healthy ecological conditions and replicate the role of natural disturbances.
- Treat heavy fuel loadings to reduce the threat of stand-replacing wildfire, protect older forest habitat components in the project area, and provide for firefighter safety.

1.5 Proposed Action as Scoped

The Goosenest Ranger District of the KNF initially proposed to restore ponderosa pine and mixed conifers, thin, and use fuel reduction techniques on approximately 5,085 acres within the Goosenest AMA. The project was designed to address the purpose and need components and move towards the desired conditions while meeting plan standards and guidelines. This project involves altering stand density, structure, and species composition, and the abatement of fuels generated from proposed activities as well as treatment of pre-existing fuel accumulations. The following paragraph notes the treatment activities included in the initial proposed action. Many fuels treatments overlap within any given silvicultural treatment. For example, thinning may be followed by both fuels abatement and underburning; and FMZs may overlap other treatments.

The initial proposal scoped is summarized in table 1.5-1. Silvicultural treatments included thinning-from-below, ponderosa pine/mixed conifer restoration and re-establishment, and lodgepole pine thinning. The overall fuels abatement prescriptions included whole-tree yarding, biomass removal, lopping and scattering, piling and burning, underburning, and mowing. Less than 1 mile of new temporary road was proposed with the remaining access provided by existing roads. No new system roads were proposed. Monitoring to ensure proper project implementation was also planned (see map A-4, appendix A).

After scoping, it was discovered the proposed action as noted in the scoping document would not meet Forest Plan standards and guidelines for the NGH. The proposed action was modified as discussed in chapter 2 (see sections 2.2.3 and 2.4).

Table 1.5-1. Scoping proposed treatments

Silviculture Treatments[1] ***Fuels Treatments***	**Acres/Miles**
Thinning-from-Below (acres)	2,682
Overall Fuels Abatement[2] *(acres)*	*2,497*
Mowing (acres)	*309*
Underburning (acres)	*1,742*
Post-treatment Evaluation of Planting (acres)	*757*
Ponderosa Pine/Mixed Conifer Restoration and Re-establishment (acres)	1,375
Overall Fuels Abatement[2] *(acres)*	*1,375*
Mowing (acres)	*107*
Underburning (acres)	*939*
Post-treatment Evaluation of Planting (acres)	*1,188*
Lodgepole Pine Thinning/Fuels Reduction (acres)	683
Overall Fuels Abatement[2] *(acres)*	*683*
Mowing (acres)	*428*
Plantation Thinning (acres)	99
Overall Fuels Abatement[2]	*99*
Machine Piling (Outside Landing Areas) (Yes/No)	Yes
Underburning Only (acres)	42
Fuel Management Zones[3] Miles (area acres)	13(480)
Total Project Area Acres Proposed for Treatment	5,085
Transportation	
Construction of Temporary Roads (miles)	0.75
Temporary Use of Non-system Roads (miles)	3.0

[1] Some treatments overlap; e.g., thinning followed with fuels abatement and underburning, FMZs overlap with other treatments.

[2] Overall fuels abatement includes whole-tree yarding, pile and burning, lop and scatter, and biomass removal treatment options.

[3] Mileage is approximate; proposed FMZs would be along Forest System Roads 15, 77, 44N84, 44N77, 44N75, and 44N75D.

1.6 Decision Framework

The responsible official for this project is Patricia A. Grantham, Forest Supervisor for the Klamath National Forest. This EIS is not a decision document; it discloses the environmental consequences of implementing action alternatives or no action at this time.

Within the record of decision, the responsible official will determine whether to implement the modified proposed action, an alternative to the modified proposed action, or choose no action (Alternative 1) at this time. The final decision will be based on the information in this document and the supplementary information contained in the project record, consideration of public comments, how well the selected alternative meets the purpose and need for the project, and whether the selected alternative complies with agency policy, applicable state and federal laws, and Forest Plan direction.

1.7 Public Involvement

Public participation helps the Forest Service identify concerns with possible effects and alternatives to its proposals. Opportunities to provide comments regarding this proposed project were made available through the process outlined below.

- On July 5, 2006, during the very early development phase for the project, a representative from the Klamath Siskiyou Wildlands Center visited the site with Goosenest Ranger District employees.
- On July 24, 2007, letters were sent to representatives from two federally recognized tribes, the Pit River Tribe and the Klamath Tribe, resulting in a field trip on September 7 with members of both tribes. Additional Tribal Consultation meetings were held on January 23, 2009, with the Pit River Tribes at the Pit River Tribal Council Room in Burney, California; and on January 28, 2009, with the Klamath Tribes at the Goosenest Ranger District Office in Macdoel, California. Tribes expressed concerns regarding the need for vegetation management, access, and cultural plants; these were considered in the development of action alternatives.
- On August 9, 2007, a representative from the Klamath Siskiyou Wildlands Center visited the site with Goosenest Ranger District employees.
- The District consulted with USDI Fish and Wildlife Service and conferred with the California Department of Fish and Game regarding other species within the project area.
- On August 26, 2008, forest personnel met with representatives from the American Forest Resource Council, Sierra Pacific Industries, Siskiyou County, and the California Forestry Association to discuss forest monitoring and field review the Hi-Grouse Project Area.
- On December 11, 2008, scoping letters were sent to approximately 34 individuals, organizations, and other government agencies that have indicated interest in similar district projects. The complete mailing list can be found in the project record. The Goosenest Ranger District received six responses from the scoping letter. Responses were received from: K. Haines, R. Svilich, B. Sachau (responded also as "J. Public"), G. Sexton, R. Hoover, and T. Williams. The comments as well as responses were provided in the draft environmental impact statement (DEIS). The full letters are available in the project file.
- The notice of intent (NOI) to prepare an environmental impact statement was published in the *Federal Register* on December 19, 2008 (73 FR 77595). The NOI asked for public comment on the proposal within 30 days of the notice.
- As part of the public notification process, this project has been included on the forest schedule of proposed actions for the KNF beginning July 1, 2008, and continuing to the present.
- The notice of availability (NOA) was published in the *Federal Register* on May 28, 2010 (75 FR 30022). The NOA began the 45-day comment period of the Hi-Grouse Project DEIS. Also on May 28, 2010, a legal notice was published in the *Siskiyou Daily News*, the newspaper of record, announcing the opportunity to comment for the Hi-Grouse Project DEIS.

The Goosenest Ranger District received seven comments on the DEIS. Responses were received from: B. Sachau (J. Public), G. Sexton, R. Svilich, U.S. Department of the Interior, P. Clary, R. Hoover, and the U.S. Environmental Protection Agency. The comments, responses, and the full letters are provided in appendix B.

1.8 Issues

Issues were developed based upon public scoping on the proposed action for this project. Issues are points of discussion, dispute, or debate about the environmental effects of the proposed action. Issues were separated into two groups: significant and non-significant. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified 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; or (4) conjectural and not supported by scientific or factual evidence. Some comments pertained to disclosing effects; impacts to various resources are analyzed and disclosed in this document. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in section 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (section 1506.3)…". The full list of comments received and issues raised was provided in appendix B of the DEIS, table B-2, which also noted the non-significant issues raised and reasons regarding their categorization as non-significant.

The following two significant issues were identified for this project.

Significant Issue #1: There is a concern that the proposed activities could remove the best remaining wildlife habitat for species associated with late-successional habitat within the project area, specifically removing and or altering habitat for northern spotted owl and northern goshawk (e.g., degrade or downgrade habitat).

Indicators: Acres treated in nesting, roosting, and/or foraging habitats across the project area and basal area maintained within individual stands.

Alternative 3 responds to this significant issue through use of less intensive thinning treatments throughout the project area to maintain higher tree densities (basal area) and canopy closure.

Alternative 4 responds to this significant issue through use of less intensive thinning treatments within northern spotted owl and northern goshawk nesting and roosting areas to maintain higher basal area and canopy closure. Thinning treatments outside nesting and roosting areas would further reduce basal area and canopy closure to improve overall long-term stand health.

Significant Issue #2: There is a disagreement about whether or not a sufficient amount of the lodgepole stand is treated to protect values at risk.

Indicators: Acres treated by treatment type.

Alternative 4 responds to this significant issue by treating the entire lodgepole stand to improve stand health and reduce fuel loadings.

Chapter 2 Alternatives

2.1 Introduction

This chapter describes and compares the alternatives considered for the Hi-Grouse Project. It includes a description and map of each alternative considered and presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice by the decision maker and the public.

The amount of a particular activity (e.g., acres, miles) and the location depicted on the treatment maps for any alternative is approximate based on inventory and survey estimates. Actual figures may change slightly during preparation of a prescribed burn or stand treatment based on such things as: avoidance of site-specific areas that are too small to be depicted on the scale of maps used for display, small inclusions of inoperable terrain, or non-uniform stand structure.

Chapter 2 concludes with a comparison of the alternatives based upon proposed activities, issues, and objectives. This chapter, along with the chapter 3, "Affected Environment and Environmental Consequences," provides the basis for the responsible official and the public to compare alternatives.

2.2 Alternatives Considered in Detail

Following public scoping of the proposed action, two additional action alternatives were developed, resulting in four alternatives. These alternatives included the no action (alternative 1), the proposed action (alternative 2), and two additional alternatives created in response to significant issues. Alternative 2 (proposed action) was later dropped from further detailed study after it was determined this alternative would not comply with Forest Plan northern goshawk (NGH) standard and guideline (S&G) 8-20 (see section 2.4 for the discussion of alternatives considered but eliminated from detailed study). Alternatives 3 and 4 include project design features to mitigate impacts to forest resources (please see section 2.2.4 for more detail). Detailed maps of the action alternatives, including stands and roadsides identified for treatment, and logging systems information are in appendix A. A detailed breakdown of silviculture prescriptions and stand tables are provided in appendix C.

2.2.1 *Alternative 1 (No Action)*

Under the no action alternative, current management plans would continue to guide management of the project area. No forest health or fuels vegetation management would be implemented to accomplish project goals. The purpose and need would not be met.

The no action alternative is required (40 Code of Federal Regulations (CFR) 1502.14(d)) and serves as a baseline for comparison of the effects for all action alternatives.

2.2.2 *Alternative 3*

Alternative 3 was developed in response to significant issue #1 (section 1.8) through use of light thinning treatments throughout the project area to maintain higher tree densities (basal area) and canopy closure and limit created openings to areas with greater proportion of ponderosa pine to enhance NGH foraging habitat. Alternative 3 will treat approximately 3,568 acres. Thinning-from-below is proposed on 2,094 acres; in particular, thinning within late-successional habitats is

proposed on 180 acres (units 37, 41). This alternative maintains areas of untreated mid/late-successional habitat for wildlife. Small openings will only be created in stands with a greater proportion of pine to enhance NGH foraging habitat. There will be no machine piling outside of landing areas with this alternative. Use of underburn only (without silviculture treatment) is proposed on 426 acres.

Approximately 2.3 miles of temporary road will be needed to access thinning units, of which approximately 1.6 miles would be on non-system roads from previous harvest entries.

Table 2.2-1 summarizes alternative 3. See section 2.2.4 below for a brief description of the treatments, and appendix C for detailed prescription descriptions. Alternative 3 includes project design features and a monitoring plan, as described in section 2.2.5.

Table 2.2-1. Treatment acreage under alternative 3

Silviculture Treatments[1] ***Fuels Treatments***	**Acres/Miles**
Thinning-from-Below (acres)	2,094
Overall Fuels Abatement[2] *(acres)*	*2,094*
Mowing (acres)	*254*
Underburning (acres)	*789*
Lodgepole Pine Thinning/Fuels Reduction (acres)	673
Overall Fuels Abatement[2] *(acres)*	*673*
Mowing (acres)	*428*
Plantation Thinning (acres)	99
Overall Fuels Abatement[2] *(acres)*	*99*
Machine Piling (Outside Landing Areas) (Yes/No)	No
Underburning Only (acres)	426
Fuel Management Zones[3] (FMZ) [Miles (area acres)]	13(480)
Acres Outside Other Treatments (acres)	300
Total Project Area Acres Proposed for Treatment (acres)	3,568
Transportation	
Construction of Temporary Roads (miles)	0.7
Temporary Use of Non-system Roads (miles)	1.6

[1] Some treatments overlap; e.g., thinning followed with fuels abatement and underburning, FMZs overlap with other treatments.

[2] Overall fuels abatement includes whole-tree yarding, pile and burning, lop and scatter, and biomass removal treatment options.

[3] Mileage is approximate; proposed FMZs would be along Forest System Roads 15, 77, 44N84, 44N77, 44N75, and 44N75D.

2.2.3 *Alternative 4 (Modified Proposed Action)*

Alternative 4 is the modified proposed action. Proposed treatments were modified to meet Forest Plan S&G 8-20 and in response to significant issues #1 and #2 (section 1.8). Lighter thinning treatments are proposed within NSO and NGH nesting and roosting areas. Alternative 4 expanded treatments to improve forest health in lodgepole pine by proposing treatments on the entire stand of diseased and dying lodgepole pine trees. Treating the entire stand will remove dead and dying overstory trees infected with mistletoe to reduce potential inoculation of existing advanced regeneration in the stand. This alternative would treat approximately 3,847 acres.

When compared with alternative 3, alternative 4 treats areas outside of NSO and NGH nesting and roosting areas with more intensive thinning treatments, and treats the entire diseased and dying lodgepole pine stand in the western portion of the planning area.

Natural fuel loadings may be treated with machine piling outside landing areas only if absolutely needed because of extreme fuel loading (see map A-6, appendix A). Machine methods will involve piling of small trees, treatment slash, and natural fuels accumulations using a track-mounted, excavator-type of machine with a boom-mounted grapple arm; or a small machine (example, all-surface vehicle) with a brush-type (toothed) blade. Due to the use of whole-tree yarding, machine piling outside of landing areas will be uncommon and only in units with heavy accumulations of fuels (either natural or past treatment-generated) where hand piling would be cost prohibitive. Where possible, machine piling outside landing units will be from existing skid or off-trail access and will be limited to one pass.

Approximately 3.2 miles of temporary roads will be needed to access thinning units, of which approximately 1.9 miles are non-system roads from previous harvest entries. Approximately 1.3 miles of new temporary road will be located and constructed to design standards that minimize ground disturbance, protect resources, and provide safe transportation at the least possible cost.

During consultation with USDI Fish and Wildlife Service two road segments (44N80A and 44N62A) within northern spotted owl (NSO) critical habitat were identified as a concern. These two road segments were previously physically closed (barricaded) from use. These two National Forest System (NFS) road segments (approximately 1.5 miles) will be fully closed and removed from the NFS roads database.

Compared to alternative 3, approximately 325 more acres of thinning is proposed. The majority of thinning in alternative 4 would leave less basal area and include small openings to reduce canopy closure and basal area within stands more than under alternative 3. Thinning within late-successional habitats and/or NSO critical habitat incorporates a diameter limit and no trees over 20 inches diameter breast height (dbh) would be removed; these lighter thinning treatments are the same under both alternatives 3 and 4. The rest of the silviculture treatments are the same as alternative 3.

Table 2.2-2 summarizes alternative 4. See section 2.2.4 below for a brief description of the treatments, and appendix C for detailed prescription descriptions. Alternative 4 includes project design features and a monitoring plan, as described in section 2.2.5.

Table 2.2-2. Treatment acreage under alternative 4

Silviculture Treatments[1] ***Fuels Treatments***	**Acres/Miles**
Thinning-from-Below (acres)	2,429
Overall Fuels Abatement[2] *(acres)*	*2,429*
Mowing (acres)	*346*
Underburning (acres)	*1,495*
Post-treatment Evaluation of Planting (acres)	*644*
Lodgepole Pine Thinning/Fuels Reduction (acres)	970
Overall Fuels Abatement[2] *(acres)*	*970*
Mowing (acres)	*728*
Plantation Thinning *(acres)*	99
Overall Fuels Abatement[2] *(acres)*	*99*
Machine Piling (Outside Landing Areas) (Yes/No)	Yes
Underburning Only (acres)	42
Fuel Management Zones[3] Miles (area acres)	13 (480)
Acres Outside Other Treatments (acres)	300
Total Project Area Acres Proposed for Treatment (acres)	3,847
Transportation	
Construction of Temporary Roads (miles)	1.3
Temporary Use of Non-system Roads (miles)	1.9
Road Closure of 44N80A and 44N62A (miles)	1.5

[1] Some treatments overlap, e.g., thinning followed with fuels abatement and underburning, FMZs overlap with other treatments).

[2] Overall fuels abatement includes whole-tree yarding, pile and burning, lop and scatter, and biomass removal treatment options.

[3] Mileage is approximate, proposed FMZs are along NFS Roads 15, 77, 44N84, 44N77, 44N75, and 44N75D.

2.2.4 *Treatment Descriptions*

Harvest treatments will be implemented first, followed by the fuels treatments. Some fuels treatments will happen simultaneously with harvest (e.g., whole-tree yarding, lop and scatter limbs while cutting, and biomass treatments). The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

2.2.4.1 Thinning-from-Below

Thinning-from-below will remove trees that are smaller and shorter than the dominant and co-dominant trees that form the upper canopy. Thinning treatments are proposed on a total of 2,094 acres under alternative 3 and 2,429 acres under alternative 4. Stand density is reduced to allow trees with the best crown development and size to have the needed space. This additional growing space will increase tree growth so trees are less susceptible to fire, insects, and disease. Species composition can also be altered by favoring some species to be left over others. In this project, the objectives are to improve overall stand vigor, favor the largest fire-resistant trees and species, and reduce the potential for crown fire through removal of trees that act as fire "ladders" and that could sustain a crown fire. The percentage of ponderosa pine, sugar pine, and white pine would increase in the residual stand. Thinning intensity will vary; up to 10 percent of the area will be left un-thinned to maintain stand diversity.

Under alternative 3, no trees over 20 inches dbh will be cut. Following thinning treatments, an average of 130 square feet of basal area in ponderosa pine with 40 percent canopy closure, and

an average 180 square feet of basal area in white fir-ponderosa pine stands with 60 percent canopy closure will be left. See appendix C for detailed prescription descriptions.

Under alternative 4, thinning will be heavier in some areas to move the species composition towards ponderosa pine and create structural patchiness. Small openings, 0.25 to 1 acre in size that cover as much as 10 percent of a treated stand, will be created and left unplanted to increase forest structural and species diversity. Areas of heavier thinning around root disease centers will be evaluated post-treatment for under-planting with a site-specific and appropriate mix of ponderosa pine, sugar pine, and white pine (if available).

Under alternatives 3 and 4, in healthier white fir dominated foraging habitat for NSO and NGH, approximately 100 to 140 square feet of basal area and a canopy cover of approximately 40 percent will be retained. Exceptions are small pockets of pine that may be thinned heavier. About 10 percent will be left in small openings and 10 percent of the stands will remain untreated.

There will be fuel abatement treatments on all areas with planned thinning. Fuel abatement treatments will include whole-tree yarding, pile and burning, lop and scatter, and biomass removal options. Additional fuels treatments include mechanical mowing and underburning in stands that have larger amounts of fire-resistant species.

Cut conifer stumps will be treated with borax to prevent colonization and spread of the conifer root disease *Heterobasidion annosum.*

Thinning Within Late-Successional Habitats. Treatments within 180 acres (units 37 and 41) of late-successional habitat were designed to maintain the current characteristics of late-successional habitat in the project area. Residual density of approximately 180 square feet of basal area and approximately 60 percent canopy cover will be retained. Understory trees will be thinned to a variable spacing of 15 to 25 feet. No trees over 20 inches diameter breast height (dbh) will be cut. No openings will be created and 10 to 15 percent of the unit area will be left un-thinned.

Prescriptions proposed in NSO and NGH nesting, roosting, and foraging habitat will vary in the treatment of the understory when compared with other treatment areas. In NGH habitat, the above prescription will apply, except that thinning in the understory will focus mainly on leaving good replacement trees for the overstory trees in the event of tree mortality. Portions of late-successional stands are currently dominated by small trees (5 to 12 inches dbh) that will be thinned to a spacing of 15 to 40 feet between trees.

2.2.4.2 Lodgepole Pine Thinning/Fuels Reduction

Lodgepole pine thinning and fuels reduction is proposed on 673 acres under alternative 3 and 970 acres under alternative 4 of the large lodgepole pine stand located along Forest Road 15. The prescription will thin the overstory lodgepole pine by removing trees infected with dwarf mistletoe and/or beetles. The existing understory will be thinned to promote the healthy trees.

The objective of this prescription is to maintain a more open stand structure with mixed conifer species composition including white fir-red fir, ponderosa pine, and lodgepole pine. This structure and composition will have less fuel hazard and will be more resistant to future mountain pine beetle mortality. Fuels treatments across the area will include mechanical piling and mowing.

2.2.4.3 Plantation Thinning

Thinning of trees generally less than 12 inches dbh in old regeneration cutting units will be accomplished on 99 acres by mechanical or hand methods to promote tree growth, future fire resistance, and a mixed species composition. Since ponderosa pine is generally the most under-represented species in these plantations due to natural seeding of lodgepole and true firs, it will be favored to remain over other species during thinning activities.

Overall fuels abatement in plantations will be accomplished through whole-tree yarding, pile burning, lop and scatter, and biomass treatments.

2.2.4.4 Fuel Management Zones

Fuel management zones (FMZs) will be created along major road corridors and certain access roads for fire control. Treatments will consist of small tree thinning and/or removal, pruning, mastication of brush, and hand or machine piling and burning of fuels concentrations. Treatments will extend 150 feet either side of the road. Along FMZ Road 77, due to critical habitat designation and nesting/roosting NSO habitat, only trees less than 8 inches dbh will be removed and variably spaced except where openings exist. This will leave some areas clumpy for dispersal and habitat needs; some areas can be more open. Trees less than 10 inches dbh will be removed/spaced along the other FMZ roads in the project area. Some FMZs overlap stands with proposed silviculture treatments.

2.2.4.5 Fuel Abatement Activities

Overall fuel abatement activities are proposed on approximately 3,570 acres under alternative 3 and 3,840 acres under alternative 4 within the project area. Activities proposed include whole-tree yarding, biomass removal, piling and burning, and lopping and scattering.

Whole-tree yarding ~ To reduce fuels levels resulting from operations, whole trees will be moved to the landing for treatment (sold as products or burned).

Biomass removal ~ Trees (generally less than 12 to 10 inch dbh) will be removed in thinning operations to reduce the potential of crown fire, improve species composition, and reduce competition. Small-diameter tree boles may be processed into bundles and removed.

Piling and burning ~ Machine piling will be limited to landing areas for processing of material such as biomass under alternative 3, and may be used on up to 25 percent of prescribed areas, as needed, under alternative 4. Piles will only be burned under favorable weather conditions.

Lopping and scattering ~ Lopping and scattering will reduce treatment-generated slash from the thinning of plantations. The objective is to reduce height and continuity of fuels and promote faster decomposition. Due to whole tree removal, this method may not be needed. An exception may be areas that are either inaccessible or unsafe for mechanized equipment.

Mowing ~ Shrubs, seedlings, and saplings will be mowed to change the fuel arrangement. Lodgepole stands that are now dominated by small trees will also be mowed.

Underburning ~ Prescribed fire will be used in varying intensities either as a stand-alone treatment, or following mechanical pre-treatment, such as thinning, piling ladder fuels, or mowing. Pre-treatment will ensure that the residual stand is protected. Prescribed fire will be used under controlled situations and favorable weather conditions. The objectives of

underburning are to reduce natural fuel loads, surface and ladder fuels, and past activity slash, while increasing herbaceous species and encouraging pine regeneration. Due to feasibility considerations, prescribed underburning treatments will not take place all at once, but incrementally throughout the life of the project. Detailed burn plans are prepared for all prescribed fire activities.

2.2.4.6 Road Maintenance and Temporary Roads

Road Maintenance. Road maintenance actions are in accordance with the Forest Plan. These actions are not analyzed with this FEIS, but are included for informational purposes only. The Hi-Grouse Project Area is accessed by a network of approximately 50 miles of county and national forest system (NFS) roads. No new permanent roads will be constructed or added to the system. Primary NFS roads that serve the project area are: 15, 77, 44N80, 44N62, and 44N54. Existing NFS roads within the project area received periodic clearing, blading, and drainage structure maintenance in the 2007 and 2008 seasons, bringing them up to a condition suitable for project activities. Roads needed for the project will be reassessed prior to and during activities to determine if additional light maintenance is needed. These roads will not require any reconstruction prior to use. Maintenance is defined as work needed to bring the road back into its original condition; could include brushing, culvert replacement, grading, and rocking. Reopening of roads applies to the unclassified roads. Road reopening activities include barrier removal, brushing, grading, and temporary culvert installation. All aggregate rock and water source requirements for this project can be met from existing sources on national forest lands. No new sources will be developed.

Temporary Roads. Under alternatives 3 and 4, approximately 2.3 miles or 3.2 miles, respectively, of temporary roads will be needed to access thinning units. Most of the temporary roads (1.6 miles under alternative 3 or 3.2 miles under alternative 4) are existing non-system (not on the Forest road system) jeep roads or spurs, which were created during previous harvest entries. Road reconstruction, as defined by Forest Service Manual 7700, is not proposed.

Under alternatives 3 and 4, approximately 0.7 mile or 1.3 miles, respectively, of new temporary road will be located and constructed to design standards that minimize ground disturbance, protect resources, and provide safe transportation at the least possible cost.

All temporary roads, including those existing from previous entries, will be closed upon project completion. Road closure will include all or a combination of the following activities: (1) placing earth or log mound barriers to prevent vehicle traffic, (2) subsoiling and outsloping the road surface, (3) installing water bars and other drainage structures, and (4) mulching with native materials (logging slash) or certified weed-free straw.

2.2.5 *Project Design Features*

The following project design features were developed to mitigate adverse environmental impacts of the proposed actions to forest resources. These project design features were developed to address overall project objectives and ensure Forest Plan compliance. Table 2.2-3 displays the design features developed for this project, along with the applicable units and/or alternatives.

Table 2.2-3. Project design features for alternatives 3 and 4

Design Feature	Description	Applicable Unit/Alternative
AIR-1	A wetting agent (water or other dust-reduction material) will be applied as needed to decrease or eliminate dust generated from timber hauling on dirt roads to provide for air quality and public safety. If water is unavailable, other means of dust abatement may be necessary. This may include, but is not limited to, rocking, applying cinders, or hauling during winter months on snow-covered roads. Temporally closing public access to interior roads during short-term hauling activities may occur, but main haul routes should stay open to the public.	Where needed, all alternatives
AIR-2	Prescribed burning will be conducted in accordance with an approved burn plan and an approved smoke management plan. Pre-treatment methods will be used to minimize smoke emissions and/or reduce fuel loadings, such as biomass removal, and public firewood utilization opportunities. Burning when piles are dry increases the combustion efficiency and therefore reduces the emissions from the burn. The burn prescription shall specify an acceptable range of fuel moisture contents for the burn to proceed. These plans will address mitigations and requirements to minimize impacts of smoke. A smoke permit will be issued by the Siskiyou County Air Pollution Control District.	All burn units/all alternatives
ARCH-1	All proposed activities, facilities, improvements, and disturbances shall avoid archaeological and historic sites. Avoidance means that no activities associated with the project that may affect an archaeological or historic site shall take place within the site's boundaries, including any defined buffer zones. Examples of such activities include, but are not limited to, felling, skidding, mowing, and burning.	All units/alternatives
ARCH-2	All cultural resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect cultural resource sties. This includes, but is not limited to, flagging site boundaries.	All units/alternatives
ARCH-3	When any changes in proposed activities are necessary to avoid cultural resource sites (e.g., project modifications), these changes shall be completed prior to issuance of the decision.	All units/alternatives
ARCH-4	The sites within the project area will not be affected by road use as long as the roads are used "as-is". Should through-site road maintenance become necessary, the following provisions will apply per the First Amended Regional Programmatic Agreement Among the USDA Forest Service, Pacific Southwest Region California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding the Process For Compliance With Section 106 of the National Historic Preservation Act for Undertakings on the National Forests of the Pacific Southwest Region: ▪ Routine road maintenance (e.g., blading and brushing) and resurfacing is allowed where work is confined to previously maintained surfaces (other than native surfaces), ditches, culverts, and other clearly disturbed contexts. ▪ Where road surfaces are native, blades must be lifted or placement of non-archaeological material (e.g., padding or filter cloth) must be placed over the archaeological deposit to prevent surface and subsurface impacts. ▪ Ground-disturbing road-decommissioning activities are not allowed within the boundaries of archaeological sites.	All units/alternatives
BOT-1	Currently, TES plants are not known from areas proposed for treatments. If any are located prior to or during implementation they will be flagged for avoidance. Appropriate buffers to maintain light regime, or to protect plants from local soil movement or heating during prescribed fire will be maintained.	All alternatives where identified during implementation; there are no known sites
GEO-1	New lava tube or fault caves discovered during unit layout and tree marking will be identified and protected by the 50-foot, mechanical-equipment-exclusion-buffer, but may require wider buffers that will be designated by the district cave coordinator or biologist.	All units/alternatives
GEO-2	Newly discovered cave locations will not be identified in the EIS, implementation, or sale area map, and confidentiality will be maintained in a manner similar to that used for archaeological sites.	All units/alternatives

Design Feature	Description	Applicable Unit/Alternative
GEO-3	If caves are discovered, prescribed fire will be allowed to back into cave entrance buffers and fault zones, unless otherwise specified by the district cave coordinator or biologist for certain caves. Ignition of fuels within entrance buffers and fault zones is not appropriate, unless such action is needed to prevent unacceptable damage to vegetation and organic materials within or immediately adjacent to a cave entrance. Burning of packrat middens or other accumulations of flammable material within caves or entrance buffers will be avoided. Fire will be excluded from the entrance buffers for caves discovered with sensitive bat habitat.	All units/alternatives
GEO-4	Equipment will be excluded from any discovered cave entrance buffers and outcrops and talus within fault zones. This can be accomplished by either flagging the exclusion zones around cave entrances, or designating and flagging the equipment road locations after the trees are marked. Crossings of fault zones will be allowed, but will be designated or approved in the field by the district cave coordinator or designated representative. Crossings will be where the fault trace is not exposed on the surface.	All units/alternatives
GEO-5	Fault zones will have no-disturbance buffers which coincide with the rock outcrops and talus deposits within the fault zone. Since outcrops and talus are easily recognizable, they will not be flagged on the ground unless required by unique circumstances. There will be no tree removal from the outcrop and talus areas. Equipment operators will typically avoid the talus and outcrops found in fault zones.	All units/alternatives
GEO-6	Cave entrance buffers will either be flagged in the field prior to implementation or other similarly effective measures taken to prevent disturbances there. Subtle cave entrances that are difficult to spot on the ground, such as those which are flush with the soil surface, will have the buffers flagged.	All units/alternatives
GEO-7	Any discovered lava-tube caves, associated sink holes, or fault caves will be protected by a minimum 50-foot no-disturbance-buffer around the entrance. Some caves may require wider buffers and if so, will be designated by the district cave coordinator or biologist.	All units/alternatives
GEO-8	Several fault zones, rock outcrops, and talus deposits were identified in the project area, and caves may be present (cave locations are protected from disclosure to the public by the Federal Cave Resources Protection Act of 1988).	All units/alternatives
NNIS-1	Ensure equipment coming to and from the project is weed free.	All units/alternatives
NNIS-2	Do not park vehicles or stage equipment in areas with known weed populations, including parking in infested areas outside of the project area.	All units/alternatives
NNIS-3	Wherever seed, straw mulch, or gravel are used to restore or maintain areas within the project area, certified weed-free seeds, straw, mulches, and/or gravel should be specified in any contract.	All units/alternatives
REC-1	During winter operations, use alternative hauling routes away from the NFS 15 and 77 roads or leave an unplowed lane about 8 feet wide so that groomed snowmobile access to Medicine Lake is maintained.	Forest Roads 15 and 77, all alternatives
REC-2	Protect dispersed campsites within the project area to maintain the integrity of these sites. Do not use or dispersed campsites for landings, burn piles, or contractor campsites or parking areas.	All units/alternatives
REC-3	Remove all identified live or dead hazard trees within or in close proximity to dispersed campsites and along high-use recreation access roads.	All units/alternatives
REC-4	Physical improvements, such as a water pond in the northern section of the project area, would be protected from damage from project treatments.	All units/alternatives
RDS-1	Provide safety signing or temporary road closures in active project areas to provide for public safety.	Temporary roads/all alternatives
RDS-2	To make road closures more effective, no trees other than hazard trees will be removed within 50 feet of the entry for a non-system road, where it intersects a system road. Exceptions may be possible based upon site-specific concerns and equipment needs.	Temporary roads/all alternatives
RDS-3	All non-system roads used for entry will be closed immediately following operations. When multiple entries are necessary for project completion, roads used by contractors will be closed in between each entry. Road closure will	Temporary roads/all alternatives

Design Feature	Description	Applicable Unit/Alternative
	include all or a combination of the following activities: (1) placing earth or log mound barriers to prevent vehicle traffic; (2) subsoiling and outsloping the road surface; (3) installing water bars and other drainage structures; and (4) mulching with native materials (logging slash) or certified weed-free straw.	
SAF-1	Hazardous trees or snags may be cut, if necessary, for safety.	All units/alternatives
SAF-2	Signs will be placed on roads to identify areas as active sale or prescribed burn areas.	Where needed, all alternatives
SAF-3	If necessary, dust abatement will be done (see also AIR-1).	Where needed, all alternatives
VEG-1	Where found within units, patches of late-successional forest consisting of predominant trees, high canopy cover, and/or snags and down logs will be retained.	All units/alternatives
VEG-2	No-treatment clumps will be left in all treatments to increase structural diversity and retain elements of biodiversity such as snags, logs, and predominant trees in a clumped distribution. The amount will vary by prescription from up to 10 or 15 percent, with higher amounts being left in the heavier treatments where suitable habitat is available. Due to the nature of the FMZs, no-treatment clumps will be minimized and designed to meet specific elements of adjacent habitat. Emphasis will be placed on leaving clumps that provide the most diversity within the unit, as well as habitat elements for other species.	All units/alternatives
VEG-3	Predominant trees of all species will be retained in all treatments. In rare instances it may be necessary to cut them for safety of workers or for equipment access, but this will require approval of the Forest Service contract administrator. Predominant trees have the following characteristics: generally taller and older than the general canopy, more deeply furrowed bark with plate formation (especially ponderosa pine), large limbs, and often patchy crowns with flat tops. In ponderosa pine the bark is orange to yellow and composed of many puzzle-like pieces in older trees. As trees age the bark plates become much wider than the fissures separating them. In white fir the bark plates appear more vertical and depth of fissures can be equal to the width of the plates. Diameter is often poorly correlated with age, but most trees with these characteristics are 24 inches dbh and larger.	All units/alternatives
VEG-4	In all treatments the largest ponderosa pine and white fir would be left. In heavy thinning prescriptions involving removal of substantial amounts of true fir, the following elements would be retained: essentially all ponderosa pine/sugar pine/white pine, pre-dominant trees, widely spaced true fir, and no-treatment clumps.	All units/alternatives
VEG-6	Lava flows will be excluded from units to the extent possible during layout. No trees will be marked for cutting on inclusions of lava flow outcrops within units, unless deemed a safety hazard by the contract administrator.	All units/alternatives
VEG-7	Machine piling of hazardous fuels outside of landing areas will be used in alternative 4 where reductions of heavy fuel loadings in excess of down log objectives are necessary for effective fire suppression and/or underburning. This will apply in units with heavy accumulations of either natural or past treatment-generated fuels where hand piling will be cost prohibitive. It is anticipated that machine piling may be needed on up to 25 percent of the area of units where it is prescribed. Units will be evaluated post-thinning to determine the need for this treatment. Piles will be burned under appropriate meteorological conditions for smoke dispersal.	Alternative 4
VEG-8	Whole-tree yarding will be the primary method for minimizing thinning-generated slash. Trees will be limbed and topped at landings for disposal by chipping or burning methods. Piles will be burned under appropriate weather conditions for smoke dispersal.	All units/alternatives
VEG-10	Prescribed burning treatments would be implemented to provide a mosaic[1] of understory vegetation, except where treatments are immediately adjacent to private property. Forty percent of underburn treatment areas will remain untreated to provide wildlife habitat.	All units/alternatives
VIS-1	Within 300 feet from roadways, skid patterns, slash, soil exposure, and stumps should be visually minor or unnoticed (6” maximum height of stumps, possible	Units within 300 feet from roadways in

Design Feature	Description	Applicable Unit/Alternative
	follow-up stump or soil disturbance concealment with hand raking of dirt and duff as needed).	the partial retention foreground visual quality objectives (VQO)/all alternatives
VIS-2	Road closures along the 15/77 Roads should appear natural and not attract attention, preferably through native boulders and logs and landforms, rather than dirt piles, trenches, signs, or gates.	
VIS-3	To the extent possible, the following approximate proportions of the view will remain after treatments: thinned canopy 90 to 95 percent, un-thinned canopy 5 to 10 percent, untreated brush/seedling/saplings 15 to 25 percent, hand-piled slash removal 75 percent, tractor-piled 15 percent, mowed areas 35 percent maximum, underburn areas 35 to 60 percent.	
VIS-4	To the extent possible FMZs should be undulating, consisting of thinned canopy retaining irregular spacing along the roads immediate foreground not to exceed 100 feet, then sweeping away from the road to retain stretches of un-thinned canopy along the road to create a diverse and natural-appearing forest edge. Where possible, FMZs treatments may have feathered edges to blend the treatment of the canopy into the surrounding vegetation.	
VIS-5	Foreground clearings (in natural appearing configurations with less than 2 acres visible to viewpoints) should not be used frequently, but can be used in specific circumstances to treat insect or disease infestations, or to open views to scenic attributes such as rock formations, large ponderosa pine or larch components, or views to distant mountain peaks.	
VIS-6	Screen temporary roads and landings from the sensitive offset observer position until complete visual recovery is attained. This may be offset due to FMZs or other treatment needs.	Units within the partial retention VQO in middle to background/all alternatives
VIS-7	To prevent public use of closed roads, screen landings from sensitive level 1 roads. Retain existing road screening vegetation as viewed from sensitive offsite observer positions.	
VIS-8	During any one entry, limit the amount of ground surface viewed to 10 percent or less of the area as viewed from selected offsite observer positions.	
VIS-9	Limit naturally shaped openings to be a maximum of 5 to 10 acres in size with blended edges. The openings should not exceed 20 percent of the area. The openings should not be located in such a manner that creates unnatural appearing patterns as a whole.	
VIS-10	Retain species of diverse fall color, such as any deciduous tree species.	Units within the modification VQO/all alternatives (units within the modification VQO are viewed from middleground to background distances)
VIS-11	Use existing skid roads and landing to the extent possible. To the extent possible, new temporary roads and landings will be located out of view of sensitive travel routes, or shall be promptly rehabilitated. New temporary roads and landings may be evident, but must remain subordinate to the shape and pattern of harvest units.	
VIS-12	Currently the visual absorption capability is expected to be moderate allowing for naturally shaped openings to be a maximum of 10 to 15 acres in size with blended edges. The openings should not exceed 40 percent of the area. The openings should be located in such a manner to create natural appearing patterns as a whole.	
WL-1	In the fuel management zone along Road 77 within NSO nesting, roosting, and foraging habitat, and critical habitat, only trees less than 8 inches dbh will be removed. Thinning will be variably spaced except in existing openings. In some areas, leave trees clumpy while other areas can be more open. *Purpose*: To prevent the loss of NSO nesting, roosting, and foraging habitat in the fuel management zone and critical habitat, reduce habitat fragmentation, and provide screening and travel corridors for wildlife.	Units 29, 30, and 41 in FMZ along Road 77
WL-2	NSO surveys to protocol will be conducted during the life of the project. Should NSO be detected within the project area or within 1.3 miles of a treatment unit outside the project area, the district biologist will contact USDI Fish and Wildlife Service. *Purpose*: To ensure detection and protection of any NSOs utilizing habitat affected by the project.	All units/alternatives
WL-3	A seasonal restriction between February 1 and September 15 will apply to all	Units 1, 2, 3, 4, 12A,

Design Feature	Description	Applicable Unit/Alternative
	activities within 0.25 miles of un-surveyed suitable NSO habitat. *Purpose*: To ensure protection of any NSOs utilizing previously un-surveyed habitat. (This measure is in place since not all habitat areas were previously surveyed to protocol.)	13, 37, and 53A
WL-4	Maintain habitat specific for goshawk consistent with the KNF LRMP, page 4-29. *Purpose*: To maintain goshawk habitat and use in the project area	Units 1, 2, 5, 6, 7, 9, 10, 11, 12a, 12b, 13, 17, 18, 19, 21a, 21b, 22, 23, 24, 25b, 28, 29, 30, 32, 35b, 37, 41, 44, 45a, 46, 48, 52, 53a, 53b, 55, 58, 59; (that occur within goshawk territories, primary nest zone, and foraging areas); all alternatives
WL-5	Restrict habitat-modifying activities between March 1 and August 31 within the primary nest zone (0.5-mile radius), unless surveys confirm goshawks are not nesting or within the area (KNF LRMP, page 4-29). *Purpose*: To eliminate disturbance to goshawks during the nesting season.	Units 9, 10, 12a, 13, 17, 19, 23, 24, 25b, 29, 30, 45a, 53b, 55, 58, 59 (within 0.5 miles of an active goshawk nest); all alternatives
WL-6	Restrict loud and/or continuous noise within 0.25 mile of active goshawk nest sites between March 1 and August 31 (KNF LRMP, page 4-29). *Purpose*: To eliminate disturbance to nesting goshawks.	All units (including FMZ) within 0.25 miles of an active goshawk nest; all alternatives
WL-7	If an active goshawk nest is discovered within a stand prior to or during treatment activities, work will be halted and the wildlife biologist notified immediately to determine steps to resolve the situation. *Purpose*: To maintain goshawk habitat and eliminate disturbance to goshawks during the nesting season.	All units/alternatives
WL-8	Maintain 5 to 20 pieces (depending upon forest type) of large down woody debris of at least 20 inches in diameter (minimum greater than12 inches dbh) and about 40 cubic feet in volume in decay classes 3, 4, and 5. Snags felled for safety reasons will be retained onsite to provide coarse woody debris, consistent with fuels objectives (KNF LRMP, pages 4-23 and 4-24). *Purpose*: To meet the habitat needs of prey species of raptors and marten as well as denning habitat for various wildlife species.	All units/alternatives
WL-9	Retain at a minimum five snags per acre of standing dead or dying trees (preferably in clumps) greater than or equal to 20 inches dbh in a variety of decay classes at locations greater than 75 feet from roads. If the representative overstory trees are greater than 20 inches dbh, retain the largest size classes available in the stand (KNF LRMP, page 4-30). *Purpose*: To provide adequate habitat for snag-dependent wildlife species.	All units/alternatives
WL-10	Design units, silvicultural prescriptions, and burn plans to ensure snags and large down woody debris are retained on the landscape over time. Protect, to the greatest extent possible, snags and large down woody debris from destruction during treatments (i.e., yarding, machine piling, and crushing by equipment, etc.; reduce fuel accumulations around snags and down logs during prescribed fire, etc.) *Purpose*: To maintain snags and large down wood during and following project implementation.	All units/all alternatives
WL-11	Roads proposed for closure will be ripped and seeded or planted with appropriate native, non-invasive grasses and/or shrubs. *Purpose*: To provide foraging opportunities for ungulates and other wildlife species.	Roads 44N80A and 44N62A in alternative 4
WL-12	District biologist will designate up to 10 to 15 percent of each unit area to be left untreated.	All units/all alternatives

Design Feature	Description	Applicable Unit/Alternative
	Purpose: To provide additional diversity of habitat for wildlife species.	
WL-13	Large-diameter snags (greater than 20 inches dbh) that are felled for safety reasons will be left onsite for use by wildlife. *Purpose*: To provide large down woody debris for down woody-dependent wildlife species.	All units/all alternatives
WS-1	Best management practices (BMPs) will be implemented during all project activities (see appendix D for applicable BMPs).	All units/alternatives
WS-2	If needed, water drafting sites for dust abatement on roads will occur at designated sites for that purpose. Portable pumps used for drafting will incorporate a mesh screened intake not to exceed 3/16 inch diameter and be placed on an oil-absorbing mat. During water drafting operations, stream flows will not be reduced by more than 10 percent at any time. All equipment operating on the project will be maintained in good repair and free of abnormal leakage of lubricants.	All units/alternatives
WS-3	Erosion control measures will be employed on the access and/or main road to prevent water leakage from causing stream sedimentation as needed.	All units/alternatives
WS-4	Reuse existing skid trails and landings whenever practical. Dedicate no more than 15 percent of a harvest unit to primary tractor skid trails and landings by good yarding layout and administration.	All units/alternatives
WS-5	Skidding should cease on skid trails when more than 10 percent of a skid trial contains ruts deeper than 6 inches due to saturated soils.	All units/alternatives
WS-6	Main skid trails in randomly selected units will be monitored post-project for compaction to determine the potential need for subsoiling.	All alternatives
WS-7	Waterbar skid trails per Sale Administration Handbook guidelines and as needed.	All units/alternatives
WS-8	Spread fine slash on that portion of skid trails that might exceed 35 percent slope as needed.	All units/alternatives
WS-9	Ground-based logging equipment is generally restricted to slopes greater than 35 percent.	All units/alternatives
WS-10	Retain existing coarse woody debris whenever possible, providing the amount of logs to meet fuel management objectives.	All units/alternatives
WS-11	Meet the prescribed soil cover for each harvest unit as measured before the fall rainy season (late October/early November). Post-treatment total soil cover should range from 70 to 80 percent for machine disturbed areas and 60 to 80 percent for underburned areas depending on slope steepness.	All units/alternatives
WS-12	Areas where existing soil cover is less than recommended levels, use the existing amount of cover as the guideline.	All units/alternatives
WS-13	Machine piling will use a brush rake that will generally be lifted a few inches above the soil surface to minimize soil disturbance, protect duff mat, and prevent piling soil into the slash piles. Organic materials less than 3 inches in diameter will be left on the soil surface.	Landing areas alternative 3; prescribed units/alternative 4 (see appendix C for stand listing)
WS-14	Machine piling will be done when the soil is dry down to 12 inches.	Landing areas alternative 3; prescribed units/alternative 4 (see appendix C for stand listing)
WS-15	Machine mowing of brush is limited to slopes generally greater than 35 percent.	All units/alternatives
WS-16	At least 50 percent cover, as fine organic matter (less than 3-inch material) will be retained in all units.	All units/alternatives
WS-17	Roads used for this project will be graded to outslope where feasible.	All units/alternatives

Design Feature	Description	Applicable Unit/Alternative
WS-18	Roads will be cleared and graded as necessary, using minimum disturbance methods and minimum clearing widths, to allow log truck and equipment access.	All units/alternatives

[1] Mosaic is defined as the intermingling of plant communities and their successional stages in such a manner to give the impression of an interwoven design (National Wildfire Coordinating Group 2005). This could be achieved with a variety of burn intensities or lighting/burning patterns.

2.3 Monitoring

The monitoring described below is applicable to all action alternatives.

Upon completion of project activities, monitoring may be conducted to assess the positive or negative effects of fuels treatments. Monitoring would be completed by the Forest and/or interested stakeholders (multi-party monitoring) and would be subject to available funding and the ability of stakeholders to contribute funds or in-kind services. The immediate (1–3 years post-project) and long-term effects on landscape attributes may be monitored using a fire effects monitoring and inventory system (e.g., FIREMON). Monitoring may be used to (1) document basic information during different phases of the project, (2) establish changes in attributes and trends through time, (3) analyze short- and long-term fire effects, and (4) determine if project objectives related to fuels were met. Monitoring would be conducted according to the KNF Fuels and Fire Effects Monitoring Guide (USDA Forest Service 2007b). Project data would be collected and input into the monitoring database at intervals established by the project monitoring plan.

Forest Plan monitoring efforts, including monitoring of BMPs, will continue throughout the Forest as funded.

For noxious weeds, the Northern Province Strategy for Monitoring (i.e., inventorying) areas for weeds will be followed. The KNF includes the following two objectives: (1) Prioritize areas of the various Northern Province Forests for inventory, helping to fill-in existing data gaps of the various counties; and (2) coordinate inventories with other ongoing inventories, i.e.; botanical surveys, stand exams, range, wildlife, wilderness, and others.

The KNF implements these objectives in the following ways:

1. Annually, usually in mid-August, after all weed treatment is completed, areas of the Forest that have had activities and/or large disturbances, and have not been traveled by the weed crew in the last couple of years, are prioritized for inventory. These inventories are documented on a hard copy atlas of quarter quadrangle maps. This survey information will eventually be entered into the NRIS database. All weed sites found in these inventories are entered into the NRIS database. Other areas that may be high priority for inventory are places where weeds are just starting to show up, or where there are only a few populations of particularly invasive species. The primary focus is to keep areas that are currently free of weeds, or that only have a few populations uninfested.
2. Forest personnel in disciplines other than botany and/or weeds are provided with booklets containing photos of the top 18 noxious weeds to be on the look-out for on the Forest. Many of the field-going personnel are familiar with noxious weeds and are committed to assisting the Forest in meeting objectives of limiting noxious weed infestations. KNF (or contracted) personnel in range, wildlife, fire prevention,

recreation, wilderness patrol, and timber have alerted the weed manager to locations of previously unknown noxious weeds that were then prioritized for treatment. Monitoring will continue to be conducted by multiple parties.

Randomly selected tractor units may be monitored to ensure soil disturbance is within established guidelines.

Walk-through monitoring of project implementation will be done by the district silviculturist, wildlife biologist, fuels officer, and/or presale forester to assess compliance with design features (implementation monitoring). Visits to the project by district, Forest, regional, or provincial teams may occur as part of regular Forest Plan monitoring.

Effectiveness of these types of treatments (effectiveness monitoring) in restoring ponderosa pine forests in the Goosenest AMA is part of ongoing research (Ritchie 2005).

Reforestation monitoring will consist of first-year survival surveys, third-year exams, and fifth-year exams. Results of this monitoring could trigger use of protection measures and/or additional planting, and manual release.

NSO surveys will be done to protocol annually throughout the life of the project. NGH surveys will be conducted annually throughout the life of the project.

2.4 Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action (as scoped) included issues with the proposed action and suggestions for other alternatives. Some of the alternatives suggested were outside the scope of this project, duplicative of the alternatives considered in detail, would result in the project not meeting the purposed and need, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed study as described below.

2.4.1 *Proposed Action from Scoping*

In accordance with the Goosenest AMA and the Forest Plan, the proposed action was developed to address existing forest health needs, including long-term restoration goals such as longer-lived conifers within the project area. The proposed action for this project was released to the interested parties for public scoping on December 11, 2008, as described in section 1.5, “Proposed Action as Scoped,” of this document. Following public scoping, there were changes to USDI Fish and Wildlife Service-designated NSO critical habitat within the project area. As a result, the proposed action was adjusted to address new NSO critical habitat concerns.

In December 2009, following field-verified updates to the NGH habitat data and further analysis, the ID team determined that the adjusted proposed action would not meet Forest Plan S&G 8-20. This S&G is intended to provide management direction for NGH within the Klamath and California Cascade Provinces, primarily as it relates to habitat needs such as canopy closure. Between December 2009 and January 2010, the ID team discussed options available to address S&G 8-20.

In order to meet S&G 8-20, it was determined that the proposed action (alternative 2) would require either a site-specific Forest Plan amendment or substantial modifications. Substantial changes to the proposed action would have resulted in the proposed action being very similar to the other action alternatives, not substantially adding to the range of alternatives. The district ID team recommended against a site-specific plan amendment, since both S&G 8-20 and the purpose and need of the project could adequately be met with alternatives 3 and 4. With this in mind, the district ID team recommended that the proposed action be dropped from further study.

On January 4, 2010, District Ranger Laura Allen reviewed the information from the ID team and recommended the proposed action (alternative 2) be dropped from further study, because it would not comply with NGH S&G 8-20. Forest Supervisor Patricia Grantham concurred with the recommendation and decided to drop the proposed action (alternative 2) from detailed study.

The original proposed action, as displayed in table 1.5-1 and map A-4, included ponderosa pine and mixed conifer restoration and re-establishment treatments on approximately 1,375 acres. These treatments would remove goshawk foraging habitat to levels below Forest Plan S&G 8-20. The original proposed action also included additional areas of thinning-from-below treatments that were not included in alternatives 3 and 4 during development of these alternatives to respond to the significant issue #1 for late-successional habitat. Alternatives 3 and 4 dropped some stands from treatment consideration that currently provided high quality nesting and roosting habitat in the project area. Alternative 3 incorporated a lighter thinning treatment with limited created openings throughout the entire project area and did not include ponderosa pine and mixed conifer restoration and re-establishment. Alternative 4 incorporated a lighter thinning treatment with limited created openings within NSO nesting and roosting habitat. In alternative 4, thinning from below for areas outside NSO nesting and roosting habitat would be the same as the original proposed action. Alternative 4 did not include the ponderosa pine and mixed conifer restoration and re-establishment to reduce impacts to species associated with mature late-successional forest habitats. During consultation with USDI Fish and Wildlife Service, two road segments (44N80A and 44N62A) within NSO critical habitat were identified as a concern. These two road segments were previously physically closed (barricaded) from use. Alternative 4 proposes to further reduce impacts to late-successional species by closing and removing roads 44N80A and 44N62A from the Forest system. Roads proposed for closure will be ripped and seeded or planted with appropriate native, non-invasive grasses and/or shrubs.

Alternative 4 expanded treatments to improve forest health in lodgepole pine by proposing treatments on the entire stand of diseased and dying lodgepole pine trees. Treating the entire stand would remove dead and dying overstory trees infected with mistletoe to reduce potential inoculation of existing advanced regeneration in the stand. After review of the alternatives, alternative 4 was identified as the modified proposed action.

2.4.2 *Avoid Root Disease Areas*

An alternative was considered that avoided all known areas of root disease. As noted in the existing condition, much of the white fir has *annosus* and stands are experiencing mortality. This alternative was dismissed from detailed analysis because it did not address the purpose and need to provide for resilient stocking levels of desired species.

2.4.3 *No Temporary Roads*

An alternative was considered that eliminated the use of all temporary roads, including existing non-system roads (pre-existing spur roads). This alternative would greatly reduce access to

stands in need of treatment, greatly reducing treatment of stands for forest health. To achieve the same level of stand treatment without the use of non-system roads, new roads would need to be constructed. New road construction has not been considered, since impacts to resources would be greater than the use of pre-existing roads. As noted in the proposed action, non-system roads would only be used temporarily and then closed, not contributing to "road maintenance overhead." This alternative was eliminated from detailed analysis since it would not address the purpose and need of the project.

2.5 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in table 2.5-1 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2.5-1. Summary of alternatives

Silviculture Treatments[1] ***Fuels Treatments***	**Alternative 1 (No Action)**	**Alternative 3**	**Alternative 4**
Thinning-from-Below (acres) *Overall Fuels Abatement*[2] *(acres)* *Mowing (acres)* *Underburning (acres)* *Post-Treatment Evaluation of Planting (acres)*	0	2,094 *2,094* *254* *789* *0*	2,429 *2,429* *346* *1,495* *644*
Lodgepole Pine Thinning/Fuels Reduction (acres) *Overall Fuels Abatement*[2] *(acres)* *Mowing (acres)*	0	673 *673* *428*	970 *970* *728*
Plantation Thinning With Overall Fuels Abatement[2] (acres)	0	99	99
Machine Piling Outside of Landing Sites (Yes/No)	na	na	Yes
Underburning Only (acres)	0	426	42
Fuel Management Zones[3] (miles/approximate acres) (Acres Outside Other Treatments)	0	13/480 (300)	13/480 (300)
Total Project Area Acres Proposed For Treatment (Acres)	**0**	**3, 568**	**3, 847**
Transportation	**Alternative 1 (No Action)**	**Alternative 3**	**Alternative 4**
Construction of Temporary Roads (miles)	0	0.7	1.3
Temporary Use of Non-System Roads (miles)	0	1.6	1.9
Haul Use of Existing System Roads (miles) Maintenance as Needed	0	39.2	41.2
Haul Use of Existing Non-System Roads (miles) Maintenance as Needed	0	4.8	5.0
Road Closure of 44N80A and 44N62A (miles)	0	0	1.5

[1] Some treatments overlap, e.g., thinning followed with fuels abatement and underburning, FMZs overlap with other treatments.
[2] Overall fuels abatement includes whole-tree yarding, pile and burning, lop and scatter, and biomass removal treatment options.
[3] Mileage is approximate, proposed FMZs are along Forest System Roads 15, 77, 44N84, 44N77, 44N75, and 44N75D.

2.6 Effects Related to the Significant Issues and Project Purpose and Need

This presents a brief summary of the effects as related to the significant issues and purpose and needs identified for the Hi-Grouse Project (see chapter 3 for specific effects discussions).

Tables 2.6-1 and 2.6-2 summarize the alternative effects to NSO and NGH habitat. This addresses the significant issue #1 and the purpose and need to improve and maintain habitat for species associated with late-successional forests.

Significant Issue #1: There is a concern that the proposed activities could remove the best remaining wildlife habitat for species associated with late-successional habitat within the project area, specifically removing and or altering habitat for northern spotted owl and northern goshawk (e.g., degrade or downgrade habitat).

> *Indicators:* Acres treated in nesting, roosting, and/or foraging habitats across the project area and basal area maintained within individual stands.

Alternatives 3 and 4 avoid treatment in the higher quality NSO and NGH nesting and roosting habitat. Some low quality NSO nesting and roosting habitat would be treated with a light thinning that would essentially maintain the existing canopy cover and 180 square feet of basal area per acre. Also, some NSO nesting and roosting habitat in red fir would have hand thinning of understory trees followed by underburning.

In alternative 3 light thinning would maintain, but degrade, some NSO foraging habitat. In alternative 4 thinning in NSO foraging habitat would cause degradation or downgrading of NSO foraging habitat in white fir/ponderosa pine units with more intensive thinning treatments. These thinning treatments may reduce canopy cover slightly below 40 percent in the short term, but would also improve some aspects of foraging by allowing owls to maneuver better through stands that are currently very dense.

Table 2.6-1 displays the amounts of habitat by alternative for NSO Activity Center KL-3201, the 0.5-mile core area, and the 1.3-mile home range analysis area. See section 3.2.3.2 for analysis discussion of NSO. The determination for both alternatives 3 and 4 is: **may affect, but is not likely to adversely affect NSO critical habitat; may affect, but is not likely to adversely affect NSO**.

There are five NGH territories that may be affected by project activities. Table 2.6-2 displays the amounts of habitat by alternative for the five NGH territories that overlap the project area. See section 3.2.3.4 of FEIS for full analysis discussion of NGH.

Table 2.6-1. Effects of alternatives on NSO habitat within KL-3201 Activity Center

	Existing Acres Habitat		Acres Habitat Degraded		Acres of Habitat Downgraded		Acres of Habitat Removed		Post Treatment Acres Habitat	
Habitat	**0.5**	**1.3**	**0.5**	**1.3**	**0.5**	**1.3**	**0.5**	**1.3**	**0.5**	**1.3**
Alternative 1 (No Action)										
Nesting/ Roosting	297	223	0	0	0	0	0	0	297	223
Foraging	166	2,005	0	0	0	0	0	0	166	2,005
Dispersal	0	5	0	0	0	0	0	0	0	5
Alternative 3										
Nesting/ Roosting	297	223	2	74	0	0	0.5	0.5	297*	223*
Foraging	166	2,005	46	556	0	0	0.5	6	166*	1,999
Dispersal	0	5	0	0	0	0	0	0	0	5
Alternative 4 (Modified Proposed Action)										
Nesting/ Roosting	297	223	2	74	0	0	0.5	0.5	297*	223*
Foraging	166	2,005	46	416	0	0	0	129	166	1,876
Dispersal	0	5	0	0	0	0	0	0	0	5

* 0.5 acres of habitat removed from landing, rounding does not show change.

Alternative 3 would maintain the existing amount of nesting and foraging habitat available to NGH across the project area in the short term and would comply with Forest Plan S&G 8-20. Habitat quality in the treated stands would be reduced in the short term. Treatments proposed would reduce the incidence of insect and disease mortality, reduce crown fire potential by 40 percent, prevent rapid future fuel build-up for approximately 20 years, and allow the reintroduction of fire within the treated areas. Over the long term, many of the untreated densely spaced stands that are currently infected with root disease and pine and fir engraver beetles would be expected to decline to the point that they would no longer provide habitat for NGH.

Habitat quality of nesting and foraging habitat for NGH would be reduced in four of the five territories and across the project area in the short term and would comply with Forest Plan S&G 8-20. Treatments proposed would reduce the incidence of insect and disease mortality, reduce the wildfire potential by 50 percent, prevent rapid future fuel build-up for approximately 20 years, and would allow for management reintroduction of fire within the treated areas. By reducing the risk of a stand-replacement fire within the project area and within NGH territories, thinning, fuel treatment zones, and underburning treatments proposed with alternative 4 should benefit NGH over the long term.

The determination for both alternatives 3 and 4 is: **may impact individual goshawks but would not likely result in a trend toward listing or loss of viability**.

Table 2.6-2. Summary of changes to goshawk foraging habitat by territory and alternative

Territory (Alternative)	Primary Nest Zone (PNZ)						Foraging Area (FA)			
	Foraging		Nesting		Non-Habitat		Nesting/Foraging		Non-Habitat	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Rainbow										
Alt 1 Existing	90	18	222	44	192	38	714	47	795	53
Alt 3 Post-treatment	90	18	222	44	192	38	714	47	795	53
Alt 4 Post-treatment	92	18	220	44	192	38	714	47	795	53
Red Cap										
Alt 1 Existing	193	38	184	36	127	25	612	40	896	60
Alt 3 Post-treatment	193	38	184	36	127	25	612	40	896	60
Alt 4 Post-treatment	193	38	184	36	127	25	612	40	896	60
Davis										
Alt 1 Existing	256	51	238	47	10	2	1,215	81	293	19
Alt 3 Post-treatment	256	51	238	47	10	2	1,215	81	344	23
Alt 4 Post-treatment	264	52	230	46	10	2	1,026	68	482	32
Hi Ridge										
Alt 1 Existing	324	64	114	23	65	13	1,265	84	242	16
Alt 3 Post-treatment	324	64	114	23	65	13	1,265	84	243	16
Alt 4 Post-treatment	324	64	114	23	65	13	1,231	82	277	18
West Grouse										
Alt 1 Existing	322	64	63	13	117	23	1,191	79	317	21
Alt 3 Post-treatment	322	64	63	13	117	23	1,191	79	317	21
Alt 4 Post-treatment	312	62	63	13	127	25	1,143	76	365	24

Significant Issue #2: There is a disagreement about whether or not a sufficient amount of the lodgepole stand is treated to protect values at risk.

Indicators: Acres treated by treatment type.

Alternative 3 would treat approximately two-thirds (673 acres) of the of the beetle-killed lodgepole pine area on the west side of the Hi-Grouse Project Area. Alternative 4 would treat essentially all of the beetle-killed lodgepole pine area (984 acres). Treatments are designed to reduce fuel loadings from the mortality and promote a stand composition of healthy small trees that would be more resilient to the mountain pine beetle in the future.

Effects Relative to the Purpose and Need

Table 2.6-3 summarizes the alternative effects related to forest composition and structure and fuels-related historic fire regime needs.

Table 2.6-3. Summary of alternative effects related to the purpose and needs of forest composition and structure and fuels-related historic fire regime

Purpose and Need	Alternative 1	Alternative 3	Alternative 4
Promote restoration of historic forest composition and structure			
Decrease stand density over most of the project area	No change	3,568 acres	3,847 acres
Increase proportion of ponderosa pine, sugar pine, and white pine on suitable sites to mimic historical stand conditions	No change	No planting	Plant up to 644 acres PP/MC where needed
Release understory in lodgepole pine stands to increase stand diversity and remove dead and dying trees to reduce current and future fuels	No change	673 acres	970 acres
Increase stand diversity to enhance overall vegetative diversity	No change	Increases through thinning and lodgepole thinning	Increases through thinning, lodgepole thinning, planting pine, and small openings within thinning treatments
Maintain aesthetic values	No change	Yes	Yes
Identify appropriate monitoring	No change	Yes	Yes
Promote restoration of fuels-related historic fire regime			
Mimic natural processes through management actions to promote healthy ecological conditions and replicate the role of natural disturbances	No change	Thinning and use of prescribed burning	Thinning with openings, inter-planting PP/MC, and use of prescribed burning
Treat heavy fuel loadings to reduce the threat of stand-replacing wildfire, protect old forest habitat components in the project area, and provide for firefighter safety	No change	3,568 acres, including 13 miles FMZ	3,847 acres, including 13 miles FMZ

Chapter 3 Affected Environment and Environmental Consequences

This section summarizes the biological, physical, and socioeconomic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

This chapter is organized by resource area. Following each resource description is a summary of the potential effects (environmental consequences) to the resource associated with the implementation of each alternative. Significant or potentially significant effects, including direct, indirect, and cumulative effects are disclosed. Unless otherwise stated, the effects between alternatives are the same. Effects are quantified, where possible, and qualitative discussions are also included. Additional discussions include the short-term uses and long-term productivity, unavoidable adverse effects, irreversible and irretrievable commitments of resources, cumulative effects, and other required disclosures.

This EIS incorporates the Forest Plan by reference and tiers to the FEIS completed for the Forest Plan. The discussions of resource and potential effects take advantage of existing information included in the Forest Plan and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record includes all project-specific information such as resource reports, ecosystem analyses, and other results of field investigations.

The supporting resource specialist reports and their amendments are available on the Forest Internet website at: www.fs.usda.gov/klamath. Key points from the analysis documents are summarized and the documents are incorporated by reference.

3.1 Analyzing Environmental Consequences

Environmental consequences are the effects of implementing an alternative on the biological, physical, economic, and social environment. The Council of Environmental Quality regulations implementing the National Environmental Policy Act include a number of specific categories to use for the analysis of environmental consequences. Several form the basis of much of the analysis that follows. They are explained briefly here.

3.1.1 *Direct, Indirect, and Cumulative Effects*

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but would occur in the foreseeable future. The project is expected to be active over the approximately the next 7 to 10 years or from the time the decision is made to full implementation. Cumulative effects result when the incremental effects of actions are added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Past activities contributed to the existing condition and are considered in the affected environment. Present and reasonably foreseeable future actions are assessed along with the effects of the proposed action to determine whether significant cumulative effects may occur. This analysis is consistent with the Council on Environmental Quality memo from James L. Connaughton titled “Guidance on the

Consideration of Past Actions in Cumulative Effects Analysis" dated June 24, 2005, incorporated by reference.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks and ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008).

The Klamath National Forest Schedule of Proposed Actions (SOPA) was reviewed and district personnel consulted to identify current and reasonably foreseeable projects on the Goosenest Ranger District. Contacts were made with adjacent Forests for proposed activities to be considered in select wildlife analyses for cumulative effects analysis.

Assessment areas vary by resource, and so do the other actions included in each cumulative effects analysis. Cumulative effects may include estimated effects from present logging (timber harvest, fuels treatments, road and landing construction and maintenance) and wildfire activities (e.g. suppression activities and the affected burn areas). Other actions may include but are not limited to grazing and fuels reduction and/or forest health projects in the vicinity.

Ongoing activities include annual road maintenance, recreation trail use for hiking and snowmobiling, dispersed camping, hunting, appropriate responses for fire suppression, and implementation of the Forest Travel Management decision. Future fuels reduction and vegetation management projects in the planning stages include the Pumice project east of the Hi-Grouse Project Area on the Goosenest Ranger District, and the Hoffmann project on the Shasta-Trinity National Forest, southeast of the project area.

The recent past, present and reasonably foreseeable actions considered for this project analysis are displayed in appendix A on maps A-7 and A-8, and described in appendix E.

3.2 Biological Environment

3.2.1 *Forest Vegetation*

A more detailed description of affected environment, methods, and environmental consequences for this project can be found in the Silviculture Report (Schantz 2009a), incorporated by reference and available on the Forest Internet website at: www.fs.usda.gov/klamath.

Goosenest Adaptive Management Area Ecosystem Analysis (AMA Analysis 1996). In 1996 an ID team was organized to conduct an intermediate analysis between Forest planning direction and project planning. This analysis provides an integrated assessment of the ecosystem processes and functions operating within the AMA, resource issues and the affected resources, and management recommendations. The analysis was used as a source of information on the existing conditions and reference conditions, and as background for the purpose and need for the project.

Methodology

Vegetation information was compiled from Forest vegetation databases and from stand exams taken in the project area. Field reconnaissance of the project area was conducted by the project silviculturist and logging systems specialist to assess stand conditions and refine unit boundaries, prescriptions, and logging system access. In addition to project specialists, the area pathologist and area entomologist from Forest Health Protection (FHP) visited the project area and prepared a report outlining the conditions regarding *annosus* root disease, mountain pine beetle, and dwarf mistletoe (Angwin 2008).

Geographic information system (GIS) data was used to develop the maps of the proposed action and alternatives; these layers included stands and roads. A 10-meter digital-elevation model was used to generate contours and slope classes as an aid in determining appropriate logging systems.

The South Central Oregon, Northeastern California Variant of the Forest Vegetation Simulator (FVS) (Dixon 2005) was used to simulate management activities. The Fire and Fuels Extension to FVS (FFE) was used to predict fuels parameters.

Limitations and Assumptions. Stand exam data was used to run the FVS model; however, data was not available for each stand. Stands representative of the different forest strata were run and used to compute stratum averages. Thinning and fuels treatment were simulated for each prescription.

Indicators from Model. The model was used to generate pre- and post-thinning stand parameters of canopy cover, average diameter, basal area, trees per acre, and stand density index. Timber volumes from thinning were computed by the model. The FFE provided estimates of stand height, canopy bulk density, canopy base height, and total canopy cover.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and

underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's statement of proposed actions (SOPA) that overlap the analysis area in time. The cumulative effects analysis area is the entire Hi-Grouse Project Area. The analysis timeframe is 20 years for short-term effects such as temporary decreases in canopy closure after thinning treatments. Some long-term effects, such as the time it takes trees to mature, would occur in excess of 20 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E.

Affected Environment

Major influences on the Hi-Grouse Project Area over the last 100 years are railroad logging that started in the early 1900 and fire suppression (USDA Forest Service 1996; Ritchie 2005). Past timber harvests removed most of the larger ponderosa pine and white fir from the original forest (Creasy et al. 2007; Ritchie 2005). It is estimated that approximately 60 percent of the Hi-Grouse Project Area had previous partial cutting (pine removals, sanitation/salvage, thinning), 5 percent were regenerated by clearcut and shelterwood methods and 30 percent had a full or partial overstory removal of the largest trees. The selective cutting prescriptions that removed larger true fir over the last several decades in the true fir-dominated stands has lead to *annosus* root disease impacts on stand structure, including mortality (Angwin 2008).

The removal of pine seed sources, combined with livestock grazing and post-logging fires, created ideal conditions for germination of true firs. Fire suppression has allowed the establishment and dominance of white fir in the white fir series, where ponderosa pine was historically maintained as the dominant species by frequent low-severity fires (Creasy et al. 2007). In the higher elevation red fir series a similar situation occurred where the removal of pine seed sources with logging lead to increases in the amount of true fir. These stands would have historically had more fir in them due to the mixed-severity fire regime, but they have still been altered by lack of fires (Creasy et al. 2007; Ritchie 2005).

Selective logging in the white fir/pine and red fir types has lead to the introduction and spread of *annosus* root disease, which is now a major factor in stand health. Due to the recent drought, insect and disease-related mortality is occurring in true firs and ponderosa pine. Mature lodgepole pine stands are continuing to experience heavy stand-replacing mortality due to the mountain pine beetle, and these high beetle populations are now infesting ponderosa pine within the white fir/pine type (Angwin 2008).

Most of the stands in the project area are overstocked and substantial mortality is occurring and is expected to continue (USDA Forest Service 1996; Angwin 2008). Most of the area has missed several fire cycles, severely departing from the historic fire-return intervals (Ritchie 2005).

According to Long (1985), density management is the manipulation and control of growing stock to achieve specific management objectives. Stand density index (SDI) (Reineke 1933) was used to develop guidelines for maintaining stand density within a range where individual tree growth rates would be optimized, and mortality would be reduced. In general, maintaining the stand between 30 percent of maximum SDI (approximate onset of inter-tree competition) and 50 percent of maximum SDI (zone below onset of competition induced mortality) (Long 1985) allows for maintaining healthy stands while meeting a variety of management objectives.

SDI was used to characterize the site potential for ponderosa pine stockability using methods outlined above. The upper management zone, or the density that a suppressed class of trees begins to develop, was calculated as approximately 120 to 140 square feet of basal area per acre for the average diameter of ponderosa pine (12 to 24 inches) within the white fir series. This range corresponds well with Oliver (1995) who estimated the threshold for imminent bark beetle mortality in ponderosa pine at a basal area of 150 square feet per acre based on observations and inventory data. The lower management zone was established at a density that allows for high rates of individual tree growth while still capturing a significant portion of site resources (inter-tree competition is present, but full site occupancy has not been reached). Stands managed towards the lower management zone would produce trees with long crowns with large limbs, typical of old-growth ponderosa pines, beneficial for goshawk and spotted owl nesting structure. For ponderosa pine in the white fir series, the lower management zone would be approximately 80 to 90 square feet of basal area per acre for this project.

White fir is noted for its rapid early growth. It is capable of out-growing ponderosa pine on similar sites, and this was observed within the project area through increment coring. The upper management zone for white fir would be 160 to 180 square feet of basal area per acre, and the lower management zone would be 100 to 115 square feet, assuming a maximum SDI of 560 (Cochran 1983). However, stockability for white fir on these sites may be largely determined by water availability. Cochran (1998) reported on the results of a white fir growing stock study on the Fremont and Deschutes National Forests that was begun in 1983 and destroyed by mortality between 1990 and 1995 after prolonged drought. Mortality was severe even in plots that were thinned to 20 percent of maximum SDI. Mortality was attributed to root disease, spruce budworm defoliation, and fir engraver beetles. Cochran (1998) cautioned against managing for white fir on sites with mean annual precipitation below 32 inches, even at very low densities. Cochran (1998) recommended maintaining a large component of ponderosa pine in the stand, and managing these sites based on ponderosa pine stockability guides. The recent widespread increase of tree mortality rates in the western United States (van Mantgem et al. 2009), which has been attributed to regional warming and increasing moisture stress, also casts doubt on the ability to manage for high levels of white fir on these sites in the long term, especially where diseases and parasites are already causing additional stress on this species.

Red fir is noted for its high maximum density in natural stands, and is reported to have one of the highest maximum SDI levels of any species (Reineke 1933). Based on the methods outlined above, the upper management zone for red fir would be 230 to 300 square feet of basal area per acre, and the lower management zone would be 150-180 square feet, assuming a maximum SDI of 800. The main concern with stocking of red fir in this project is the effect of root disease which deteriorates roots making trees more susceptible to competition. Having lost most of the historic pine component means there are fewer species to anchor these stands against the effects of losing red fir to drought-root disease interactions. However, contrary to white fir, it is thought that thinning red fir could help reduce losses to *annosus* root disease (Angwin 2008).

Insects and Disease. Several insects and diseases are common in the project area and are having an impact on species composition and structure (Angwin 2008). The mountain pine beetle (*Dendroctonus ponderosae*) and fir engraver beetle (*Scolytus ventralis*) are very active in the Hi-Grouse Project Area in both ponderosa and lodgepole pines (Angwin 2008). In ponderosa pine the beetles have been attacking trees within dense white fir leading to a substantial loss of the pine component in these stands. Pine engraver beetle (*Ips* species) activity currently appears to be low in the Hi-Grouse Project Area.

Approximately one-third of the Hi-Grouse Project Area consists of early- and mid-seral true fir-dominated stands that have a high incidence of *annosus* root disease, primarily as a result of past management (Angwin 2008). *Annosus* root disease infection centers in white fir expand at the rate of approximately 1 foot per year, as the fungus grows through root contacts of live trees (Angwin 2008).

Two main dwarf mistletoes found within the project area are lodgepole pine dwarf mistletoe (*A. americanum*) and true fir dwarf mistletoe (*A. abietinum*). Lodgepole pine dwarf mistletoe is found in all lodgepole pine stands and is especially heavy in mature lodgepole stands in both the remnant overstory trees and in the advanced lodgepole regeneration. Remnant trees are providing a recurring source for infection to seedlings and saplings. Moderate to heavy infection in lodgepole reduces growth drastically, and most of these trees would never reach the typical 9 to 12 inch diameters of a mature stand; this level of infection leads to development of stunted, bushy trees that persist for long periods without any substantial growth (Angwin 2008).

Infection of white fir by the true fir dwarf mistletoe tends to be moderately heavy throughout the white fir series. Damage can be substantial with this dwarf mistletoe when combined with concurrent infection by a canker fungus (*Cytospora* spp.). The canker causes branches to die and leads to a general dieback of the crowns. This effect was commonly observed in the Hi-Grouse Project Area where white fir was infected with dwarf mistletoe, and along with *annosus* root disease is creating a high hazard for attack by fir engraver beetles (Angwin 2008).

When trees become stressed by density-related competition and drought, the effects of insects and disease agents often increase. For more information on the specific pathogens present in the project area see the Silviculture Report (Schantz 2009a).

The Final Spotted Owl Recovery Plan (NSO Recovery Plan) (USDI Fish and Wildlife Service 2008, page 26) identifies active management of the matrix as a high priority. The following features are recommended to guide these treatments (ib. pages 109-110): Favor fire tolerant species, e.g., old ponderosa pine, and promote smaller size classes of these species for future recruitment of large-tree habitat.

1) Retain large, old trees

2) Apply treatments unevenly within stands

3) Apply treatments unevenly among stands

4) Develop landscape-level prescriptions

In the Hi-Grouse Project Area the element most lacking in high-quality habitat is the presence of large, old, fire-resistant ponderosa pines which previously dominated this landscape. Promotion of existing smaller size classes and establishment of pine would be necessary to meet the Plan's goal of restoration of fire tolerance and large tree habitat that would "anchor" stands from one disturbance to the next by providing the legacies that are the slowest to develop.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

The no action alternative does not address the purpose and need for the project. This alternative would lead to a continued loss of tree species diversity and movement away from the historic/desired species composition and structure. High stand densities and slow growth would continue the trends of mortality and increase the time in which smaller trees would replace the larger fire-resistant trees that have recently been killed. Dense canopies in both the vertical and horizontal dimensions, as well as continued fuel buildup from mortality, would perpetuate the propensity towards tree torching and active crown fire during a wildfire event.

Historic Forest Composition and Structure/Resiliency to Disturbance. Resiliency to disturbance would remain low, since almost all mid-seral stands are overstocked (at or above the upper management zone for stand density). There would be continued loss of the larger ponderosa pine, which are the most fire-resistant trees that provide a long-lived component for late-successional habitat with the ability to survive wildfire. At the high stand densities found in this area, the larger, older trees are often the first to die, because under stress they are unable to maintain their higher respiratory requirements compared to smaller trees, and are susceptible to bark beetles (Fettig et al. 2006). Ritchie et al. (2008) noted this mortality of the larger pines in northeastern California at the Blacks Mountain Experimental Forest, and this situation was also observed within the Hi-Grouse Project Area.

The trend of true fir dominance would continue and this area would move even further away from the pine-dominated forest conditions that existed prior to early logging and fire suppression. Early- and mid-seral true fir-dominated stands that have a high incidence of *annosus* root disease primarily would continue to experience mortality, leading to increasing fuel loadings and loss of canopy cover, until they would eventually reach the stand initiation phase in 20 to 30 years. Regeneration in these stands would be heavily dominated by true fir, which would perpetuate the disease on the site.

Mature lodgepole stands will continue to die. There would be a stagnation of small trees infected with dwarf mistletoe and a high hazard of losing all advance regeneration of other species to wildfire. This advance regeneration would continue to develop slowly. True fir and ponderosa pine would continue to be susceptible to mountain pine beetles.

Late-Successional Habitat. No action would leave all late-successional habitat untreated, leaving this habitat at a higher hazard for loss to wildfire and insects and disease. A primary effect would be that larger ponderosa pine would continue to be lost to bark beetles.

No action would not address the loss of long-lived fire-resistant tree species. Mid- and early-seral stands in the white fir/pine and mixed conifer communities on over 50 percent of the Hi-Grouse Project Area would remain in slow growing conditions.

Fuel Loadings/Fire Regime. Current trends of heavy fuel loadings would continue under no action due to ongoing mortality related to bark beetles, root disease, and tree suppression. Forest structure would not be modified from its current condition, which is conducive to high-severity fire, to a structure that would be conducive to non-lethal surface fire.

Effects Related to the Key Issues

The no action alternative does not directly affect any late-successional habitat, but has the indirect effect of perpetuating the high risk factors that in the future could lead to a rapid and widespread loss.

This alternative does not address the current and future conditions in the beetle-killed lodgepole pine stands, since fuel loadings and stand composition are not treated.

Cumulative Effects

Within the Hi-Grouse Project Area, timber harvest and fire suppression have been the dominant management activities having a cumulative effect on vegetation. The trends that have developed under this management regime would continue under no action, and would contribute to the adverse forest health conditions discussed in the existing condition in chapter 1.

The level of infection in white fir-dominated stands with previous partial cutting would lead to significant losses of canopy cover and high levels of down wood as *annosus* root disease progresses in the next 20 to 30 years.

Alternative 1 would not move the project area toward meeting the goals for the Goosenest AMA, since restoration treatments that employ prescribed burning and silvicultural techniques would not be initiated.

Alternative 3

Direct and Indirect Effects

Historic Forest Composition and Structure/Resiliency to Disturbance. Resiliency to disturbance would improve. Mid-seral white fir-ponderosa pine stands would be thinned to levels that are just below the threshold for bark beetle mortality to levels approaching the upper management zone. Thinning would reduce mortality from bark beetles and create stand structures more conducive to low-severity surface fires when compared to the existing condition. In terms of stand density, it is expected that the effects of reduced canopy closure would be less intensive and short-lived compared to alternative 4.

In lodgepole pine and white fir stands removal of the overstory dwarf mistletoe seed source and sanitation of the understory by removal of the most heavily infected trees would allow existing advanced regeneration to eventually develop into an upper canopy.

The target upper density level of basal area is generally not reached due to the 20-inch diameter limit, and the stands are projected to be well above the upper density level by 2029 (table 3.2-1). The year 2014 represents the effects of thinning after treatment. Canopy cover in the pine-dominated and white fir dominated thinning treatments would be reduced after thinning and increase slightly by 2029 (table 3.2-2)

Small-tree thinning (less than 12 inches dbh) treatments would promote growth, promote a higher proportion of pines in the composition, and reduce potential for crown fire. These treatments would maintain these stands within desired density ranges for at least 20 years, which should reduce the effects of insects and diseases as well as promote growth rates of individual trees.

Table 3.2-1. Current and projected basal area for alternative 3 treatments

Silviculture Rx	Ave. Sq. Ft. Basal Area per Acre by Year*		
	2009 Before Treatment	2014 After Treatment	2029 After Treatment
Lodgepole thinning	93	39	58
Underburn	153	151	185
Light thinning ponderosa pine	174	145	170
Light thinning white fir, ponderosa pine	200	191	216
Light thinning red fir	177	176	213
Light thinning mixed conifer	148	153	186
Small tree thinning mixed conifer	64	69	92
Small tree thinning promote ponderosa pine	100	94	117
Small tree thinning in old growth red fir	154	144	171

* These are average basal areas as modeled in FVS by treatment type across the project area and are not reflective of any particular stand or unit.

Table 3.2-2. Current and projected canopy cover for alternative 3 treatments

Silviculture Rx	Ave. Canopy Cover per Acre by Year*		
	2009 Before Treatment	2014 After Treatment	2029 After Treatment
Lodgepole thinning	38	15	20
Underburn	49	48	53
Light thinning ponderosa pine	53	44	47
Light thinning white fir, ponderosa pine	60	53	54
Light thinning red fir	51	46	49
Light thinning mixed conifer	55	52	55
Small tree thinning mixed conifer	16	14	19
Small tree thinning ponderosa pine	40	32	35
Small tree thinning in old growth red fir	41	29	32

* These are average canopy cover as modeled in FVS by treatment type across the project area and are not reflective of any particular stand or unit.

Approximately a third of the Hi-Grouse Project Area has mid-seral white fir with a high incidence of *annosus* root disease that would not be treated under alternative 3. Over the next 20 to 30 years these stands would be regenerated by the effect of the root disease in conjunction with fir engraver beetles, which commonly attack white fir weakened by disease and/or drought. Since there is little or no ponderosa pine seed source in these stands, the resulting regeneration is also expected to be white fir, which would perpetuate the disease on the site (Angwin 2008). As mortality continues to occur, fuel loadings would reach high levels. High fuel loadings lead to concerns over resistance to control for fire suppression forces, potential for lethal surface fires, and tree torching within the stands.

Ips species are commonly called pine engraver beetles and have several generations per year. Ips beetle populations may build up in slash to levels where small diameter trees and tops of mature

trees in the vicinity are at risk for attack (Angwin 2008). Thus, the proposed slash treatment is essential to the management of these beetles (Livingston 1979).

Late-Successional Habitat. Alternative 3 and would maintain the late-successional forest in this alternative. Light thinning treatments would reduce ladder fuels on approximately 165 acres of mid-late seral white fir-ponderosa stands identified as NSO and NGH habitat..

Thinning in alternative 3 would promote pole-sized (4 to 8 inches dbh) and small tree (less than 12 inches dbh) stands towards mid- and late-seral stages because of more durable structure and species composition. Ponderosa pine would be promoted over other species that would increase fire-resistance and future large-tree structure as described in the Recovery Plan for the NSO. Another long-term benefit of thinning would be to open up very dense areas to encourage growth of understory shrub and herbaceous species that would increase overall biodiversity. Thinned areas, small openings, and un-thinned clumps in close proximity mimics historic stand conditions and provides for species diversity.

Prescribed burning and thinning treatments would improve forest health and promote sustainable late-successional forests in both the short and long term. A semi-landscape approach would be used to restore disturbance processes and patterns more typical of historic conditions before widespread changes resulting from logging and fire-suppression.

Cumulative Effects

Effects of Ongoing and Reasonably Foreseeable Actions. Similar restoration projects are being carried out within the Goosenest AMA and other parts of this watershed. In conjunction with these projects, it is likely that the potential for large uncharacteristic wildfires and bark beetle outbreaks in ponderosa pine and white fir would be reduced. Use of fire, including wildland fire, as a management tool in the future could be increased.

Alternative 4 (Modified Proposed Action)

Direct and Indirect Effects

Alternative 4 has similar effects as alternative 3, except as described below.

Historic Forest Structure and Composition/Resiliency to Disturbance. Resiliency to disturbance would improve. Thinning would reduce susceptibility to mortality from bark beetles and create stand structures more conducive to low-severity surface fires. The effects of the reduction in stand density would last for at least 20 years (table 3.2-3). Canopy cover in the pine-dominated thinning treatments would be reduced to approximately 33 percent after thinning and would be 35 percent in 2029 (table 3.2-4). In the white fir-dominated thinning treatments, canopy cover would be reduced to approximately 37 percent, and would reach 40 percent in 2029. Heavy thinning in pine on 405 acres would reduce canopy cover below 30 percent—these stands would provide an open forest, park-like structure on the landscape.

Late-Successional Habitat. The effects on late successional habitat under alternative 4 would be the same as discussed for alternative 3.

Cumulative Effects

Effects of Ongoing and Reasonably Foreseeable Actions. The effects under alternative 4 would be the same as discussed for alternative 3.

Table 3.2-3. Current and projected basal area for alternative 4 treatments

Silviculture Prescription	Ave. Sq. Ft. Basal Area per Acre by Year*		
	2009 Before Treatment	2014 After Treatment	2029 After Treatment
Thinning ponderosa pine	183	97	111
Lodgepole thinning	93	39	58
Thinning white fir, ponderosa pine	191	122	141
Light thinning white fir, ponderosa pine	200	191	216
Heavy thinning ponderosa pine	147	72	85
Heavy thinning mixed conifer/mixed conifer re-establishment	166	107	126
Small tree thinning mixed conifer	64	69	92
Small tree thinning promote NGH forage habitat	113	113	143
Small tree thinning promote ponderosa pine	100	94	117
Small tree thinning in old growth red fir	154	144	171
Underburn	153	151	185

* These are average basal areas as modeled in FVS by treatment type across the project area and are not reflective of any particular stand or unit.

Table 3.2-4. Current and projected canopy cover for alternative 4 treatments

Silviculture Prescription	Ave. Canopy Cover per Acre by Year*		
	2009 Before Treatment	2014 After Treatment	2029 After Treatment
Thinning ponderosa pine	54	33	35
Lodgepole thinning	38	15	20
Thinning white fir, ponderosa pine	61	37	40
Light thinning white fir, ponderosa pine	60	53	54
Heavy thinning ponderosa pine	49	22	24
Heavy thinning mixed conifer/mixed conifer re-establishment	64	41	45
Small tree thinning mixed conifer	16	14	19
Small tree thinning promote NGH forage habitat	36	29	32
Small tree thinning promote ponderosa pine	40	32	35
Small tree thinning in old growth red fir	41	29	32
Underburn	49	48	53

* These are average canopy cover as modeled in FVS by treatment type across the project area and are not reflective of any particular stand or unit.

Summary and Conclusions

A comparison of alternatives as it relates to purpose and need and key issues, including lodgepole treatment, can be found in sections 2.5 and 2.6.

3.2.2 *Fuels*

A more detailed description of affected environment, modeling methods, and environmental consequences for this project can be found in the Fire and Fuels Report (Helmbrecht and Kurth 2009), incorporated by reference and available on the Forest Internet website at: www.fs.usda.gov/klamath.

Methodology

Vegetation information was compiled from Forest vegetation databases and from stand exams taken in the project area. Field reconnaissance of the project area was conducted by the project silviculturist and fuels specialists to assess stand conditions.

The South Central Oregon, Northeastern California Variant of the Forest Vegetation Simulator (FVS) (Dixon 2005) was used to simulate silvicultural treatments proposed in the action alternatives. The Fire and Fuels Extension to FVS (FFE) (Reinhardt and Crookston 2003) was used to predict canopy fuel parameters for both critiquing LANDFIRE data and building post-treatment landscape data for use in FlamMap.

LANDFIRE (www.landfire.gov) is a national vegetation and fuels mapping project that provides nationally consistent and seamless geospatial data products for use in wildland fire analysis and modeling. LANDFIRE national data on elevation, aspect, slope, fire behavior fuel model, canopy cover, canopy height, canopy base height, and canopy bulk density were used as the basis for geospatial wildland fire modeling. Together these geospatial data layers make up the "landscape" file used by the FlamMap fire behavior modeling system (Finney 2006) used for analysis of this project. LANDFIRE national data was evaluated together with other local fuels data and was determined to be the best suited for this analysis.

Given uncertainty of any modeling, the results are best used to compare the relative effects of the alternatives, rather than an indicator of absolute effects. Interpretation, professional judgment, and local knowledge of fire behavior were used to evaluate the outputs from the models and adjustments made as necessary to refine the predictions.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. For analysis purposes, implementation of the Hi-Grouse project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. Activities within and adjacent to the planning area can collectively modify wildland fire spread and behavior. To account for fire spread into the planning area, ongoing and proposed activities recorded in the Forest Service Activity Tracking System (FACTS) within the Badger Basin-Willow Creek HUC 5 Watershed were analyzed. The cumulative effects analysis area is the entire Hi-Grouse Project Area. The analysis timeframe is 20 years for short-term effects such as temporary decreases in canopy closure after thinning treatments. Some long-term effects, such

as the time it takes trees to mature, would occur in excess of 20 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E.

Historical Fire Weather Analysis

Remote automated weather stations (RAWS) collect fire weather that is archived and available through KCFAST (http://fam.nwcg.gov/fam-web/kcfast/mnmenu.htm) and the Western Region Climate Center (http://www.raws.dri.edu/index.html). Weather for this analysis was initially obtained from three RAWS stations. Based on input from the KNF fire personnel and a review of the data, the Van Bremmer station data was determined to best represent the planning area.

Fire Behavior Potential

Fire behavior is driven by the combination of fuels, topography, and weather across the landscape. Surface fire is fire that burns in the surface fuels (grass, shrubs, litter, dead and down branch wood, and short trees in contact with the ground surface). Crown fire refers to fire burning in the tree canopy. Two types of crown fire can be modeled in fire behavior modeling systems. Passive crown fire also referred to as torching, kills individual or small groups of trees. Active crown fire, also referred to as continuous crown fire, involves the entire surface and canopy fuel complex and crowning remains dependent on heat from the surface fuels. Crown fires are more difficult to control and have more severe and lasting effects than surface fire due to the increased rate of spread, increased intensity, and likelihood to start spot fires long distances ahead of the fire front.

The FlamMap fire modeling system (Finney 2006) was used to assess the distribution of potential fire behavior characteristics in the planning area. Specific characteristics assessed were fireline intensity expressed as flame length, rate of spread, and type of crown fire activity.

Late-Successional Wildlife Habitat and Burn Probability

The FlamMap fire behavior modeling system was used to estimate burn probability. Burn probability, as used in FlamMap, is defined as the number of times a pixel (each pixel represents a 30 meter by 30 meter area) burned as a proportion of the total number of fires simulated. One thousand random ignitions were used in the simulations. Burn probabilities are related to the sizes of fires that occur on a given landscape. Large fires burn a larger portion of the landscape than small fires and therefore a given pixel is likely to be burned by multiple fires resulting in a higher burn probability. Since fire size is a function of the gross spread rate and duration of the fire, treatments that reduce the spread rate would lower the burn probability. Burn probability estimates were used to assess the effectiveness of treatment alternatives in reducing fire spread into areas of high quality NSO nesting/roosting and NGH nesting habitat.

Analyzing potential fire behavior and effects were based on the severe weather conditions, collected from historical weather records. To model fire behavior in FlamMap, fuel moistures and conditioning periods were selected to represent the 97th percentile. The 97th percentile was used because it represented maximum fire behavior for approximately 90 percent of the fires that have occurred. Kit Jacoby indicated that problem fire weather occurs from June through September when the 1-hour fuel moisture is 6 percent and 10-hour fuel moisture is slightly higher, with wind playing a prominent role (Jacoby, K., 2008, *personal communication*). The Van Bremmer station has a high frequency of days when the 1-hour fuel moisture was no higher than 6 percent and the 10-hour fuel moisture was no higher than 8 percent. Winds of 25 mph from the northwest were used for analysis since those were the predominant winds during the burning periods

Affected Environment

Major influences on the Hi-Grouse Project Area over the last 100 years are railroad logging that started in the early 1900 and fire suppression (USDA Forest Service 1996; Ritchie 2005). Past timber harvests removed most of the larger ponderosa pine and white fir from the original forest (Creasy et al. 2007; Ritchie 2005). It is estimated that approximately 60 percent of the Hi-Grouse Project Area had previous partial cutting (pine removals, sanitation/salvage, thinning), 5 percent were regenerated by clearcut and shelterwood methods, and 30 percent had a full or partial overstory removal of the largest trees. The selective cutting prescriptions which removed larger true fir over the last several decades in the true fir-dominated stands has lead to *annosus* root disease impacts on stand structure and mortality (Angwin 2008).

Fire History, Occurrence, and Regime

Fires were much more common in the planning area prior to European settlement, with much of the area experiencing short fire-return intervals. Estimated fire-return intervals are slightly longer than 4 to 19 years for white fir/ponderosa pine, 8 to 20 years in mixed conifer, 9 to 42 years for white fir/mixed conifer, and about 60 to 80 years for lodgepole pine/mixed conifer (USDA Forest Service 1996). With the natural fire occurrence, low intensity fires kept the understory fairly open, with scattered grasses and forbs. (USDA Forest Service 1996).

Analysis of fire history data reveals that the planning area has not experienced a wildland fire greater than 100 acres since 1918 when one touched the planning area's northern boundary (Creasy et al. 2007). This lack of fire in the planning area has contributed to the current vegetative structure and composition, fuel load, and subsequent increase in fire hazard. Fire exclusion has allowed the establishment and dominance of true firs, where ponderosa pine was historically maintained as the dominant or a co-dominant species by frequent, low- to mixed-severity fires. This influx of true firs in the understory and mid-story provides a ladder for fire, thus threatening the overstory trees.

A fire regime is a generalized description of the role fire plays in an ecosystem (Agee 1993). Historical fire regimes can provide useful references for evaluating landscape health and designing ecologically viable fuel treatments (Reinhardt et al. 2008). For a more detailed synopsis of fire regimes in the planning area, refer to the Silviculture Report (Schantz 2009a). In general, the lower elevation white fir series historically experienced a frequent low severity fire regime. Due to fire exclusion and changes in species composition and structure, most notably the replacement of fire tolerant ponderosa pine with fire intolerant white fir, the series has accumulated surface and ladder fuels conducive to stand-replacement fire. In the higher elevation red fir series, fire was historically less frequent than in the white fir series and the fire regime was characterized as a moderate frequency mixed-severity fire regime. Today the red fir series is also more conducive to stand-replacement fire.

Measured live woody fuel moistures vary greatly depending on time of season and species measured, with values as low as 60 percent and well above 180 percent. Based on the measured fuel moistures for greenleaf manzanita (*Arctostaphylos patula)* and live fuel moisture guidelines (Scott and Burgan 2005), live herbaceous and live woody values are assumed two-thirds cured, or dried (60 percent herbaceous, 90 percent woody). Generally, fire in fuels with shrubs (grass shrub, shrub, and timber understory models) would have more active fire behavior when live woody fuel moisture is below 100 to 120 percent, depending on species and location. By using the selected live fuel moistures, the modeled fire behavior in this analysis would reflect more active fire behavior in fuel models that incorporate live fuels.

Fire Behavior and Fuels

A fire behavior fuel model is a set of fuelbed inputs used to predict surface fire behavior and transition to crown fire. Table 3.2-5 shows the distribution of fuel models in the Hi-Grouse Planning Area.

Table 3.2-5. Current distribution of fire behavior fuel models in the Hi-Grouse Planning Area

Fuel Model	Fuel Model Descriptor	Acres	Percent of Total
TU5	Very high load, dry climate timber-shrub	3,144	42
TL8	Long-needle litter	858	12
TL5	High load conifer litter	762	10
GS2	Moderate load, dry climate grass-shrub	761	10
TL4	Small downed logs	616	8
TU1	Low load dry climate timber-grass-shrub	532	7
TL3	Moderate load conifer litter	477	6
Other	Includes grass, grass-shrub, shrub, timber litter, timber understory models with less than 25 acres each and non-burnable areas currently in the planning area	302	5

Forty-two percent of the planning area is mapped as fire behavior fuel model timber-understory 5 (TU5). The primary carrier of fire in TU5 is heavy forest litter with a shrub or small tree understory. Within the planning area, this fuel model is mostly associated with the white fir/pine community. Thirty-six percent of the planning area is mapped with a timber litter (TL) fuel model. The primary carrier of fire in the timber litter fuel models is dead and down woody fuel. Live fuel, if present, has little effect on fire behavior. The timber litter fuel models are dispersed throughout the planning area with the exception of TL5, which is concentrated in the lodgepole pine community. The primary carrier of fire in TL5 is high-load conifer litter and light slash or mortality fuel. Ten percent of the planning area is mapped as grass-shrub 2 (GS2). The primary carrier of fire in GS2 is grass and shrubs combined.

Fire behavior characteristics are directly related to fire behavior fuel models, but vary with fuel moisture and wind. Modeled minimum, maximum, and mean flame lengths and rates of spread and number of acres of crown fire activity under current conditions for each fuel model are included in table 3.2-6. Flame lengths range from nearly 0.5 feet to several hundred feet where there is crown fire. The average flame length for the planning area is 41 feet. The dominant TU5 fuel model would have a lot of crown fire resulting in the high average flame length. Rates of spread range from less than 20 feet per hour to several miles per hour where there is crown fire or flashy grass and shrub fuels. The average rate of spread is 48 chains per hour. Fire behavior in the planning area is dominated by the expected high flame lengths and rates of spread associated with crown fire in the majority of the area represented by the TU5 fuel model. Nearly one-half of the area is expected to experience either passive or active crown fire with flame lengths greater than 8 feet (table 3.2-7).

Table 3.2-6. Current fire behavior characteristics in the major fuel models

Flame length and Rate of Spread							
Fuel Model	Acres	Minimum Flame Length (ft)	Maximum Flame Length (ft)	Mean Flame Length (ft)	Minimum Rate of Spread (ch/hr)[1]	Maximum Rate of Spread (ch/hr)	Mean Rate of Spread (ch/hr)
TU5	3,144	3	349	86	1	451	91
TL8	858	1	228	6	1	399	12
TL5	762	1	3	2	1	12	3
GS2	761	1	143	17	1	415	54
TL4	616	1	2	1	<1	7	2
TU1	532	1	4	1	<1	12	1
TL3	477	<1	1	1	<1	3	1
Crown Fire Activity (acres)							
		Surface	**Torching**	**Active Crown**			
TU5		282	1,291	1,572			
TL8		824	2	32			
TL5		762					
GS2		479	193	89			
TL4		616					
TU1		532					
TL3		477					
Acres with Potential Fire Behavior							
Flame Length (ft)	**Acres**		**Rate of Spread (ch/hr)**	**Acres**		**Crown Fire Activity**	**Acres**
0–4	3,868		0–1	594		Surface	3,972
4–8	442		1–5	2,944		Torching	1,485
8–11	118		5–10	555		Active	1,692
> 11	3,024		10–20	373			
			20–40	442			
			40–80	621			
			> 80	1,923			

[1] ch/hr = chains per hour; one chain equals 66 feet.

Late-Successional Habitat. Fuel model TU5 makes up the majority of the identified NSO nesting/roosting (72 percent) and NGH nesting (68 percent) habitats. The expected high flame lengths in this fuel model, in combination with the higher stand densities and multi-layered structure of these late-successional forests, lead to approximately two-thirds of the identified habitat areas expected to experience either passive or active crown fire. High flame lengths and rates of spread in the areas surrounding the late-successional habitat increase the likelihood of fire moving into the habitat areas. Mean burn probability is 11 percent for the NSO nesting/roosting habitat and 10 percent for the NGH nesting habitat. Acres of potential crown fire activity and burn probability modeled under current conditions within each habitat area is included in table 3.2-7.

Table 3.2-7. Crown fire activity and burn probability within NSO nesting/roosting and northern goshawk nesting habitat

	Crown Fire Activity (acres)			Burn Probability (percent)		
	Surface	Torching	Active Crown	Minimum	Maximum	Mean
NSO nesting/roosting	186	141	217	3	15	11
NGH nesting	275	154	298	2	15	10

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

There would be no direct effect on fuels and fire behavior from the no action alternative. Over time, indirect effects of no management actions would result in additional accumulation of large dead and down fuels in areas of *annosus* infection. Forest fuel models would become fuel model TL7 where there is little herbaceous or shrub understory and TU5 where there is understory. This would result in increased fire intensity and severity, including increased passive and active crown fire.

Cumulative Effects

The above noted accumulations of large dead and down fuels would furthermore increase the probability of fire spread into late-successional habitat patches and risk of losing the desired composition and structure to stand-replacement fire.

Alternative 3

Direct and Indirect Effects

Alternative 3 would reduce surface fuels, resulting in a change in fuel models in much of the planning area, but on fewer acres than alternative 4. Some areas would retain their surface fuel characteristics, but receive treatment that would result in increased canopy base heights, decreased canopy cover, and decreased canopy bulk density, resulting in reduced fire behavior. The fire behavior would be reduced from current conditions. Table 3.2-8 shows the fire behavior characteristics by fuel model. While the ranges of flame length and rate of spread are similar to the current conditions, the means for each fuel model are reduced. Average flame length and rate of spread for the planning area are 26 feet and 32 chains per hour, respectively. Approximately 25 percent of the planning area is expected to experience either passive or active crown fire and/or flame lengths greater than 8 feet (table 3.2-8).

Table 3.2-8. Alternative 3 fire behavior characteristics in the major fuel models

Flame length and Rate of Spread							
Fuel Model	**Acres**	**Minimum Flame Length (ft)**	**Maximum Flame Length (ft)**	**Mean Flame Length (ft)**	**Minimum Rate of Spread (ch/hr)[1]**	**Maximum Rate of Spread (ch/hr)**	**Mean Rate of Spread (ch/hr)**
TU5	2,571	3	349	65	1	451	70
TU1	1,011	1	4	2	<1	12	2
TL1	726	<1	1	1	<1	1	1
TL3	640	<1	2	1	<1	4	1
GS2	526	1	143	18	1	415	61
GS1	501	1	176	5	1	298	17
TL8	497	1	228	7	1	399	13
TL4	420	1	2	1	<1	7	2
TL5	335	1	3	2	1	12	3
Crown Fire Activity (acres)							
		Surface	**Torching**	**Active Crown**			
TU5		911	689	971			
TU1		1,011					
TL1		726					
TL3		640					
GS2		369	79	78			
GS1		489	1	11			
TL8		477	<1	20			
TL4		420					
TL5		335					
Acres with Potential Fire Behavior							
Flame Length (ft)	**Acres**		**Rate of Spread (ch/hr)**	**Acres**		**Crown Fire Activity**	**Acres**
0–4	4,516		0–1	1,108		Surface	5,380
4–8	1,039		1–5	2,970		Torching	769
8–11	96		5–10	988		Active	1,079
> 11	1,801		10–20	505			
			20–40	301			
			40–80	358			
			> 80	1,222			

[1] ch/hr = chains per hour.

Late-Successional Habitat. Alternative 3 would treat the same amount of acres of late-successional habitat as alternative 4. Table 3.2-9 shows the potential crown fire activity and burn probability within NSO nesting/roosting and NGH nesting habitat areas for alternative 3. The reduced fire behavior outside of the late-successional habitat would decrease the probability of

fire spread into the habitat areas. Mean burn probability is 5 percent for the NSO nesting/roosting habitat and 4 percent for the NGH nesting habitat (table 3.2-9).

Table 3.2-9. Alternative 3 crown fire activity and burn probability within NSO nesting/roosting and northern goshawk nesting habitat

	Crown Fire Activity (acres)			Burn Probability (percent)		
	Surface	Torching	Active Crown	Minimum	Maximum	Mean
NSO nesting/roosting	218	128	199	<1	11	5
NGH nesting	391	128	209	0	11	4

Cumulative Effects

Similar restoration projects have been carried out within the Goosenest AMA and other parts of the watershed. In conjunction with these projects, it is likely that with any of the action alternatives the potential for large uncharacteristic wildfires and bark beetle outbreaks in ponderosa pine and white fir would be reduced. Use of fire as a management tool, including wildland fire, in the future could be increased.

Proposed vegetation and fuels activities within FACTS are likely to have little effect on wildland fire spread and behavior within the planning area due to their small acreage and location in relation to the planning area. Proposed activities are at least 2 miles from the planning area boundary and most of the acreage is to the northeast within the Callahan Lava Flow HUC 7 Watershed, while the predominant winds are from the south to northwest (figure 3.2-1).

Alternative 4 (Modified Proposed Action)

Direct and Indirect Effects

Alternative 4 would reduce surface fuels, resulting in the change in fuel models in much of the planning area, and approximately 300 more acres than alternative 3. Some areas would retain their surface fuel characteristics, but receive treatment that would result in increased canopy base heights, decreased canopy cover, and decreased canopy bulk density, resulting in reduced fire behavior. The fire behavior would be reduced from current conditions. Table 3.2-10 shows the fire behavior characteristics by fuel model. While the ranges of flame length and rate of spread are similar to the current conditions, the means for each fuel model are reduced. Average flame length and rate of spread for the planning area are 23 feet and 30 chains per hour, respectively. Approximately 22 percent of the planning area is expected to experience either passive or active crown fire and/or flame lengths greater than 8 feet (table 3.2-10).

Table 3.2-10. Alternative 4 fire behavior characteristics in the major fuel models

Flame length and Rate of Spread							
Fuel Model	**Acres**	**Minimum Flame Length (ft)**	**Maximum Flame Length (ft)**	**Mean Flame Length (ft)**	**Minimum Rate of Spread (ch/hr)[1]**	**Maximum Rate of Spread (ch/hr)**	**Mean Rate of Spread (ch/hr)**
TU1	1,910	1	4	2	<1	12	2
TU5	1,790	3	349	82	1	451	87
GS2	1,314	1	143	9	1	415	33
TL1	678	<1	1	1	<1	1	1
TL4	403	1	2	1	<1	7	2
TL3	357	<1	1	1	<1	3	1
TL8	311	1	228	9	1	399	19
GS1	270	1	51	3	1	197	16
TL5	202	1	3	2	1	12	4
Crown Fire Activity (acres)							
		Surface	**Torching**	**Active Crown**			
TU1		1,910					
TU5		341	606	843			
GS2		1,180	61	73			
TL1		678					
TL4		403					
TL3		357					
TL8		292	<1	19			
GS1		270	1				
TL5		202					
Acres with Potential Fire Behavior							
Flame Length (ft)	**Acres**		**Rate of Spread (ch/hr)**	**Acres**		**Crown Fire Activity**	**Acres**
0– 4	4,831		0–1	977		Surface	5,633
4–8	972		1–5	3,167		Torching	668
8–11	81		5–10	707		Active	935
> 11	1,567		10–20	705			
			20–40	498			
			40–80	322			
			> 80	1,075			

[1] ch/hr = chairs per hour. One chain equals 66 feet, 80 chains equals a mile.

Late-Successional Habitat. Alternative 4 would treat the same amount of acres of late-successional habitat as alternative 3. Table 3.2-11 shows the potential crown fire activity and burn probability within NSO nesting/roosting and NGH nesting habitat areas for alternative 4. The reduced fire behavior outside of the late-successional habitat decreases the probability of

fire spread into the habitat areas. Mean burn probability is 4 percent for the NSO nesting/roosting and NGH nesting habitat (table 3.2-11).

Table 3.2-11. Alternative 4 crown fire activity and burn probability within NSO nesting/roosting and northern goshawk nesting habitat

	Crown Fire Activity (acres)			Burn Probability (percent)		
	Surface	Torching	Active Crown	Minimum	Maximum	Mean
NSO nesting/roosting	218	128	199	0	9	4
NGH nesting	391	128	209	0	9	4

Cumulative Effects

Within the planning area, timber harvest and fire suppression have been the dominant management activities having a cumulative effect on vegetation and fuel. The trends that have developed under this management regime would continue with no action, and would contribute to the adverse forest health conditions discussed under the existing condition in chapter 1 and increase the risk of high-severity fire.

Cumulative effects for alternative 4 would be similar to those discussed under alternative 3. An additional 300 acres of lodgepole would be treated under alternative 4 and result in reduced burn probability (see figure 3.2-1).

Summary and Conclusions

Table 3.2-12 summarizes the crown fire activity and burn probability within NSO and NGH habitat. Figure 3.2-1 includes burn probability maps for current conditions and each alternative. Currently, fire behavior in the planning area is dominated by the high flame lengths and rates of spread associated with crown fire in the majority of the area represented by the TU5 fuel model. Nearly one-half of the area is expected to experience either passive or active crown fire with flame lengths greater than 11 feet. Mean burn probabilities are 11 percent for the NSO nesting/roosting habitat and 10 percent for the NGH nesting habitat. Modeled fire behavior under current conditions is not characteristic of the frequent low severity and moderate frequency mixed-severity historical fire regimes of the planning area.

Both alternatives 3 and 4 include treatments that would reduce the amount of TU5 fuel model, increase canopy base heights, and reduce canopy bulk density; thus reducing crown fire and burn probabilities and moving the expected fire behavior more towards conditions characteristic of the historical fire regimes of the planning area. Alternative 4 would provide a greater reduction in fire behavior in the planning area followed by alternative 3.

Alternative 3 would have reduced flame length, rate of spread, and torching or active crown fire when compared to no action. Burn probability would be reduced from no action, and slightly more than alternative 4. Acres with crown fire within the planning area would be reduced by approximately 40 percent in this alternative. Mean burn probability would be reduced by 6 percent in both NSO nesting/roosting and NGH nesting habitat.

Alternative 4 would have approximately 300 more acres overall with reduced flame length, rate of spread, and passive or active crown fire; and lower burn probability in late-successional habitat than alternative 3. Acres with crown fire within the planning area would be reduced by

approximately 50 percent in this alternative. Mean burn probability would be reduced by 7 percent in NSO nesting/roosting habitat and 6 percent in NGH nesting habitat.

Table 3.2-12. Crown fire activity and burn probability within NSO nesting/roosting and northern goshawk nesting habitat for all alternatives

Alternative 1 (No Action)	Crown Fire Activity (acres)			Burn Probability (percent)		
	Surface	Torching	Active Crown	Minimum	Maximum	Mean
NSO nesting/roosting	186	141	217	3	15	11
NGH nesting	275	154	298	2	15	10
Alternative 3	**Crown Fire Activity (acres)**			**Burn Probability (percent)**		
	Surface	Torching	Active Crown	Minimum	Maximum	Mean
NSO nesting/roosting	218	128	199	<1	11	5
NGH nesting	391	128	209	0	11	4
Alternative 4	**Crown Fire Activity (acres)**			**Burn Probability (percent)**		
	Surface	Torching	Active Crown	Minimum	Maximum	Mean
NSO nesting/roosting	218	128	199	0	9	4
NGH nesting	391	128	209	0	9	4

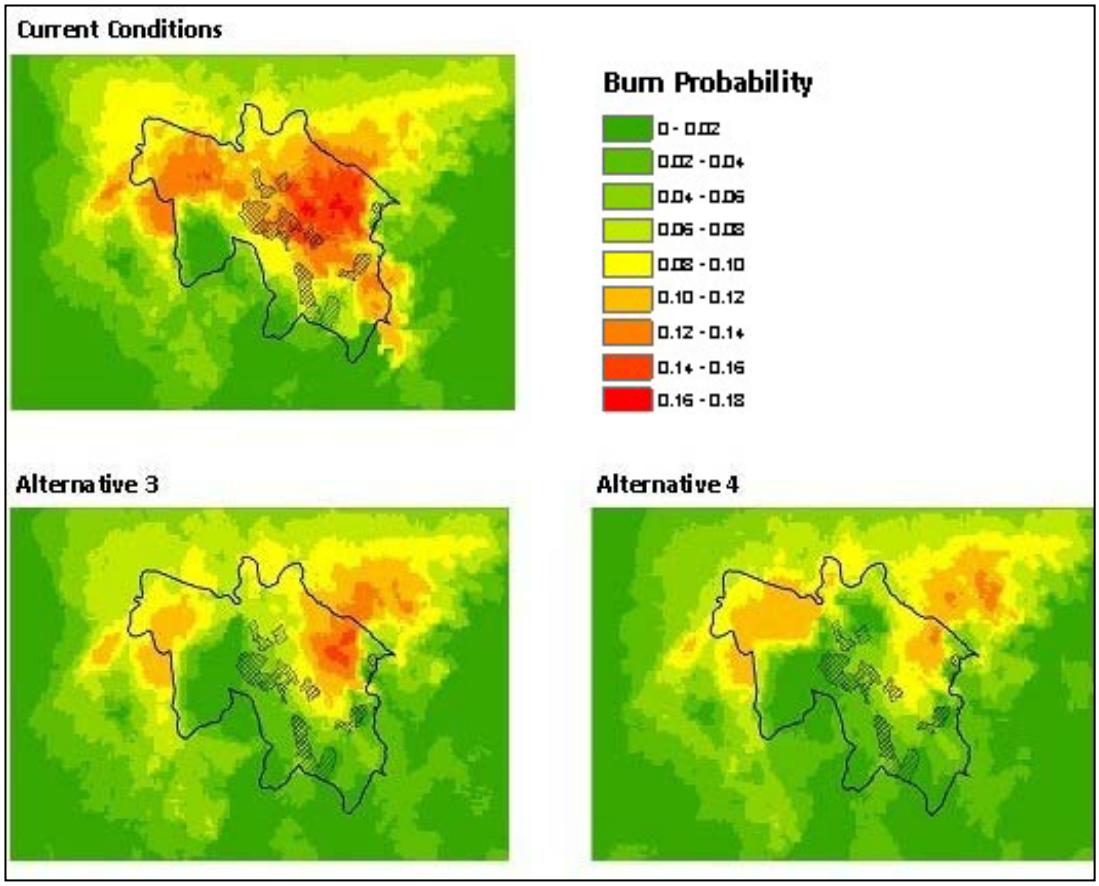

Figure 3.2-1. Burn probability by alternative

3.2.3 *Terrestrial Wildlife*

3.2.3.1 Wildlife–General

The effects of each alternative on Northwest Forest Plan (NWFP) LSR, endangered and threatened species protected under the Endangered Species Act (ESA); designated NSO critical habitat; species listed as sensitive by Region 5 of the USDA Forest Service, NWFP survey and management species, management indicator species (MIS) designated in the Forest Plan, and migratory birds and deer within the project area are summarized in table 3.2-13. Species that may occur within the project area, or may be impacted from project alternatives are discussed below. Among the most notable of these are NSO, which are protected through multi-state habitat management plans. How well each alternative would meet the project objective and the impacts to wildlife and their habitats is discussed within this section.

For more detailed discussions of affected environment, methods, or environmental consequences for the species considered see the following reports: Biological Assessment (Oechsner 2010a, 2010b) for the federally listed species; the Biological Evaluation (Oechsner 2010c) for Region 5 sensitive species; the Management Indicator Species Project Level Assessment Part I and Part II (Oechsner 2010d, 2010e) for MIS; the Survey and Manage Report (Oechsner 2009) for Chace sideband; and the Migratory Bird and Deer Analysis (Oechsner 2010f) for the affected birds and deer. These reports are incorporated by reference and available on the Forest Internet website at: www.fs.usda.gov/klamath.

Methodology

The methodology and scope used for the wildlife analyses are noted here where in common. Only the areas of difference are noted in the species specific discussions below.

Stand examination data and walk-through field recognizance data were used to discuss and evaluate the existing forested conditions and habitats within the project area. Using field verifications and aerial photography, the vegetation data layer called ‘e-veg04’ from USFS Region 5 Remote Sensing Laboratory was updated by Rob Schantz (USDA Forest Service silviculturist), Christy Cheyne (USDA Forest Service wildlife biologist) and Elizabeth Willy (USDI Fish and Wildlife Service wildlife biologist).

Acres noted are approximate. New or relocated landing locations would be approximately one-half acre in size.

Scope of Analysis: Affected environment for all species includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the action alternatives, along with the project design features. Implementation of the Hi-Grouse project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start) (Schantz 2009a).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. The cumulative effects analysis area varies by species, due to range and or habitat

availability, and is discussed in more detail below. The analysis timeframe varies by the anticipated habitat effect. For example, 20 years may be used for short-term effects such as temporary decreases in canopy closure after thinning treatments. Some long-term effects, such as the time it takes trees to mature, would occur in excess of 20 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E.

Three future projects located adjacent to the Hi-Grouse Project Area overlap the analysis areas for NSO, bats, MIS, and deer. A brief description of these future projects follows, and the effects of these relevant projects are noted in the related species sections.

Adjacent to the southwest of the Hi-Grouse Project Area, the 9,562-acre Pumice Project is in the early planning stages, and would focus on vegetation management and fuels reduction treatments. The 14,833-acre Hoffman Project is located adjacent to the south of the Hi-Grouse Project Area on the McCloud District of the Shasta-Trinity National Forest and would focus on dwarf mistletoe areas. Group selections, sanitation, and small-diameter tree thinning may be proposed.

The Highlands Roadside Safety Improvement Project is planned east of the Hi-Grouse Project Area on the Doublehead District of the Modoc National Forest. The proposed action is to remove dead and dying hazard trees from along approximately 147 miles of major access roads. Vegetation would be removed around corners to increase sight distance. The following activities are proposed:

- Thinning of green trees greater than 12 inches dbh where necessary to improve line of sight
- Mow brush and low growing vegetation to improve line of sight distances
- Prune tree limbs to a height of 8 to 16 feet
- Hand pile and burn residual fuels to reduce surface accumulations and ladder fuels

Species Considered in Analysis. The list of threatened, endangered and proposed species for the area affected by the project was obtained via internet from the Arcata Field Office of the USDI Fish and Wildlife Service on November 24, 2009. The project area lies within the Shasta/McCloud Northern Spotted Owl Critical Habitat Unit Number 29 which was designated on August 13, 2008 (Oechsner 2010a, 2010b). The Regional Forester's sensitive species list (last amended October 15, 2007, to include the delisted bald eagle) identifies 22 sensitive animal species that may occur on the Forest. The Forest Plan (as amended August 15, 2007) lists the peregrine falcon as a sensitive species. However, peregrine falcons are no longer on the Regional Forester’s sensitive species list and were not analyzed (Oechsner 2010c). The Forest Plan also identifies MIS and a project-level assessment was completed to identify potentially affected species (Oechsner 2010d, 2010e). Additional species that may occur in the project area were also analyzed (Oechsner 2009).

In order to determine the scope of analysis, a preliminary evaluation was conducted for each potentially affected species. There are many species that would not be affected by this project, due to lack of habitat and or lacking likelihood of occurrence in or adjacent to the project area. The following species or and their habitats would not be affected by project actions and are listed in the respective wildlife analysis (Oechsner 2010a, 2010b, 2010c, 2010d, 2010e, 2010f).

Federally Listed Species
shortnose sucker
Lost River sucker
delta smelt
vernal pool fairy shrimp

Region 5 Sensitive Species
California wolverine
Pacific fisher
Sierra Nevada red fox
bald eagle
willow flycatcher
Swainson's hawk
greater sandhill crane
great gray owl
northwestern pond turtle
Siskiyou mountain salamander
Cascades frog
foothill yellow-legged frog
southern torrent salamander
Tehama chaparral snail
Steelhead–Klamath Mountain Province Evolutionary Significant Unit (ESU)
Upper Klamath/Trinity Chinook ESU–Spring Run
Upper Trinity River Chinook ESU–Fall Run

Management Indicator Species
acorn woodpecker
western gray squirrel
northern red-legged frog
western pond turtle
rainbow trout
steelhead
tailed frog
Cascades frog
American dipper
northern water shrew
long-tailed vole
pronghorn
montane vole
loggerhead shrike
Swainson's hawk
sage thrasher
burrowing owl
hairy woodpecker
downy woodpecker
pinyon jay

Survey and Manage Species
Chace sideband
blue-gray taildropper slug

This analysis document focuses on only those species with potential habitat that may occur in the project area, and that may be affected by project activities. Table 3.2-13 summarizes the species discussed in this document.

Table 3.2-13. Summary of species considered and their determination or findings of effects

Species	Classification	Potential Suitable Habitat / Likelihood of Occurrence in Project Area?	Determination/Finding for Alternative 1	Determination/finding for Alternatives 3 and 4
NSO and NSO critical habitat	Federally listed Designated critical habitat	Yes/may Designated critical habitat present	No effect No effect	May affect, but is not likely to adversely affect NSOs May affect, but is not likely to adversely affect NSO critical habitat
American marten	Region 5 Sensitive	Yes/may	No impact	May impact individuals but not likely to result in a trend toward listing or loss of viability
Northern goshawk	Region 5 Sensitive	Yes/may	No impact	May impact individuals but not likely to result in a trend toward listing or loss of viability
Townsend's big-eared bat	Region 5 Sensitive	Yes/may	No impact	May impact individuals but not likely to result in a trend toward listing or loss of viability
Pallid bat	Region 5 Sensitive	Yes/may	No impact	May impact individuals but not likely to result in a trend toward listing or loss of viability
Red-breasted sapsucker	Snag associated MIS, migratory bird	Yes/may	No effect	No impact on forest-level habitat and no change to the population trend
Vaux's swift	Snag associated MIS, migratory bird	Yes/may	No effect	No impact on forest-level habitat and no change to the population trend
Pileated woodpecker	Snag associated MIS, migratory bird	Yes/may	No effect	No impact on forest-level habitat and no change to the population trend
Black-backed woodpecker	Snag associated MIS, migratory bird	Yes/may	No effect	No impact on forest-level habitat and no change to the population trend
White-headed woodpecker	Mature ponderosa pine MIS, migratory bird	Yes/may	No effect	No impact on forest-level habitat and no change to the population trend
Flammulated owl	Mature ponderosa pine MIS, migratory bird	Yes/may	No effect	No impact on forest-level habitat and no change to the population trend
Mule deer	Big game	Yes/yes	No effect	Improve habitat by increasing foraging habitat while maintaining adequate cover

Affected Environment

The existing vegetative conditions within the project area are discussed by forest type in chapter 1 of this document. Specific species habitats are noted in the sections below.

3.2.3.2 Threatened Species, Northern Spotted Owl and Critical Habitat

Methodology

The list of threatened, endangered and proposed species for the area affected by the project was obtained via internet from the Arcata Field Office of the USDI Fish and Wildlife Service on November 24, 2009. The NSO (*Strix occidentalis caurina*) was listed along with the Shasta/McCloud Northern Spotted Owl Critical Habitat Unit Number 29, which was designated on August 13, 2008 (Oechsner 2010a, 2010b).

Analysis methods involve a combination of on-the-ground surveys, vegetation modeling, and the comparison of documented habitat criteria to pre- and post-treatment conditions. The project area and adjacent lands have been extensively surveyed over the past 5 years by KNF and USDI Fish and Wildlife Service personnel. Most recently, protocol surveys were completed for the project area in 2009.

Barred owls have been documented utilizing NSO habitat within the project area, and competition between the species may be occurring. Barred owls negatively affect site occupancy, reproduction, and survival of NSOs (Livezey et al. 2007). It is possible that these same negative effects may be occurring to spotted owls if they are currently occupying the project area.

Scope of Analysis: Direct and indirect effects of the Hi-Grouse project were evaluated at the Badger Basin-Willow Creek Watershed level, quarter townships, the project area, LSR #5297, and Critical Habitat Subunit 67spatial scales. A new NSO habitat layer was created from the stand examination, aerial photos, and field verification that encompass the NSO critical habitat, the project area. For cumulative effects analysis an estimated 1.3-mile home range of NSO that overlaps the project area was used with, a 16-mile radius for dispersal habitat was considered (Oechsner 2010a, 2010b). The timeframe is 20 years for short-term effects and long-term effects are those occurring in excess of 20 years (e.g., for nest trees to mature).

Terminology important for this section:

Degraded ~ the habitat continues to function at its current state (i.e., nesting/roosting/foraging). For example, pre-treatment nesting/roosting habitat maintains the characteristics and functionality of nesting/roosting habitat post-treatment.

Dispersal (connectivity) habitat ~ patches of vegetation used by wildlife to move between habitats. Areas with 50 percent 11-inch dbh and greater trees with 40 percent canopy closure are considered to function as NSO dispersal habitat (Thomas 1979).

Downgraded ~ habitat characteristics are changed from suitable nesting/roosting to foraging habitat or foraging habitat that is changed to dispersal habitat.

Removed ~ habitat that is eliminated and no longer functions as owl habitat (remains capable).

Affected Environment

The Goosenest District is the eastern most district of the KNF, and the project area is the eastern extent of the NSO range in the fire-prone California Cascades (USDA Forest Service 1996). Six activity centers occur on the eastside of the Goosenest District within 16 miles of the project area. (Sixteen miles is about the mean dispersal distance for 50 percent of the juvenile male and female owls [Forsman et al. 2002].) The McCloud District of the Shasta-Trinity National Forest has two NSO activity centers within 16 miles of Activity Center KL-3201 (D. Derby 2009, *personal communication)*. The Doublehead District of the Modoc National Forest has two established NSO activity centers within 16 miles of KL-3201 Activity Center within the project area. There are two additional "paired" owl locations on the Doublehead District. These recently discovered owl locations do not yet have activity centers determined (P. Beuttner 2009, *personal communication*).

Activity Center KL-3201 was established in 1989 when a pair of NSOs was found. Surveys for NSOs were conducted in and around KL-3201 off and on since 1991, including 2007, 2008, and 2009. In recent survey years, barred owls were detected within 0.7 mile of Activity Center KL-3201; NSOs have not been detected there since 1994. The presence of barred owls is known to interfere or inhibit responses from NSOs in the vicinity. Thus, survey results are inconclusive as to whether or not activity center KL-3201 is occupied by NSOs. Some nesting/roosting and foraging habitat located outside the project area, but within 1.3 miles of NSO habitat proposed for treatment, has not been surveyed to protocol.

Trend analysis for NSO habitat indicated an overall decline of about 2.1 percent in the amount of suitable habitat on Federal lands as a result of range-wide management activities from 1994 to 2003 (USDI Fish and Wildlife Service 2008). This rate of loss is lower than the 2.5 percent per decade estimate of habitat loss resulting from management activities predicted in the Northwest Forest Plan (USDI Fish and Wildlife Service 2008).

The California Cascade Province has shown a relatively high rate of NSO habitat loss (USDI Fish and Wildlife Service 2008). The average annual habitat decline of 0.64 percent within the California Cascade Province amounted to 5.77 percent (5,091 acres) over the course of 9 years through 2003 (USDI Fish and Wildlife Service 2008).

Approximately 60 percent of the project area has had previous partial cutting, 5 percent has been regenerated, and 30 percent had a full or partial overstory removal of the largest trees (Schantz 2009a). The Hi Timber Sale of 1989–1990 removed suitable nesting/roosting habitat within activity center core of KL-3201 and the surrounding area (C. Cheyne 2009, *personal communication*). Reductions in the amount of suitable nesting/roosting and foraging habitat have continued in the project area as a result of drought and increased insect- and disease-caused tree mortality.

5th-field Watershed. The project area occurs on the southern end of the Badger Basin-Willow Creek 5th-field Watershed. Approximately half of the watershed is considered capable land. Capable lands include those forests within NSO elevation limits of occupancy, at some time in the future, capable of growing and sustaining structural conditions that would function as owl habitat (USDI Fish and Wildlife Service 2008). The Badger Basin/Willow Creek Watershed is well below the 15 percent retention of late-successional/old-growth forest (LSOG) in Forest S&G 6-4 (USDA Forest Service 1995a). Table 3.2-14 displays the acres and percent of late-successional/old growth habitat in the Badger Basin-Willow Creek 5th-Field Watershed (Stresser 2009).

Table 3.2-14. Acres/percent of available late-successional/old growth habitat (LSOG) in the 5th-field watershed

5th-Field Watershed	Total Acres	Acres of Capable Land	Acres of LSOG	Percent LSOG
Badger Basin-Willow Creek	84,067	44,230	945	2%

Quarter-Townships. The project area overlaps six quarter townships. Dispersal or connectivity habitat is defined as 50 percent of the area with 11 inch or greater trees with 40 percent canopy closure (Thomas et al. 1990). Dispersal habitat was determined for these six quarter townships and ranges from 61 percent to 85 percent of the total acres. All quarter townships exceed the 50 percent threshold for dispersal habitat.

Late-Successional Reserves. The project area contains a 155-acre late-successional reserve (LSR #5297). LSRs are land allocations established in the NWFP. LSR #5297 lies within an area designated as NSO critical habitat (USDI Fish and Wildlife Service 2008) and has 71 acres of NSO nesting/roosting habitat, and 82 acres of NSO foraging habitat. LSR #5297 has no NSO dispersal habitat and 2 acres are classified as non-habitat (Oechsner 2010a, 2010b). See the NSO discussion below.

KL-3201 Activity Center. Tables 3.2-15, 3.2-16, and 3.2-17 display the amounts of nesting/roosting, foraging and suitable habitat needed and that exists within the KL-3201 503-acre core area and the 3,396-acre home range. LSR #5297 contributes 71 acres of nesting/roosting habitat and 66 acres of foraging habitat to the KL-3201 Core Area. There are currently sufficient amounts of nesting/roosting and foraging habitat within the KL-3201 Core Area. Forty acres of non-capable habitat also exists in the core area. A sufficient amount and type of habitat for NSOs currently exists within KL-3201 Activity Center.

Table 3.2-15. Suitable habitat that exists within the core of Activity Center KL-3201

Suitable Habitat	Acres (%) Needed	Acres (%) Existing
Nesting/Roosting	250 (50%)	297 (59%)
Foraging	150 (30%)	166 (33%)
Total Suitable	400 (80%)	463 (92%)

KL-3201 home range area (not including core) is 2,895 acres. LSR#5297 contributes 16 acres of foraging habitat to the home range. Approximately 2,233 acres is suitable habitat for NSOs within the home range. There are 662 acres in the home range not considered NSO habitat. Table 3.2-16 displays the acres of suitable NSO habitat that currently exists, and the non-habitat acres, within KL-3201 home range.

Table 3.2-16. Existing habitat within the KL-3201 home range (excluding the core area)

Suitable Habitat	Acres of Suitable Habitat	Percent of Suitable Acres	Percent of Home Range
Nesting/Roosting	223	10%	8%
Foraging	2,005	90%	69%
Dispersal	5	<1%	<1%
Total Suitable	**2,233**	**100 %**	**77%**
Non-habitat	662	-	23%

Table 3.2-17. Total combined suitable habitat that exists within the 1.3 mile (3,398 acre) home range of KL-3201

Suitable Habitat	Acres Needed	Acres Existing Suitable Habitat	Percent Existing Suitable Habitat	Percent of Home Range
Nesting/Roosting	>=250	520	19%	15%
Foraging	>=1,085	2,171	81%	64%
Dispersal	--	5	<1%	<1%
Total Suitable	1,336	2,696	-	79%

NSOs were not detected within KL-3201 or the project area during surveys in 2007, 2008, and 2009; barred owls were detected during surveys in 2007, 2008, and 2009. Prior timber harvest within the project area removed suitable NSO habitat and may have reduced the overall ability of NSOs to persist in the area. Although suitable habitat exists within the project area, the current condition and configuration of habitat is more likely to support territorial singles or dispersal by NSOs (C. Cheyne; E. Willy 2009, *personal communication*).

Critical Habitat. Critical habitat for a listed species contains the physical or biological features (primary constituent elements) essential to the conservation of the species. Primary constituent elements associated with nesting, roosting, and foraging habitats include moderate to high canopy closures; multi-layered, multi-species canopy; large overstory trees; large trees with deformities; large snags; large accumulations of down woody debris; and sufficient open space to fly beneath canopy. Primary constituent elements associated with dispersal habitat are adequate tree size and canopy closure to provide protection from predators and minimal foraging opportunities.

All but 15 acres (greater than 99 percent) of the 1,751 acres of Critical Habitat Unit 29, Subunit 67, occur within the Hi-Grouse Project Area. High quality habitat within Critical Habitat Subunit 67 is limited. Table 3.2-18 displays the existing habitat available.

Table 3.2-18. Existing NSO habitat in Critical Habitat Subunit 67 within the Hi-Grouse Project Area

Habitat Type	Acres of Critical Habitat Subunit 67 in Project Area	Percent of Suitable Critical Habitat in Subunit 67 in Project Area	Percent of Critical Habitat in Subunit 67 in Project Area
Nesting/Roosting	326	25%	19%
Foraging	973	75%	55%
Dispersal	0	0	0
Total Suitable Acres	**1,299**	-	-
Non-habitat	452	-	26%
Total Critical Habitat Acres	**1,751**	**-**	**-**

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect

Under the no action alternative, current management plans would continue to guide existing and previously authorized activities in the project area. Tree mortality from insects and disease would be expected to continue within the project area. Canopy cover would be expected to decrease over time due to the loss of dominant trees in the overstory from insects and disease. Snag numbers and down woody material would be expected to gradually increase as trees die due to crowded conditions, insects, and disease. Further development of large old trees within stands would likely progress slowly due to existing tree densities and competition for sunlight, nutrients, and water.

The amount of available nesting and roosting habitat for NSO within KL-3201 Activity Center and Critical Habitat Subunit 67 would be expected to continue to decline in the short and long term. Foraging habitat would continue to be provided in the short term, but would also be expected to decline long term. Dispersal habitat would be expected to increase as nesting, roosting, and foraging habitat declined over time.

The loss of NSO habitat to high-severity wildfire in the Klamath and Cascade Provinces has been relatively high over the last decade and if this trend continued, could significantly impact the owl in these drier forests (USDI Fish and Wildlife Service 2008). In the event of a wildfire within the project area, burn intensity, extent, and post-fire conditions would likely vary widely, resulting in a mosaic of habitat conditions. The quantity and quality of NSO habitat remaining after a wildfire would affect the continued viability of the KL-3201 Activity Center and Critical Habitat Subunit 67.

Cumulative Effects

There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination

Alternative 1 (no action) would have **no effect on NSOs or their habitat**.

Alternative 1 (no action) would have **no effect to Critical Habitat Subunit 67**.

Alternative 3

Direct and Indirect

Alternative 3 would not alter existing late-successional old growth habitat conditions in the Badger Basin-Willow Creek 5th field Watershed, and would not alter the existing amount of connectivity habitat within the six quarter townships. The potential for wildfire to burn through the LSR would be reduced by thinnings, fuel reductions, and fuel management zone proposed around it (Helmbrecht and Kurth 2009). Reducing the potential effects of wildfire burning through the LSR would benefit NSOs and their habitat. The effects of reduced stand density and canopy closure would last 10 to 20 years (see section 3.2.1 Forest Vegetation, tables 3.2-1 and 3.2-2). Alternative 3 effects would be less intensive and short-lived when compared to alternative 4.

Some nesting/roosting and foraging habitat would be degraded until canopy closure grows in (approximately 20 years). Habitat removal would result from new landings. No downgrades are anticipated from treatments.

Survey efforts throughout the life of the project will continue. Should a pair of breeding NSOs be detected within the project area or within 1.3 miles of a treatment unit outside the project area, the district biologist would reassess what appropriate actions should be taken to protect NSOs and their habitat. Actions proposed in alternative 3 across the project area would:

- Degrade 78 acres of nesting and roosting habitat and remove 1 acre of nesting/roosting habitat. The quantity of nesting and roosting habitat available to NSO would remain about the same.
- Degrade 2,402 acres of foraging habitat; remove 18.5 acres of foraging habitat.
- Degrade 38 acres of dispersal habitat; remove 0.5 acres of dispersal habitat.

Alternative 3 would not change the quantity or quality of nesting/roosting or foraging habitat within the 100-acre LSR #5297, because no treatments are proposed.

Treatments proposed in alternative 3 within Kl-3201 Core Area and home range would degrade some nesting/roosting and foraging habitat, until canopy closure grows in. Habitat removal would result from new landings. No downgrades are anticipated from treatments. Actions proposed in alternative 3 in the KL-3201 Activity Center Core would:

- Degrade 2 acres of nesting and roosting and remove 0.5 acre of nesting and roosting.
- Degrade 46 acres of foraging habitat.

Alternative 3 actions proposed in KL-3201 Home Range would:

- Degrade 61 acres of nesting and roosting and remove 0.5 acre of nesting and roosting.
- Degrade 556 acres of foraging habitat; remove 6 acres of foraging habitat.

Post-treatment, habitat within the KL-3201 Core Area and home range will remain above threshold retention values and remain most similar to the existing condition in the short term.

Because alternative 3 proposes less intensive thinning prescriptions over fewer acres than alternative 4, more higher quality NSO nesting and roosting habitat would be maintained over the short term. Over the long term, mid-seral white-fir stands not proposed for treatment in alternative 3, that are currently infected with root disease and fir engraver beetles and function as nesting, roosting and foraging habitat, would decline to the point that they would no longer provide habitat for northern spotted owls. Light thinning from below treatments would maintain NSO habitat in treated stands for the short and long term.

NSO Critical Habitat Subunit 67. Alternative 3 would have a minor effect on the primary constituent elements available to NSO within Critical Habitat Subunit 67 in the short term.

Alternative 3 would degrade 27 acres of nesting and roosting habitat and remove 0.5 acre of nesting and roosting habitat within Critical Habitat Subunit 67. The amount of nesting and roosting habitat available to NSO within Critical Habitat Subunit 67 would remain essentially the same. Alternative 3 would degrade 340 acres of foraging habitat and remove 1 acre of foraging habitat.

Treatments proposed in alternative 3 within critical habitat would degrade some nesting/roosting and foraging habitat, until canopy closure grows in. Habitat removal would result from new landings. No downgrades are anticipated from treatments. Light thinning from below treatments would maintain NSO habitat in Critical Habitat for the short and long term.

The characteristics of NSO nesting, roosting and foraging habitat will be retained post-treatment with the light thinning-from-below treatments, underburning, FMZs treatments, and use of existing roads and landings. Use of borax on freshly cut stumps is not expected to have adverse effects on wildlife or surrounding plants, invertebrates, or microorganisms (Dost et al. 1996).

Temporary roads and new landings would remove approximately 19 acres. Due to the number of acres and spatial arrangement of the treatments, the effects would not be expected to significantly impact primary constituent elements associated with NSO habitat or NSO critical habitat. There are no new temporary roads or non-system roads proposed for use within NSO critical habitat; therefore, no effects to NSO critical habitat are expected. The creation of new landings is not expected to significantly affect the PCEs associated with NSO critical habitat.

The risk of a stand-replacement fire within the project area and critical habitat would be reduced some, but would be higher than in alternative 4 due to less intensive fuel reductions on fewer acres.

Snag and Down Woody Primary Constituent Elements. Implementation of any thinning or prescribed burning is likely to result in loss of snags, future snags, and down wood—important stand attributes of healthy forests and critical components of wildlife and invertebrate habitat (Pilliod et al. 2006). During project activities, a few snags would be knocked over during thinning processes, and a few snags would be removed during temporary road building, and within FMZs. Any large-diameter snags deemed a hazard and felled for safety reasons would be left on site as needed to meet the objectives for down woody debris standards and guidelines. Some of the largest standing trees would not be affected by treatments and would provide future snag and large woody debris. Treatments that affect the number of snags and amount of down woody material may affect prey species and foraging opportunities of NSO.

The amount of down woody material would be reduced in units with heavy fuel levels. Generally, coarse woody debris greater than 12 inches dbh would be left on site. Within thinning units some existing down woody material may be inadvertently crushed by machinery.

During and following treatments, current Forest Plan snag and down woody material standards and guidelines would likely continue to be met. Existing numbers of snags and amounts of down woody debris would remain the same in that portion of the project area not treated. Snag numbers and down woody material would also be unaffected in 10 to 15 percent of each unit left untreated. The snag and down woody material project design features would help in maintaining this important primary constituent element within the project area. As insects and diseases continue to kill trees in untreated areas, the number of snags and amount of down woody material would be expected to increase in those places.

Cumulative Effects

No State or private lands occur within 1.3 miles of NSO habitat proposed for treatment in alternative 3. The Pumice project overlaps the KL-3201 home range and proposes to maintain nesting habitat (C. Cheyne 2010a, *biologist personal communication*). Within the six quarter townships around the project area considered for dispersal habitat, alternative 3 would maintain the existing late-successional old growth habitat conditions in the Badger Basin-Willow Creek

5th field Watershed, and would maintain connectivity habitat within the six quarter townships. In relation to the Hi-Grouse Project area, the Pumice Project is located to the southwest, the Hoffman Project is located to the south, and the Highlands Roadside Safety Improvement Project is to the east. Adequate NSO dispersal habitat (50 percent of the area with greater than 11 inch trees and 40 percent canopy closure) would remain available in the dispersal areas within the quarter townships around the Hi-Grouse Project area.

The closest known NSO activity center is less than 5 miles to the southwest of the southern quarter township that overlaps the Hi-Grouse Project area. Non-capable ground such as large lava flows, glass and pumice mountains (Little Glass Mountain Geologic Area) are immediately south and east of the project boundary, as well as large tracts of lodgepole pine (also considered non-capable of becoming nesting/roosting habitat).

The area south of the project area on the Shasta-Trinity National Forest provides both foraging and dispersal habitat for NSO (D. Derby 2009, *personal communication*). Movement of a northern spotted owl between the Goosenest District and the Shasta-Trinity National Forest has been demonstrated with a color-banded adult moving from the Haight Mountain area (KL-0372) 16 miles southwest to the Six Shooter Butte area (D. Derby 2009, *personal communication*). The amount and distribution of dispersal habitat south and southwest of the project area, along with the number of nearest neighboring activity centers that occur within 16 miles of KL-3201, would facilitate continued connectivity for dispersal of NSO to and from the project area and critical habitat subunit 67.

Habitat similar to what is described above also occurs east of the project boundary on the Doublehead District of the Modoc National Forest. This landscape is dominated by lodgepole, glass flows and high elevation true fir. Pockets of fir may allow successful dispersal/movement as shown by the Haight Mountain spotted owl. Adequate dispersal habitat would also be maintained east of the project area with the Modoc National Forest.

With the maintenance of nesting and roosting habitat within the home range, and maintaining adequate dispersal habitat in areas beyond the project area, no adverse cumulative effects are anticipated.

Determination

Alternative 3 **may affect, but is not likely to adversely affect NSOs.**

Actions proposed in alternative 3 **may affect, and is not likely to adversely affect NSO critical habitat.**

Alternative 4 (Modified Proposed Action)

Direct and Indirect

Alternative 4 would have a short-term negative effect on the quantity and quality of NSO habitat across less than 2,500 acres of the project area. Alternative 4 would not alter existing late-successional old growth habitat conditions in the Badger Basin-Willow Creek 5th Field Watershed and would maintain dispersal/connectivity habitat at or above 50 percent across all of the six quarter townships.

Alternative 4 would not change the quantity or quality of nesting/roosting or foraging habitat within the 100-acre LSR #5297, because no activities are proposed. The potential for wildfire to burn through the LSR would be reduced by thinnings, fuel reductions, and the fuel management

zone proposed around it (Helmbrecht and Kurth 2009). Reducing the potential effects of wildfire burning through the LSR would be of benefit to NSOs and their habitat. Effects of the reduction in stand density and canopy closure would last for at least 20 years (see section 3.2.1 Forest Vegetation, tables 3.2-3 and 3.2-4).

Approximately 2,257 acres of NSO habitat would be treated. Some nesting/roosting and foraging habitat would be degraded until canopy closure grows in. Habitat removal would result from new landings and new temporary roads. No nesting/roosting habitat would be removed within treatment units. Actions proposed in alternative 4 across the project area would:

- Degrade 78 acres of nesting and roosting habitat and remove 0.5 acre of nesting/roosting habitat. The quantity of nesting and roosting habitat available to NSO would remain about the same.
- Degrade 703 acres of foraging habitat and remove 1,704.5 acres of foraging habitat. The amount of foraging habitat available to NSO would decrease.
- Remove 8.5 acres of dispersal habitat.
- The amount of non-habitat would increase by about 1,713 acres due to the removal of foraging and dispersal habitat.

Within the home range the amount of foraging habitat would decrease and the amount of non-habitat would increase after treatments due to stand density reductions. No downgrades are anticipated from treatments. Actions proposed in alternative 4 in the KL-3201 Activity Center Core would:

- Degrade 2 acres of nesting and roosting habitat and remove 0.5 acres of nesting and roosting habitat.
- Degrade 46 acres of foraging habitat.

Alternative 4 actions proposed in KL-3201 Home Range would:

- Degrade 74 acres of nesting and roosting and remove 0.5 acres of nesting and roosting.
- Degrade 416 acres of foraging habitat and remove 129 acres of foraging habitat.

Post-treatment, habitat within the KL-3201 Core Area and home range will remain above threshold retention values.

Alternative 4 proposes more intensive thinning prescriptions overall than alternative 3. In the short-term there would be slightly more reduction in the higher quality NSO nesting and roosting habitat. However, in the long term, the treated stands would be more resilient to wildlife potential (see fire fuels figure 3.2-1). As with alternative 3, untreated white fir stands that are currently infected with root disease and fir engraver beetles and function as nesting, roosting and foraging habitat, would decline to the point that they would no longer provide habitat for northern spotted owls. Light thinning from below treatments would maintain NSO habitat in treated stands for the short and long term.

NSO Critical Habitat Subunit 67. NSO nesting, roosting and foraging critical habitat would be affected by treatments proposed in alternative 4. Twenty-seven acres of nesting and roosting habitat would be degraded and 340 acres of foraging habitat would be degraded within critical habitat, until canopy closure grows in. Approximately 2 acres of habitat would be removed as a result from new landings. No downgrades are anticipated from treatments.

High quality habitat within Critical Habitat Unit 29, Subunit 67, is limited. Alternative 4 would negatively affect the primary constituent elements available to NSOs within Critical Habitat Subunit 67 in the short term.

- Degrade 27 acres of nesting and roosting habitat and remove a 0.5 acre of nesting and roosting habitat within Critical Habitat Subunit 67. The amount of nesting and roosting habitat available to NSO within Critical Habitat Subunit 67 would remain essentially the same.
- Degrade 340 acres of foraging habitat and would remove 1.5 acres of foraging habitat.

Alternative 4 includes several different thin-from-below prescriptions, and the effects to NSO habitat and primary constituent elements would vary. Thinning treatments would maintain but temporary degrade some habitat areas due to reductions in canopy closure and tree density. Reductions in canopy cover and tree density would increase herbaceous and shrub growth that would increase in number and type of prey species available to NSOs. Reduction of canopy cover may increase the risk of predation to NSOs. These effects would diminish over time as the canopy gradually closed. Culturing around select ponderosa pine trees and thinning around clumps of mixed conifers would create future habitat features such as large primary limbs and full crowns. Light thinning-from-below and plantation thinning would maintain NSO habitat in the project area in the short and long term.

The characteristics of NSO nesting, roosting, and foraging habitat will be retained post-treatment with underburning, FMZs treatments, and use of existing roads and landings. The application of borax to freshly cut stumps is not expected to have adverse effects on wildlife or surrounding plants, invertebrates, or microorganisms (Dost et al. 1996). Temporary roads and new landings are not expected to significantly affect the PCEs associated with NSO critical habitat.

Use of machinery causes noise, which could temporarily disturb a NSO using habitat within the vicinity of the equipment/operation. Machine mowing and piling may remove components of NSO prey species habitat causing shift in prey species home ranges and reduce their abundance in treatment units during the short term.

The risk of a stand-replacement fire within the project area and critical habitat would be lower in alternative 4 than alternative 3 due to more intensive thinning that will reduce fuels and treatment of approximately 300 more acres.

The effects of alternative 4 to snag and down woody primary constituent elements would be similar to that as described in alternative 3.

Cumulative Effects

Reasonably foreseeable effects and cumulative effects for alternative 4 would be the same as discussed in alternative 3.

Determination

Alternative 4 **may affect, but is not likely to adversely affect NSOs.**

Actions proposed in alternative 4 **may affect, and is not likely to adversely affect NSO critical habitat.**

Summary and Conclusions

A comparison of alternatives as it relates to purpose and need and key issues, including NSO habitat, can be found in sections 2.5, 2.6 and 2.7.

3.2.3.3 Sensitive Species, American Marten

Marten are found on the district in mature white and red fir or mixed conifer stands. Slauson (2009, *personal communication*) suggests marten are found in the upper portion (greater than 6,000 feet elevation) of the project area. Marten are also known to occur adjacent to the project area on the Goosenest District, the Doublehead District of the Modoc National Forest (P. Beuttner 2009, *personal communication*), and the McCloud District of the Shasta-Trinity National Forest (D. Derby 2009, *personal communication*).

Methodology

The vegetation data layer was used for GIS queries along with on-going research information (K. Slauson 2009, *personal communication*) to estimate acres of habitat.

Scope of Analysis: The 14,407-acre marten cumulative effects analysis area includes the project area and adjacent areas determined to provide capable habitat for martens (Oechsner 2010c; K. Slauson 2009, *personal communication*) and the timeframe is 20 years for the short term and over 20 years for the long term.

Affected Environment

Within the project area boundary at elevations greater than 6,000 feet, there are about 347 acres of suitable denning and resting habitat for marten. There are about 1,087 acres of foraging/dispersal habitat for marten. The denning/resting stand where marten were detected within the project area is characterized as a late-seral red fir/white fir/mixed conifer stand. The foraging/dispersal stands are mostly early-mid seral true fir (5 to 24 inches dbh) with root disease (which typically equates to heavy down wood) (Schantz 2009a).

Based on marten detections made during the course of an on-going research project, Slauson (2009, *personal communication*) has documented that there are four individual marten using the project area.

Within the marten analysis area there are approximately 1,600 acres of denning and resting habitat and 8,404 acres of foraging habitat. There are approximately 3 miles of paved road (Highway 15) within the marten analysis area or 0.13 miles per square mile of paved road.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect

With no action, there would be no change to the existing amount and quality of habitat for marten habitat in the project area.

In the project area, tree mortality from insects and disease would be expected to continue. Canopy cover would be expected to decrease over time due to the loss of dominant trees in the overstory from insects and disease. The amount of denning, resting, and foraging substrate for marten would continue to be provided and would be expected to increase over time.

In the event of a wildfire within the project area, burn intensity, extent, and post-fire conditions would likely vary widely, resulting in a mosaic of habitat conditions. Smith (2000) reported that the effects of fire on mammal species are related to the uniformity and pattern of fire on the landscape. Fire affects marten denning, resting, cover, and foraging habitat components. Fire has been cited by many authors as detrimental to American marten food and habitat (Smith 2000). However, a mixed-severity fire in an area of lodgepole pine, spruce, and fir in northern Idaho left a mosaic of forest types that supported a diversity of cover and food types favorable for marten (Koehler and Hornocker 1977). While large, uniform burns do not favor American marten, a mosaic of vegetation shaped in part by recent fire may do so (Smith 2000).

Cumulative Effects

There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination

Alternative 1, no action, would result in **no impact** to marten or their habitat because no thinning, burning, or related activities would take place within the project area.

Alternative 3

Direct and Indirect

Alternative 3 would maintain the same amount of denning, resting, and foraging habitat for marten that currently exists. Treatments would alter the quality (reduced canopy closure and down material), but not the quantity, of denning and resting habitat available to marten.

Because less fuel reduction would take place, the risk of a higher intensity and/or stand-replacement fire within marten habitat in the project area is higher than in alternative 4.

The amount of down woody material would be reduced in treated units. Existing numbers of snags and amounts of down woody debris would remain across 68 percent of the available marten habitat. Snag numbers and down woody material would also be unaffected in 10 to 15 percent of each unit left untreated. As insects and diseases continue to kill trees in untreated areas, the number of snags and amount of down woody material would be expected to increase in those places.

Cumulative Effects

There are three foreseeable actions proposed within the marten analysis area. The Pumice, Hoffman, and Highlands Roadside Safety Improvement projects would reduce canopy closure understory structure and coarse woody debris through treatments to reduce fuels while meeting their respective Forest Plan direction for coarse woody debris. Treatments proposed would reduce the incidence of insect and disease mortality, reduce crown fire potential by 40 percent, prevent rapid future fuel build-up for approximately 20 years, and allow the reintroduction of fire within the treated areas. Removal of dead and dying trees would result in the loss of existing snags, future snags and down woody debris for snag and down woody dependent species such as marten, in the short and long term. Foraging substrate, resting and denning habitat and cover would be reduced for marten. Though the risk is low and dependent, in part, upon the width of clearing, fragmentation of marten habitat and increased marten vulnerability to predation and vehicle mortality may occur as a result of vegetation removal along road corridors.

Determination

Alternative 3 **may impact individual marten but would not likely result in a trend toward listing or loss of viability.**

Alternative 4 (Modified Proposed Action)

Direct and Indirect

Alternative 4 would alter the quality, but not the quantity, of denning and resting habitat available to marten. The quality of 200 acres of marten foraging habitat would be reduced following treatments, but would continue to provide usable habitat for marten in the short and long term. Approximately 45 acres (about 4 percent) of the existing marten foraging habitat would be altered to the extent that it would become unsuitable for use by marten long term. The risk of a higher intensity and/or stand-replacement fire within marten habitat in the project area would be lower than in alternative 3.

Effects to snags and large down woody material in marten habitat would be similar to those described under alternative 3.

Cumulative Effects

Cumulative effects would be similar to alternative 3. Thinning treatments proposed in alternative 4 would leave less basal area in the majority of the thinned stands. Treatments would reduce the incidence of insect and disease mortality, reduce crown fire potential by 50 percent, prevent rapid future fuel build-up for approximately 20 years, and allow the reintroduction of fire within the treated areas.

Determination

Alternative 4 **may impact individual marten but would not likely result in a trend toward listing or loss of viability.**

3.2.3.4 Sensitive Species, Northern Goshawk

Northern goshawks (NGH) have broad geographic and elevation distributions in North America (Andersen et al. 2004). In northern California, NGH are considered permanent residents (NatureServe 2008a). There are no reliable population trend data on NGH in the western United States (Andersen et al. 2004). NGH populations in California are considered vulnerable (NatureServe 2008a).

Methodology

The results of district NGH surveys were incorporated into the Forest databases.

Scope of Analysis: Direct, indirect, and cumulative effects to NGH were evaluated across the project area as well as for each territory that occurred wholly or partially within the project area. Short-term effects would be those occurring within about 10 years of implementation and long-term effects would be those occurring in excess of 50 years.

Terminology:

Primary nest zone (PNZ) ~ a 0.5-mile radius circle (504 acres) around the last known nest or the geometric center of a cluster of all known nests.

Foraging areas (FA) ~ 1-mile radius circle (2,010 acres: 1,506 acres excluding PNZ) centered on the primary nest zone.

Affected Environment

NGH are found on the Goosenest District. Approximately 12 percent of the project area (873 acres) provides suitable goshawk nesting habitat and approximately 60 percent (4,442 acres) provide foraging habitat. There are five known NGH territories partially or completely within the project area. Table 3.2-19 displays the amount of existing NGH habitat within the primary nest zone (PNZ) and foraging area (FA) of each of the five territories.

Table 3.2-19. Existed amount of goshawk habitat by territory

	Primary Nest Zone (PNZ)						Foraging Area (FA)			
	Foraging		Nesting		Non-Habitat		Nesting/Foraging[1]		Non-Habitat	
Territory	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Rainbow	90	18	222	44	192	38	714	47	794	53
Red Cap	193	38	184	36	127	25	612	40	896	60
Davis	256	51	238	47	10	2	1,215	81	293	19
Hi Ridge	324	64	114	23	65	13	1,265	84	243	16
West Grouse	322	64	63	13	117	23	1,191	79	317	21

[1]Some foraging areas overlap.

The Red Cap, Hi Ridge, and West Grouse NGH territories all lack the desired 40 percent nesting habitat within their PNZs. The Rainbow, Red Cap, and Davis territories lack the desired 60 percent foraging habitat in their PNZs. The Rainbow and Red Cap territories also lack the desired 60 percentage foraging/nesting habitat in their foraging areas. None of the five territories meet all of the KNF Forest Plan standards and guidelines for suitable amounts of NGH nesting and foraging habitat within the PNZ and foraging areas.

Surveys of the five NGH territories have consistently been conducted for a number of years. NGH activity within the five territories varies by year. Complete survey and activity records included in the project record.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect

With no action, there would be no change to the existing amount and quality of habitat for NGH within the project area.

In the project area, tree mortality from insects and disease would be expected to continue. Canopy cover would be expected to decrease over time due to the loss of dominant trees in the overstory from insects and disease. Snag numbers and down woody material would be expected to gradually increase as trees die due to crowded conditions, insects, and disease. Further development of large old trees within stands would likely progress slowly due to existing tree densities and competition for sunlight, nutrients and water.

In the event of a wildfire within the project area, burn intensity, extent, and post-fire conditions would likely vary widely, resulting in a mosaic of habitat conditions. Wildfire would affect the amount and distribution of nesting and foraging habitat available to NGH. Habitat components important to NGH and their prey, such as snags, vertical and horizontal structure, canopy closure and large down woody material would be affected by wildfire. Conditions following a wildfire event would influence the continued use of the remaining suitable habitat by NGH.

Cumulative Effects

There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination

Alternative 1 (no action) would result in **no impact** to NGH or their habitat.

Alternative 3

Direct and Indirect

Alternative 3 would result in changes to the quantity and quality of NGH habitat within the project area and within each of the five NGH territories. Project design features WL-5, -6, and -7 (table 2.2-3) would minimize the likelihood of disturbance or displacement of NGH during implementation of alternative 3. Mortality to NGH from any activities proposed would not be expected.

Approximately 47 percent (2,500 acres) of the available NGH nesting and foraging habitat within the project area would be treated. Approximately 31 percent (271 acres) of suitable nesting habitat and approximately 51 percent (2,246 acres) of NGH foraging habitat would be treated. The immediate effect of fuel reduction and thinning treatments would be a change in the structure of the vegetation (Pilliod et al. 2006), including reduced canopy closure and tree density. These changes would be expected to increase shrub and plant growth in the understory which would be beneficial to some prey species of NGH (Oechsner 2010c). The existing 821 acres of nesting habitat and the existing 4,442 acres of foraging habitat would remain functional within the project area.

Alternative 3 would maintain the existing amount of nesting and foraging habitat available to NGH across the project area in the short term and would comply with Forest Plan S&G 8-20. Habitat quality in the treated stands would be reduced in the short term. Treatments proposed would reduce the incidence of insect and disease mortality, reduce crown fire potential by 40 percent, prevent rapid future fuel build-up for approximately 20 years, and allow the reintroduction of fire within the treated areas Over the long term, many of the untreated densely spaced stands that are currently infected with root disease, pine and fir engraver beetles would be expected to decline to the point that they would no longer provide habitat for NGH.

Existing numbers of snags and amounts of down woody debris would remain across 52 percent of the project area. Snag numbers and down woody material would also be unaffected in 10 to 15 percent of each unit left untreated. The snag and down woody material project design features would help in maintaining this important primary constituent element within the project area. As insects and diseases continue to kill trees in untreated areas, the number of snags and amount of down woody material would be expected to increase in those places.

Cumulative Effects

On the district, the Pumice Project Area overlaps with and has the potential to affect the primary nest zones and foraging areas in the Rainbow and Red Cap NGH Territories. The Davis and Hi Ridge NGH foraging areas would be unaffected by the Pumice Project.

South of the Hi-Grouse Project Area on the McCloud District of the Shasta-Trinity National Forest, the Hoffman Project would affect habitat in the foraging area of the Hi-Ridge NGH territory.

No known foreseeable actions would affect the West Grouse Hill NGH territory.

Determination

Alternative 3 **may impact individual goshawks but would not likely result in a trend toward listing or loss of viability.**

Alternative 4 (Modified Proposed Action)

Direct and Indirect

Approximately 53 percent (2,800 acres) of the available NGH nesting and foraging habitat within the project area would be treated. Approximately 31 percent (271 acres) of suitable nesting habitat and approximately 57 percent (2,546 acres) of NGH foraging habitat would be treated.

Alternative 4 would result in a 60-acre reduction in the amount of nesting habitat and a 331-acre reduction of foraging habitat available to NGH across the project area. Non-habitat would increase by 391 acres across the project area in alternative 4.

Alternative 4 would maintain the existing amount of nesting and foraging habitat in the PNZ and foraging areas of the Rainbow and Red Cap Territories. Alternative 4 would change the amount of nesting and foraging habitat in the PNZ and foraging area of the Davis Territory and in the Hi Ridge Territory. In the West Grouse Hill Territory PNZ and foraging area, the amount of foraging habitat would change; however, nesting and foraging habitat thresholds in the PNZ and foraging areas would remain above thresholds in all five territories. Alternative 4 would provide NGH habitat to comply with Forest Plan S&G 8-20 by meeting the nesting and foraging habitat amounts or maintaining the available habitat in territories that are currently lacking in nesting or foraging habitat in the primary nest zone or foraging areas.

Habitat quality of nesting and foraging habitat for NGH would be reduced in the five territories and across the project area in the short term. Treatments proposed would reduce the incidence of insect and disease mortality, reduce the wildfire potential by 50 percent, prevent rapid future fuel build-up for approximately 20 years, and allow the reintroduction of fire within the treated areas. By reducing the risk of a stand-replacement fire within the project area and within NGH territories, thinning, fuel treatment zones, and underburning treatments proposed with alternative 4 should benefit NGH over the long term.

A reduction in canopy cover and tree density would be expected to cause a shift in prey species home ranges. The reduction in canopy would be expected to increase botanical biodiversity in the understory and at ground level. With the increase in amount of herbaceous and shrub growth, there should also be an increase in number and type of prey species available to NGH. These effects would diminish over time as the canopy gradually closed within approximately 20 years.

Treatments proposed would reduce the incidence of insect and disease mortality, reduce the wildfire potential by 50 percent, prevent rapid future fuel build-up for approximately 20 years, and allow the reintroduction of fire within the treated areas. By reducing the risk of a stand-replacement fire within the project area and within NGH territories, thinning, fuel treatment zones, and underburning treatments proposed with alternative 4 should benefit NGH over the long term. Other than this, the effects of alternative 4 to snag and down woody components in NGH habitat would be similar to alternative 3.

Cumulative Effects

Cumulative effects for alternative 4 would be the similar to those discussed in alternative 3.

Determination

Alternative 4 **may impact individual goshawks but would not likely result in a trend toward listing or loss of viability.**

Summary and Conclusions

A comparison of alternatives as it relates to purpose and need and key issues, including NGH habitat, can be found in section 2.5, 2.6 and 2.7.

3.2.3.5 Sensitive Species, Townsend's Big-eared Bat and Pallid bat

More detailed descriptions of affected environment, methods, and environmental consequences for this project can be found in the biological evaluation (Oechsner 2010c).

It has not been verified whether or not Townsend's big-eared bats or pallid bats occupy or use the project area. Lava tubes and large decadent trees and snags exist in the project area and may be used by these bats. Foraging and roosting habitat is likely present within the project area.

Hayes and Loeb (2007) described four ecological factors considered important in shaping habitat suitability for bats in North American forests; these are: characteristics and abundance of roost sites, amount of "clutter", availability of prey, and availability of water. These four ecological factors will be evaluated for project effects analysis in this section. *Note:* Clutter is the number of obstacles a bat must detect and avoid in a given area; it affects maneuverability and influences habitat use by bats.

Methodology

Scope of Analysis: The cumulative effects analysis timeframe for short-term effects would be those occurring within about 10 years of implementation; long-term effects would be those occurring in excess of 50 years. The cumulative effects analysis area includes the project area (Oechsner 2010c).

Affected Environment

Townsend's big-eared bats maternity and hibernation colonies are typically in caves and mine tunnels in elevations between 4,500 to 10,460 feet (Gruver and Keinath 2006). Connectivity of habitat may be especially important as commuting distance from roosts to foraging or drinking habitat increases (Gruver and Keinath 2006). Maximum one-way distances traveled between roosts and foraging areas in California ranged between 3.1 and 8 miles (Fellers and Pierson 2002).

Foraging occurs in a wide variety of habitats. Foraging sites are preferred that have dense and structurally diverse vegetation that may support greater abundances of insect prey and provide escape from potential avian predators (Gruver and Keinath 2006).

Townsend's big-eared bats are moth specialists, emerging from roosts to begin foraging about 60 minutes after sunset (Gruver and Keinath 2006). In California, Fellers and Pierson (2002) found that they foraged among foliage near the perimeter of trees, usually between mid-canopy and near the top of the canopy, as well as gleaned insects directly from substrates.

Pallid bats are found in a variety of habitats and elevations, and known to occur in Siskiyou County California (California Department of Fish and Game 1997; NatureServe 2008b). They are commonly found in arid deserts and grasslands, often near rocky outcrops, cliffs, and water. They also inhabit chaparral shrublands and higher elevation (over 7,000 feet) coniferous forests.

Day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, tree cavities, and various human structures. Pallid bats roost alone, in small groups, or gregariously and may switch day roosts on a daily and seasonal basis.

Pallid bats travel 0.31 to 1.55 miles from day roosts for foraging (California Department of Fish and Game 1997, 2009). Pallid bats are opportunistic generalists that glean a variety of large insects, such as crickets, grasshoppers, and scorpions, usually from the ground (Western Bat Working Group 2005).

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect

With no treatment, there would be no change to the existing habitat for bats within the Hi-Grouse Project area or the larger analysis areas. Some habitat conditions for bats would gradually change over the next 20 years. The amount of snags available for roosting would be expected to gradually increase as a result of tree mortality from insects and disease. Water availability, primarily occurring in the analysis area, would remain static. The gradual reduction in the canopy as large trees die and eventually fall would decrease the amount of clutter and increase the number of openings. An increase in the number of small openings would increase ground cover and shrubbery in these openings which may increase the amount of prey and foraging opportunities for bats.

Little or no research has been conducted on wildfire and prescribed burning impacts to bats and bat populations (Carter et al. 2000). In the event of a wildfire within the project area, burn intensity, extent, and post-fire conditions would likely vary widely, resulting in a mosaic of habitat conditions. Smith (2000) reported that the effects of fire on mammal species are related to the uniformity and pattern of fire on the landscape. A wildfire would be expected to affect prey and roosting and foraging habitat of bats by altering the structural components of the area burned.

Cumulative Effects

There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination

Alternative 1 (no action) would result in **no impact** to Townsend's big-eared bats or pallid bats or their habitat.

Alternatives 3 and 4

Direct and Indirect

While occupancy and/or use of the project area by Townsend's big-eared bats and/or pallid bats is uncertain, most all of the project area would be expected to provide some habitat components important to bats.

The amount of potential bat habitat (approximately 3,955 acres) affected by alternative 4 is 301 acres greater than alternative 3 (approximately 3,654 acres) because of the additional area of lodgepole pine treated. Thinning and prescribed burning have direct and indirect effects on bats. Thinning and burning alter the structure of forest stands, reducing the amount of clutter and possibly affecting insect prey abundance (Loeb and Waldrop 2008). The immediate effect of the proposed treatments would result in changes to the density and vertical and horizontal structure of the vegetation by removing smaller diameter trees. In response to a change in stand vertical structure, bats may change their vertical use of space (Loeb and Waldrop 2008). A decrease in the density of trees would increase bat foraging maneuverability (Hayes and Loeb 2007).

Thinning forested habitats, prescribed fire, and mowing would be expected to increase the amount of shrubs, forbs, and grasses on the forest floor. An increase in shrubs, herbs, grasses and forbs would provide additional foraging opportunities for bats and may increase numbers and diversity of insect prey.

Effects of treatments proposed to snag habitat would affect roosting habitat of bats and may potentially impact a few individual bats. Felling or burning-up a roost structure (snag) could result in displacement of bats or the mortality of the bat(s) inside the roost (Hayes and Loeb 2007). A decrease in the density of trees could alter the thermal properties in and adjacent to live trees with cavities and snags used for roosting (Hayes and Loeb 2007). Microclimate changes could affect the habitat suitability of these existing snag roosts for bats. Project design features will assure that with few exceptions existing potential bat roosts (snags) will be retained in all units.

The actions proposed in either alternative 3 or 4 would not change the availability of water sources for bats.

Cumulative Effects

The Pumice Project and Hoffman Project may affect foraging and roosting habitat of both bat species by reducing tree densities and canopy closure. The Highlands Roadside Safety Improvement project may affect foraging and roosting habitat of Townsend's big-eared bat by reducing tree densities and canopy closure.

Determination

Either Alternative 3 or 4 **may impact individual Townsend's big-eared bats, but would not likely result in a trend toward listing or loss of viability.**

Either Alternative 3 or 4 **may impact individual Pallid bats, but would not likely result in a trend toward listing or loss of viability.**

3.2.3.6 Management Indicator Species (MIS)

Methodology

MIS for the KNF are identified in the Forest Plan standards and guidelines 8-21 through 8-34. A review was conducted using the MIS Report Part I—Project Level Assessment Checklist to determine: (1) if the project is within the range of any MIS, (2) if habitat for which the species is an indicator is present within or adjacent to the proposed treatment areas, and (3) if there are potential direct, indirect, or cumulative effects on habitat components (Oechsner 2010d, 2010e).

Table 3.2-20 displays the species associations and MIS selected for analysis for the Hi-Grouse Project due to the presence of suitable habitat that may be impacted by the project activities, as described in the MIS Project Level Assessment Part I (Oechsner 2010d, 2010e).

Table 3.2-20. Species associations and MIS that may be affected by project activities

Species Association	MIS
Snag Species	Red-breasted sapsucker White-headed woodpecker Vaux's swift Pileated woodpecker Black-backed woodpecker
Mature Ponderosa Pine Species Association (Eastside Pine)	Flammulated owl White-headed woodpecker

Scope of Analysis: The cumulative effects analysis timeframe is 20 years for short-term effects and over 20 years for long-term effects. The cumulative effects analysis area encompasses the project area and areas with activities proposed directly adjacent to the project area.

Affected Environment

The project area habitat was stratified by vegetation seral stage. Acres of habitat by stratum were calculated from 2009 stand exam data and field verification information, and are displayed in table 3.2-21.

Table 3.2-21. Habitat strata within the Hi-Grouse Project Area

Habitat Strata	Acres
Early Seral Lodgepole Pine-White Fir-Ponderosa Pine Seedling Sapling (Plantations)	132
Early Seral Red Fir-Ponderosa Pine-Lodgepole Pine Poles (Plantations)	80
Early/Mid-Seral Lodgepole Pine, Immature	583
Early Seral Mixed Conifer	327
Early Seral White Fir	91
Mid-Seral Lodgepole Pine, Mature	1,072
Mid-Seral Mixed Conifer	1,267
Mid-Seral Ponderosa Pine	292
Mid-Seral White Fir-Ponderosa Pine	2,160
Mid-Late-Seral White Fir	863
Late Seral Red Fir	347
Other	237
Total	**7,451**

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect

In the project area, tree mortality from insects and disease would be expected to continue, providing more and larger snags for the six selected snag-associated MIS birds. Habitat for static numbers of black-backed woodpeckers would be expected to continue to be available as the bark beetle infestation continued. The death of conifers would reduce foraging habitat for the red-breasted sapsucker and white-headed woodpecker that forage on and under the bark of live trees. Black-backed and pileated woodpecker forage would continue to be available in the insect- and disease-ridden trees and fallen logs.

Preferred nesting and foraging habitat for flammulated owls would continue to be limited in the dense ponderosa pine habitat in the short term (about 5 years) and long term (more than 50 years). Vaux's swift habitat would remain available.

In the event of a wildfire within the project area, burn intensity, extent, and post-fire conditions would likely vary widely, resulting in a mosaic of habitat conditions. Fire effects on birds depend largely on fire severity (Smith 2000). Changes to the quality and quantity of habitat available to the seven selected MIS species would vary widely.

In areas of high-intensity fire, there would be a reduction in the availability of the ponderosa pine habitat for flammulated owls and white-headed woodpeckers in the long term (more than 50 years). Long-term impacts to forest structure would be expected in areas burned by high-intensity crown fire. Trees of all sizes would be killed, including large trees suitable for cavity nesting and foraging by selected MIS birds. Large snags currently suitable for nesting would be burned up in a high-intensity crown fire. Displacement and reduced reproduction of selected MIS birds would occur in areas that experienced a stand-replacing wildfire.

Fires that underburn in ponderosa pine would improve stand conditions. Smaller trees would be killed and/or burned up, while the larger ponderosa pine would be more fire tolerant. Habitat conditions for the remaining larger ponderosa pine trees would improve and so would conditions for the flammulated owl over the long term in areas burned at low intensity.

Fires that reduce logs, stumps, and snags could have adverse effects by decreasing insect availability for pileated woodpeckers. Black-backed woodpecker habitat would increase in burned areas and their numbers would be expected to rise for approximately 5 years following the wildfire. Some snag habitat would be created while existing decadent standing snags would be burned up.

Cumulative Effects

Because there are no direct or indirect effects of the no action alternative, there are no cumulative effects to MIS.

Alternatives 3 and 4

Direct and Indirect

Both action alternatives would reduce selected MIS habitat elements such as individual snags, smaller green trees, and down woody debris. Snag loss within treatment areas would be incidental. There would be some reduction in the amount of down woody debris in treatment areas, but down woody debris Forest Plan standards would be met across the project area. Snags

and large down woody debris would be maintained across the treated areas in all action alternatives.

The amount of available red-breasted sapsucker habitat would be reduced as a result of removing smaller green conifer trees during thinning in either of the action alternatives. By promoting resiliency to fire, insects, and disease within the project area, the black-backed woodpecker would lose the most habitat in any of the action alternatives. This is because removing insect infected dead and dying trees affects the amount of available foraging and nesting habitat of black-backed woodpeckers over the long term (more than 50 years). More black-backed woodpecker foraging and nesting habitat would be removed in alternative 4 with the thinning of more acres of lodgepole pine than that proposed in alternative 3.

MIS species that prefer late-successional habitat (Vaux's swift and pileated woodpecker) would benefit the most from alternative 4. The emphasis in alternative 4 is maintaining the late-successional habitat in project area, while increasing resiliency of the stands by treating fuel build-up and insect and disease infestations in adjacent stands.

Promoting and preserving larger fire resilient ponderosa pine within stands and across the project area would benefit white-headed woodpeckers and flammulated owls. Removal of smaller trees during thinning proposed in all three action alternatives would improve existing habitat conditions for white-headed woodpeckers and flammulated owls.

The amount of black-backed woodpecker and mature ponderosa pine habitat would be reduced in alternatives 3 or 4 across the Klamath National Forest by less than one half of one percent. There should be no impact on forest-level habitat and no change to the population trend for MIS with the implementation of either alternative 3 or 4.

Cumulative Effects

Removal of dead and dying trees would result in the loss of existing snags, future snags, and down woody debris for snag and down woody dependent species in the short and long term with the Pumice and Hoffman Projects. As proposed in the Highlands Roadside Safety Improvement Project, thinning of green trees less than 12 inches would reduce available red breasted sapsucker habitat. Foraging substrate, nesting habitat, and cover would be reduced for snag and down woody debris dependent species. Brush mowing and low growing vegetation mowing would result in the short-term and long-term loss of some amount of cover, nesting, and foraging habitat for shrub and ground nesting/foraging MIS species.

3.2.3.7 Migratory Birds

Methodology

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, section 6(g)(3)(B)). The January 2000 USDA Forest Service Landbird Conservation Strategic Plan, Executive Order 13186 in 2001, Partners in Flight specific habitat conservation plans for birds, and the January 2004 Partners In Flight North American Landbird Conservation Plan, all reference goals and objectives for integrating bird conservation into forest management and planning.

In late 2008 a memorandum of understanding was signed between the USDA Forest Service and USDI Fish and Wildlife Service to promote the conservation of migratory birds. The intent of the MOU was to strengthen migratory bird conservation through enhanced collaboration and cooperation between the Forest Service and the USDI Fish and Wildlife Service as well as other Federal, State, tribal, and local governments. Within the national forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities.

For the Klamath National Forest, the migratory bird species of management concern are those bird species listed under the Endangered Species Act as threatened (T) or endangered (E), those species designated by the Regional forester as sensitive species (S) (pages 4-27 to 4-29) and those species listed under standard and guideline 8-21 through 8-34 (pages 4-30 to 4-32 of the Klamath Land and Resource Management Plan (as amended 08/15/07) as Management Indicator Species (MIS) for project-level assessment (see sections pertaining to NSO and MIS).

Environmental Consequences

Alternatives 3 and 4

Direct and Indirect

Snag- and down woody debris-dependent species (NSO, NGH, red-breasted sapsuckers, black-backed woodpeckers, white-headed woodpeckers, pileated woodpeckers, Vaux's swifts and flammulated owls) would be affected by the reduction in the number of snags and amount of large down woody debris in either alternative 3 or 4. Snags and large down woody debris would be maintained across the treated areas in both alternatives.

The amount of available red-breasted sapsucker habitat would be reduced as a result of removing smaller green conifer trees during thinning in either alternative 3 or 4.

The black-backed woodpecker would lose the most habitat in alternative 4. This is because removing insect infected dead and dying trees affects the amount of available foraging and nesting habitat of black-backed woodpeckers over the long term (more than 50 years). More black-backed woodpecker foraging and nesting habitat would be removed in alternative 4 with the thinning of more acres of lodgepole pine than that proposed in alternative 3.

Mature ponderosa pine dependent species (white-headed woodpeckers, flammulated owls, and NGH) would benefit the most from the actions proposed in alternative 4, and to a lesser extent in alternative 3, both in the short and long term. Promoting and preserving larger fire resilient ponderosa pine within stands and across the project area would benefit white-headed woodpeckers, NGH, and flammulated owls. Removal of smaller trees during thinning proposed in either alternative 3 or 4 would improve existing habitat conditions for white-headed woodpeckers, NGH, and flammulated owls.

The emphasis in alternative 4 is maintaining the late-successional habitat in project area, while increasing resiliency of the stands by treating fuel build-up and insect and disease infestations in adjacent stands. Species that prefer late-successional habitat (Vaux's swift, NSOs, NGH, and pileated woodpeckers) would benefit from both alternatives, and the most from alternative 4.

By promoting resiliency to fire, insects, and disease within the project area, the project reduces the risk of wildfire within the project area, thereby maintaining migratory bird habitats over the

long term. Sustaining migratory bird habitat in both treated and untreated areas of the project area is compatible with maintaining bird migration habitat.

Project design features (table 2.2-3) would minimize disturbance to NSOs and NGH and other migratory birds utilizing habitat within known or suspected nesting locations during the breeding season and maintain and/or enhance the composition, structure, and juxtaposition of migratory bird habitats within the project area.

In balance, the long-term benefits of forest restoration are of greater conservation value to the species than the short- and long-term adverse effects.

Summary

The short-term and long-term adverse and beneficial effects to the migratory bird species of concern and their key habitats under alternatives 3 and 4 are:

- Alternative 4 would positively and negatively affect the quantity and quality of existing NSO and NGH habitat in the short term. Wildfire, insect, and disease resiliency in NSO and NGH habitat would increase in the short and long term (Oechsner 2010a, 2010b, 2010c).
- Alternative 3 would positively and negatively affect the quantity and quality of existing NSO and NGH habitat in the short term. In the long term, NSO habitat would be expected to decline due to the amount of insect and disease that would persist in untreated areas. In the long term, the wildfire hazard would remain high (Oechsner 2010a, 2010b, 2010c).
- Mature ponderosa pine dependent species (white-headed woodpeckers, flammulated owls, and NGH) would benefit the most from the actions proposed in alternative 4, and to a lesser extent in alternative 3, both in the short and long term (Oechsner 2010e).
- Snag and down woody debris dependent species (NSOs, NGH, red-breasted sapsuckers, black-backed woodpeckers, white-headed woodpeckers, pileated woodpeckers, Vaux's swifts, and flammulated owls) would be negatively affected by the reduction in the number of snags and amount of large down woody debris in either alternative 3 or 4 in the short term (Oechsner 2010e).
- Species that prefer late-successional habitat (Vaux's swift, NSOs, NGH, and pileated woodpeckers) would benefit the most from alternative 3 in the short term. These species would benefit the most in the long-term from alternative 4 treatments (Oechsner 2010e).
- The short-term and long-term loss of black-backed woodpecker habitat is the similar between alternatives 3 and 4. Under alternative 4 approximately 300 acres more black-backed woodpecker foraging and nesting habitat would be removed with the thinning of more acres of lodgepole pine than that proposed in alternative 3 (Oechsner 2010e).

Cumulative Effects

The past, present and future foreseeable effects for migratory birds associated with snags, coarse woody debris, mature ponderosa pine, and late and mid seral habitat trees include forest management, livestock grazing, hazard trees, impacts from roads, firewood gathering, prescribed fire, and other restoration projects throughout the analysis area.

The Forest Service will actively manage livestock grazing, using rest periods and compliance with existing standards and guidelines. Firewood gathering will occur in the analysis area and would remove standing lodgepole snags and down woody debris along roads. Forest management will include hazard tree removal along roads, thinning small diameter trees (greater than 12 inches dbh), commercial thinning for forest health and fuels reduction and prescribed

fire. There will be some loss of snags, coarse woody debris and loss of green trees with these activities. Forest-wide standards and guidelines will be met.

The *Biological Evaluation, Biological Assessment, Management Indicator Species* report for this project provides a more detailed analysis of the impacts to wildlife and bird species, including migratory birds, from the proposed action. Several design features are incorporated into the proposed action to maintain a mosaic of habitat types across the landscape and in stand diversity, including no treatment leave islands, a mosaic treatment of understory fuels, spacing variability and the retention of the largest trees in thinning units (see table 2.3-3 for project design features).

This may open up some areas for browse and grass species, but this would likely occur in such relatively small areas that it would have negligible impacts to the project area. In addition, prescribed burning will include a variety of burn intensities to retain desired understory characteristics.

At the project scale, pertinent standards and guidelines would be implemented to maintain habitat diversity. Habitat modification would not cause a measurable negative effect to migratory bird populations due to the small amount of acreage where project activities would occur during the breeding season relative to the large amount of migratory bird habitat across the Forest.

3.2.3.8 Big Game, Mule Deer

More detailed descriptions of affected environment, methods, and environmental consequences for this project can be found in the Migratory Bird and Deer Analysis (Oechsner 2010f).

Methodology

Stand examination data and walk-through field recognizance data were used to discuss and evaluate the existing forested conditions within the project area. The vegetation data layer called ‘e-veg04’ from USFS Region 5 Remote Sensing Laboratory was verified and updated by Rob Schantz (USDA Forest Service silviculturist), Christy Cheyne (USDA Forest Service wildlife biologist) and Elizabeth Willy (USDI Fish and Wildlife Service wildlife biologist) in the field and with aerial photography. Analysis used GIS queries for generalized deer habitat mapping using the Mule Deer Habitat Capability Model.

Scope of Analysis: Effects to deer fawning habitat were evaluated at the project area as well as those portions of the two fawning areas that occur within the project area. The cumulative effects analysis area includes both fawning areas in their entirety. This cumulative effects analysis area is appropriate because portions of the two fawning areas extend beyond the project area. The analysis time for the short-term effects is 20 years. Long-term effects would be those occurring in excess of 20 years.

Affected Environment

The project area is part of the Goosenest AMA. Much of the Goosenest AMA has been identified as critical deer fawning habitat. Good fawning habitat contains low shrubs or small trees from 2 to 6 feet tall under a tree overstory of about 50 percent or more crown closure, is located on slopes less than 15 percent, has water available within 600 feet, and has abundant succulent forage for does and young fawns. Optimum size is 1 to 5 acres (California Department of Fish and Game 1997).

Mule deer populations within the Goosenest AMA (USDA Forest Service 1996) are migratory and part of the much larger McCloud Flats Deer Herd. The project area is used by deer; a mule

deer fawn was observed in a timbered stand within the project area on June 25, 2008 (M. Oechsner 2009, *personal communication*). California Department of Fish and Game (1992) suggests that habitat for deer range should be 55 percent forage, 20 percent hiding cover, 10 percent thermal cover, and 15 percent fawning and fawn-rearing habitat.

The project area, which overlaps portions of two delineated fawning areas, is densely timbered with little foraging habitat existing beneath the canopy. Table 3.2-22 displays the estimated amounts of cover and forage within the two fawning areas. Forest cover habitat is above and forage habitat is below the suggested proportions.

Approximately 11.8 miles of open road exist within the project area; existing open road density is 3.7 miles per square mile. Within the east fawning area there are approximately 15.7 miles of open road. The east fawning area has an open road density of 4.3 miles per square mile. Within the west fawning area, there are approximately 7.4 miles of open road. The west fawning area has an open road density of 2.5 miles per square mile.

Table 3.2-22. Cover and forage for the fawning areas and the project area portions of fawning areas

Fawning Area	Total Fawning Area Cover		Total Fawning Area Forage		Project Area Cover		Project Area Forage	
	Acres	%	Acres	%	Acres	%	Acres	%
East	2,212	95	125	5	965	94	62	6
West	1,764	95	91	5	1,095	93	85	7
Total	3,976	95	216	5	2,060	93	147	7

Based on the high amount of cover, low amount of forage, long distance to water, and the high open road density displayed above, the habitat capability of the project area and fawning areas is medium to low.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect

With no action there would be no change to the existing habitat conditions for deer within the project area or the fawning areas. Cover would continue to predominate over forage within the project area and within delineated fawning habitat areas. Miles of open road and road densities would remain the same.

In the event of a wildfire, burn intensity, extent, and post-fire conditions would likely vary widely across the landscape resulting in a mosaic of habitat conditions. Overall, a wildfire would affect the distribution and amount of cover and forage available to deer. A wildfire event would likely reduce the amount of cover and increase the amount of forage available to deer over the long term.

Cumulative Effects

There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Alternative 3

Direct and Indirect

Within areas being treated within the project area and fawning habitat, temporary disturbance and displacement of deer may occur. Mortality to a hidden young fawn, while unlikely, could occur if a tree fell on it during thinning operations and/or it became separated from its mother due to disturbance or displacement. Treatments proposed across the project area and within fawning areas will modify the amount of cover and forage available to deer across about 45 percent of the project area. Canopy cover would be reduced after treatment and would increase over time. Approximately 30 percent of the east fawning area and 55 percent of the west fawning area within the project area is proposed for treatment in alternative 3, which would reduce cover for the short term.

The effects of different fuel reduction techniques on most wildlife and invertebrate species are not very well known (Pilliod et al. 2006). Most of the activities proposed in alternative 3 would stimulate the growth of varying amounts of grasses, forbs, and shrubs, which would increase foraging habitat for deer. Underburning in a mosaic pattern may help to increase grasses and forbs important to does during the fawning season (California Department of Fish and Game 1992).

Overall, the distribution, quantity, and quality of hiding cover and foraging habitat would change across approximately 41 percent of project area with alternative 3. The quantity of hiding cover would decrease while the quantity and quality of foraging habitat would increase on the treated acres. Alternative 3 would result in some improvement in the deer habitat capability in the short term within the project area and to both of the fawning areas. Alternative 3 would bring cover/forage ratios closer to the desired condition in deer range.

Cumulative Effects

The Hi-Grouse Project area, located within Badger Basin, is part of the 34,500-acre Three Sisters Range Allotment. The cattle allotment season of use is from June 16 to September 30. A small (less than 50 individuals) wild horse herd uses the Badger Basin area yearlong. Wild horse use in sagebrush grasslands outside of the timbered project area was observed (M. Oechsner 2009, *personal communication*). Grazing practices can reduce the amount of forage available to deer.

Two planned projects adjacent to the Hi-Grouse Project area would contribute to effects to fawning areas by reducing cover and increasing foraging areas. The Pumice Project would affect the habitat in the west fawning area. The Highlands Roadside Safety Improvement Project would be expected to minimally affect the east fawning habitat adjacent to roads.

Alternative 4 (Modified Proposed Action)

Direct and Indirect

Overall, the distribution, quantity, and quality of hiding cover and foraging habitat would change across approximately 44 percent of project area with alternative 4. The quantity of hiding cover would decrease while the quantity and quality of foraging habitat would increase on the treated acres. When compared to alternative 3, alternative 4 would result in more improvement to deer habitat capability in the short and long term within the project area and to both of the fawning. Under alternative 4, cover would decrease more and foraging opportunities would increase more than in alternative 3, bringing cover/forage ratios closer to the desired condition in deer range.

After the Hi-Grouse Project is completed, 1.5 miles of road within the project area would be closed. The KNF Motorized Travel Management decision, signed August 13, 2010, included converting 0.8 mile of non-system road within the project area to an open-system road. When considering the Motorized Travel Management decision, open road density across the project area would be 3.5 miles per square mile, a decrease of 0.2 miles per square mile. About 0.2 miles of Forest Service Road 44N80A within the west fawning area would be closed after the Hi-Grouse Project is completed. This small decrease would not result in any change to the existing open road density within the west fawning area.

Cumulative Effects

Foreseeable cumulative effects for alternative 4 would be similar to those discussed for alternative 3.

3.2.4 *Fish and Aquatic Habitat*

The project area 7th-field HUC watersheds are Antelope Well, Dock Well, Grouse Hill, Hill 22, and Tamarack Flat. The project area contains ephemeral drainages that likely flow only in response to very large runoff events (McNamara 2009). There are no vernal pools and no mapped surface hydrologic connectivity between the project units and downstream waters (McNamara 2009); therefore, fish species associated with streams are not addressed further in this analysis.

3.2.5 *Botany*

Scope of Analysis for Botany: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the treatments in the action alternatives, along with the project design features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. The cumulative effects analysis area is the entire Hi-Grouse Project area. The analysis timeframe is 10 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E.

3.2.5.1 Threatened, Endangered, and Sensitive Species

More detailed descriptions of affected environment, methods, and environmental consequences related to plants for this project can be found in the following reports incorporated by reference: Hi-Grouse Project Biological Assessment/Evaluation for Threatened, Endangered, Proposed, and Sensitive Plant Species (Baker 2009a), Hi-Grouse Project Supplemental Botany Report for Ethnobotanical Species (Baker 2009b), and Hi-Grouse Project Noxious Weed Assessment (Baker 2009c). These are incorporated by reference and available on the Forest Internet website at: www.fs.usda.gov/klamath.

Methodology

An office pre-field review and a preliminary field review were conducted to determine if this An office pre-field review and a preliminary field review were conducted to determine if this project is within the range of any KNF-listed threatened, endangered, proposed, sensitive, or survey and manage species, and if suitable habitat is present within the proposed project area (USDA Forest Service 2007c). All threatened, endangered, proposed, sensitive, and survey and manage species listed for the KNF were considered during this review (USDA Forest Service 2006b). USDI Fish and Wildlife Service, Arcata Field Office, was consulted regarding listed plant species and responded to the KNF on March 9, 2009 (USDI Fish and Wildlife Service 2009).

There is one known population of a sensitive bryophyte species in a non-treatment area of the project, *Ptilidium californicum*. Surveys for sensitive plants were conducted on August 1, 2, 7, and 9; and October 11 and 13, 2007. Surveys conducted during October were for *Ptilidium californicum* (see USDA Forest Service 2007d). Surveys were conducted for this species, and no other suitable habitat or populations were found.

Consultation to Date: No consultation was required because threatened and endangered species are not suspected or present (USDI Fish and Wildlife Service 2009).

Affected Environment

There were no threatened, endangered, or proposed plant species within the Hi-Grouse Project area. The Hi-Grouse Project is not within the range, and does not contain habitat for any threatened, endangered, or proposed species within the project area. No federally listed threatened, endangered, or proposed plant species would be affected by this project.

Pre-field review, and field surveys for *Ptilidium californicum* did not yield any locations of sensitive plants, survey and manage plants, fungi, or bryophytes within the Hi-Grouse Project area.

The Region 5 Regional Forester has listed plants for which there is a concern for species viability as "sensitive." Sensitive plants are those species which may occur in few to large numbers in a small localized area, or which may occur in a wide geographical area, but in few numbers in restricted specialized habitats. Fifty-one sensitive plant species are known, or thought likely to occur on KNF (USDA Forest Service 2006b). Only those species of concern that have potentially suitable habitat or documented occurrences in areas that may be affected by the proposed project are discussed in this document. These areas include all activities in the action alternatives.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

No direct or indirect effects to threatened, endangered, proposed, and sensitive plants are anticipated because no treatments are proposed.

Cumulative Effects

Without direct or indirect effects there would be no cumulative effects. Possible natural disturbance (such as windthrow of trees or wildfire) may occur in the analysis area.

Alternatives 3 and 4

Direct and Indirect Effects

No federally listed threatened, endangered, or proposed, plant species would be affected by this project alternative. The action alternatives were grouped for determination of effects because the effects are the same. Since no sensitive plants are present within treatment units of the project area, the Hi-Grouse Project would have **no impact** to any sensitive species by implementation of any action alternatives.

No direct effects to threatened, endangered, proposed, and sensitive plants are anticipated because the one known population of *Ptilidium californicum* is in a no-treatment area. No indirect effects from habitat modification from treatments are anticipated. The treatments would be within the range of possible natural disturbance (such as windthrow of trees or wildfire) in the analysis area.

Cumulative Effects

Without direct or indirect effects from project activities there would be no cumulative effects. Possible natural disturbance (such as windthrow of trees or wildfire) may occur in the analysis area.

3.2.5.2 Noxious Weeds

Methodology

The Forest Noxious Weed GIS Database was used for information on existing noxious weed sites currently mapped within or adjacent to the project area. Inventory in the project area was conducted during August 2007. Forest Service Manua1 2080 Noxious Weed Management (USDA Forest Service 1995b) includes the policy statement, "When any ground disturbing action or activity is proposed, determine the risk of introducing or spreading noxious weeds associated with the proposed action." A noxious weed risk assessment was completed for this project (Baker 2009c).

Affected Environment

The KNF places high priority on the management of noxious weeds, particularly the introduction and spread of noxious weeds related to forest management activities (USDA Forest Service 2001). Surveys were completed and no weeds were located within the project area.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

Currently, according to the district database, the area is weed-free and low levels of disturbance are present. The short growing season also limits the types of weeds that could infest the area. Vulnerability to weed infestation/spread is low. Low levels of use and current weed-free condition of the area indicate that non-project vectors pose a low risk from weeds.

Cumulative Effects

Wind could disperse weeds to un-infested areas. The relative distance of weeds to susceptible habitat tempers the risk. Currently weed risk in the area from wind-blown seed is low.

Alternatives 3 and 4

Direct and Indirect Effects

Increases in traffic and equipment use directly related to the project implementation in the action alternatives could increase the risk of weeds. This is a moderate risk as weeds are not known from the project area and the roads to the area are generally weed-free. Project design features NNIS-1 through NNIS-3 will prevent the potential spread of weeds. As weeds are detected across the KNF they are controlled as appropriate. With the weed prevention design criteria in place, the Hi-Grouse Project has a low risk of weed introduction and spread.

Cumulative Effects

While weeds could find opportunities to infest into the project area, the current weed-free nature of the area, low levels of disturbed areas, high vegetative cover, and the limited timeframe after treatments when bare ground would be available to invade, severely limit infestation opportunities. In addition, prevention measures NNIS-1 through NNIS -3 would be followed (section 2.2.5). The use of weed free materials and washing equipment will reduce the risk of introducing and spreading weeds.

3.3 Physical Environment

More detailed descriptions of affected environment, methods, and environmental consequences for soils, geology, and hydrologic resources for this project can be found in the Watershed Report (McNamara 2009), incorporated by reference and available on the Forest Internet website at: www.fs.usda.gov/klamath.

3.3.1 *Soil Resource*

Methodology

The forest soil scientist and ID team hydrologist conducted field reviews in the project area for soil data collection surveys and making other field observations. Plot data was collected using traverses in proposed units. Fieldwork included verification of soils mapped in 1994.

Each management activity was reviewed and rated (low, moderate, or high) for its probability of meeting each applicable evaluation criteria. Probability ratings are qualitative estimators based on past experiences, observations, and monitoring data. A high rating is comparable to a 90 to 100 percent likelihood of the activity meeting the evaluation criteria. A moderate rating is comparable to a 75 percent likelihood of the activity meeting the evaluation criteria. A low rating is comparable to greater than 50 percent likelihood of the activity meeting the evaluation criteria.

Detrimental disturbance consists of two main types of disturbance: detrimental compaction and detrimental displacement. Detrimental compaction is compaction that exceeds threshold bulk density values as measured at the 4 to 8 inch soil depth. Detrimental disturbance is where soil displacement of the topsoil removes greater than 15 percent of the soil organic matter in the upper 12 inches of soil (disturbed area must be greater than 1 square meter in size).

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design

features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. The cumulative effects analysis area is the entire Hi-Grouse Project area. The analysis timeframe is 20 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E. No foreseeable future projects overlap with the project area.

Affected Environment

Soils in the project area have developed primarily from volcanic ash deposited over lava flows. Soils are generally moderately deep to very deep (20 to 60 inches or greater). Surface soil textures are gravelly, coarse sandy loams overlying gravelly, cobbly, or very cobbly, sandy loam subsoils. Estimated soil productivity, as determined from soil properties, is generally FSSC 4-5. Maximum erosion hazard ratings for 100 percent bare soil are moderate. Currently, erosion hazards are low due to gentle slopes and the high amount of soil cover.

Total soil cover ranges from about 85 to 100 percent and averages about 92 percent. The average slope distribution within the project area ranges from about 0 up to 50 percent and averages around 5 to 10 percent. The amount of area in identifiable skid trails and landings is approximately 3 percent of the project area. The level of existing detrimental soil disturbance that exceeds the soil compaction thresholds at 4 to 8 inch depth or loss of soil organic matter in the upper 12 inches of soil was estimated to vary from 0 to 15 percent and averages 3 percent. Currently, over 95 percent of the soils in the project area have a well functioning soil biological system.

Coarse woody debris or downed logs are an important component of coniferous forest ecosystems. Existing levels of course woody debris are an interaction between past fires, past management activities, and the age of the existing vegetation. Currently, course woody debris (greater than 20 inches diameter) varies from 0 to 11 logs per acre and averages 4 logs per acre. The course woody debris is poorly dispersed throughout the project area. Overall, the course woody debris will continue to increase over time as trees continue to fall by natural events.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

With no action taken, the effect on the soil resource would be no new disturbances and the gradual increase in larger course woody debris. Nutrient cycling would be maintained as fine organic matter increases as duff/litter layers. Soil fertility would be maintained due to the increased organic matter on the soil surface and in the soil. Compacted soils (reduced porosity) in portions of old, existing skid trails will slowly increase their porosity due to biological activities, and thereby regain lost soil productivity over the next 40 to 50 years.

Cumulative Effects

Depending of severity, future wildfires could change the forest floor and increase the time frames for rebuilding the litter layer and mesofauna population recovery. Future wildfires could

also cause organic matter decomposition rates to increase due to more sunlight and changes in organic litter composition. Depending on the severity of future wildfires, soil erosion could significantly increase. A severe wildfire could interrupt nutrient cycling by removing the duff layer. If this happens, the duff layer would not return until the grass/brush seral stage evolved into pine stands.

Alternatives 3 and 4

Direct and Indirect Effects

Alternatives 3 and 4 would result in various intensities of soil disturbance, such as, compaction, displacement, and loss of soil organic matter on the treated acres. Alternative 4 includes slightly more intensive treatments that would impact approximately 632 more acres than alternative 3. Machine piling under alternative 4 is anticipated to be minimal because whole-tree yarding will be used to move trees to landing areas.

Based upon soil compaction monitoring (Laurent 2006a, b) on the district, detrimental soil disturbance would be confined to a small portion of main skid trails and landings which would equal approximately 6 to 11 percent of the project area. A small portion of the total disturbed project acres, such as portions of skid trails and landings, would exceed the soil quality analysis standard (SQAS) thresholds for loss of porosity and soil organic matter. These two alternatives would cause both reduced and increased soil productivity in skid trails and landings, but would not, spatially, exceed Forest Plan and SQAS standards and guidelines of 15 percent.

Within the project area, soil integrity (functionality) and productivity would be maintained. Overall, this project would result in recommended soil cover levels, varying degrees of decreased macroporosity, maintaining existing organic matter content in the soil, maintaining the existing moisture regime, a slightly altered hydrologic function, and unchanged buffering and exchange capacities.

Under alternatives 3 and 4 there would be varying degrees of fertility/growth reduction and some growth increases on approximately 700 to 800 acres of skid trails and landings due to varying levels of compaction (decreased macroporosity and increased microporosity), soil displacement and loss of soil organic matter. Changes in site productivity are a normal occurrence associated with ground-based harvesting methods and may not be measurable due to the affects of competing vegetation.

Cumulative Effects

Cumulatively, mechanical harvesting and biomass removal have the most potential to affect soil productivity. The effects are mostly associated with nutrient displacement and removal, which has the ability to recover over the long term. There may be a slight (within normal variability) short-term soil productivity decrease, but long-term soil productivity will not be significantly decreased (greater than 15 percent decline) over the life of the new stand.

Overall, the generally low to moderate intensity of harvesting and fuel reduction activities will minimize any cumulative effects. The use of existing skid trails and landings minimizes cumulative effects to these previously disturbed acres. Machine mowing (mastication) would not significantly increase soil compaction (reduction in soil porosity) because generally, only one pass would be made over any piece of ground. Short-term disturbance effects would not measurably affect long-term soil productivity. The dynamic and highly variable nature of soil processes and ecosystems and its strong buffering capacity reduce the possibility of having any measurable negative long-term cumulative effects on soil productivity.

Potential future management treatments for these stands may be more thin harvests. Studies (Wells and Jorgensen 1979) have shown that thin harvest would remove only 2.9 percent of the total site nitrogen, which is 67 percent less nitrogen removal than a total biomass harvest (whole-tree clear-cut). The literature also suggests that it would take at least three total biomass removals within 150 years to significantly reduce soil productivity (Wells and Jorgensen 1979). These stands, within the same timeframe, could have at least two biomass thin harvests and numerous bole only harvests. The literature also indicates that repeated bole only harvest would not produce a significant soil productivity decline (Wells and Jorgensen 1979).

Individually as well as cumulatively, these project activities would result in a slight decrease in soil fertility, but that would be within the natural variability for the soils within the project area. Soil productivity would be increased in areas where there is a slight increase in soil bulk density (equipment tracks) due to decreased macroporosity and increased microporosity. Reductions in macroporosity (compaction) and increased erosion rates would not exceed the SQAS. Both alternatives 4 and 3 would retain sufficient soil cover to minimize soil erosion, maintain nutrient cycling, and maintain soil fertility and soil integrity/health, and therefore, maintain short- and long-term soil productivity.

3.3.2 *Hydrologic Resource*

Methodology

Topographic maps and recent aerial photos were examined and combined with local information from knowledgeable district personnel. Field reviews were conducted to evaluate potential hydrologic features and to observe surface hydrologic connectivity. The project hydrologist walked along the un-named stream riparian reserve to verify that there is no surface hydrologic connectivity between the project area and downstream waters. Potential intermittent channels identified on a 1:24000 quad map in the project area units were field inspected. Field observations found no evidence of any past flow in these features.

Three quantitative cumulative watershed effects models were used (USDA Forest Service 2004a; Reichert 2008). The model results are intended to provide an indication of the potential magnitude of effects. Combined with an estimate of the probability of these effects occurring, this information can be interpreted as the relative risk of altering stream flows (ERA Model), surface erosion (USLE Model), or mass wasting (GEO Model) attributable to implementation of this project.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. Cumulative effect analysis is based on the 7th field watersheds that intersect the project

and all recent past, present, and future foreseeable actions. Cumulative watershed effects for this project were assessed quantitatively and qualitatively. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E. No foreseeable future projects overlap with the project area.

Affected Environment

The project area lies within the Badger Basin-Willow Creek 5th-field HUC Watershed. This watershed is further subdivided into 6th and 7th-field HUCs. The following 7th-field HUC watersheds—Antelope Well, Dock Well, Grouse Hill, Hill 22, and Tamarack Flat—are within the project area. Two mapped riparian reserves segments were identified previously with remote sensing inside the project area boundary. However, field verification revealed that there is no defined channel and inter-annual scour in these drainages, and that they likely flow only directly in response to very large flows, and are therefore, ephemeral. As a result, the designated riparian reserves lack the characteristics necessary for classifying them as riparian reserves. There is no mapped surface hydrologic connectivity between the project units and downstream waters. There are no domestic water sources in the project watersheds. The project area is upstream of domestic and fish beneficial uses.

Antelope Well 7th-Field Watershed. In the Antelope Well 7th-Field Watershed, there are no fish and no identified stream courses. Drainages consist of ephemeral draws that flow only in direct response to large precipitation events. There is no sign of inter-annual scour in drainages.

Disturbances and past impacts in the watershed include roads, logging activities, OHV use, and grazing. The current road density is approximately 3.1 miles per square mile. Currently, ERA cumulative watershed effects risk ratios range from 0.12 to 0.33 for the three modeled erosion/disturbance processes. Cumulative effects risk ratios are the relative risk of the current watershed conditions exceeding the threshold of concern for the watershed. A risk ratio of 1 indicates that the risk of sedimentation or sediment delivery to streams exceeds the threshold of concern.

Dock Well 7th-Field Watershed. Disturbances and past impacts in the watershed include roads, logging activities, OHV use, and grazing. The current road density is approximately 3.3 miles per square mile. Currently, cumulative watershed effects risk ratios range from 0.11 to 0.52 for the three modeled erosion/disturbance processes.

Grouse Hill 7th-Field Watershed. Disturbances and past impacts in the watershed include roads, logging activities, OHV use, and grazing. The current road density is approximately 3.3 miles per square mile. Currently, cumulative watershed effects risk ratios range from 0.22 to 0.48 for the three modeled erosion/disturbance processes.

Hill 22 7th-Field Watershed. Disturbances and past impacts in the watershed include roads, logging activities, OHV use, and grazing. The current road density is approximately 3.1 miles per square mile. Currently, cumulative watershed effects risk ratios range from 0.14 to 0.38 for the three modeled erosion/disturbance processes.

Tamarack Flat 7th-Field Watershed. Disturbances and past impacts in the watershed include roads, logging activities, OHV use, and grazing. The current road density is approximately 3.0 miles per square mile. Currently, cumulative watershed effects risk ratios range from 0.11 to 0.37 for the three modeled erosion/disturbance processes.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

Existing conditions resulting from past disturbances and impacts in the project area include roads, logging activities, off highway vehicle (OHV) use, and grazing. Current road density varies from 3.08 to 3.45 miles per square mile by 7th-field watershed. Current risk ratios range from 0.11 to 0.52 for the three modeled erosion/disturbance processes. With no action, existing conditions would steadily improve over time. Effects of road density on the area would remain the same. Erosion would lower over time as soil cover increases in disturbed areas. Given the affected environment and lack of hydrologic connectivity, water quality would remain basically the same as current conditions.

There would be no new indirect effects. Existing indirect effects are increased snow pack, increased subsurface water due to reduced evapotranspiration, and surface erosion as a result of past logging. These indirect effects would be reduced over time as the existing vegetation increases in density and height. Impacts from existing road densities would remain the same. Water quality would remain the same as current conditions.

Cumulative Effects

Existing cumulative effects would decrease as vegetation and soil cover in disturbed areas increases. Cumulative effects from future projects would be somewhat less if this area experiences no new disturbances. Water quality would remain the same as current conditions. Beneficial uses would remain the same as current conditions.

Depending on intensity, future wildfires could change the forest floor and increase the time frames for rebuilding the litter layer, removing soil cover, and reducing evapotranspiration. Depending on intensity, wildfires could drastically increase soil erosion due to loss of soil cover and increased runoff, and could negatively affect un-named drainages leaving the project area.

Alternatives 3 and 4

Direct and Indirect Effects

No direct effects are anticipated from this project because there are no stream channels within the project area. Overall, alternatives 3 and 4 have a very high probability of meeting the watershed resource evaluation criteria, and therefore maintaining long-term watershed condition/quality. This project will meet the Forest Plan and Basin Plan objectives for suspended sediment, settleable materials, turbidity, and water temperature. Overall, this project will not significantly decrease short- or long-term watershed condition and water quality.

Given the proposed silviculture and fuels treatments in alternatives 3 and 4, there would be little to no impacts to this resource. Fuel treatments are not anticipated to cause sedimentation to channels because there are no defined channels and no surface connectivity between the project units and downstream waters. Compliance with BMPs and wet weather operations standards during implementation and at the close of the timber sale will prevent erosion problems. Decommissioning of the existing temporary roads including putting barriers to at the road takeoff would be beneficial over the long term, allowing the road to revegetate and recover without additional disturbance. Compared to Alternative 3, the road closures proposed in Alternative 4 would have additional benefits long term benefits.

Alternatives 3 and 4 would not measurably increase short- or long-term suspended sediment, settable material, stream turbidity, and water temperature in the five 7th-field drainages. Alternatives 3 and 4 have a very high probability of meeting the watershed resource evaluation criteria, and, therefore, maintaining long-term watershed condition/quality. These alternatives would meet the Forest Plan and Basin Plan objectives for suspended sediment, settleable materials, turbidity, and water temperature.

Cumulative Effects

The surface erosion (USLE) model shows that surface erosion is slightly increased, but these increases would probably be within the natural variability of sediment transport and turbidity. The cumulative effects of the project on the mass wasting risk (GEO model) are the same or mostly reduced due to road decommissioning, except for the Tennant-Antelope Creek Watershed, with implementing either alternative 3 or 4, including future foreseeable actions. All the increases in the risk ratio are no more than 2 percent. The cumulative risk ratios as determined by the ERA model are raised 0.04 for Antelope Well, 0.42 for Dock Well, 0.01 for Grouse Hill, 0.16 for Hill 22, and 0.04 for Tamarack Flat. These increases are small and would not result in detectable increased effects on peak flows. Project activity would not negatively affect channel conditions or water quality. Beneficial uses in the project area would not be significantly affected by these small increases in cumulative watershed effects.

Inference Points and Thresholds of Concern: Much of the cumulative watershed effects assessment of sedimentation and hydrologic runoff incorporates model-supported information that accumulates disturbances relative to land sensitivity. As disturbances increase (and recover) over time and space, at some point, depending on the rate of recovery verses new activities, the risk of initiating or contributing to existing cumulative watershed impacts becomes a concern. These model-specific levels are defined as “inference points” (or “thresholds of concern” [TOC]) and are used to inform land managers of potential risks for a project or activity. A transition exists from lower to higher potential risk of adverse effects to beneficial uses (from minor to potentially significant). From a management perspective, inference points are intended to represent the center of that transition zone. Inference points do not represent the exact point at which cumulative watershed effects will occur. Rather, they serve as “yellow flag” indicators of increasing susceptibility for significant adverse effects occurring within a watershed.

Cumulative Watershed Effects Analysis. Cumulative effects of past, present, and future activities may increase the risk of (1) hydrologic (peakflow) changes, modeled in ERA/TOC; (2) increased rate of sedimentation from surface erosion sources, modeled in the USLE; and (3) increased rate of landslides, displayed in the GEO Mass Wasting model. The model outputs need to be put in perspective of the surface hydrology of the project area as previously discussed.

Alternatives 3 and 4 occur within five 7th-field drainages—Antelope Well, Dock Well, Grouse Hill, Hill 22, and Tamarack Flat. With implementation of either alternative 3 or 4, model values increase in each of the drainages. These increases, however, do not push any of the drainages to a higher categorical status for any of the models (USDA Forest Service 2004a, Cumulative Watershed Effects 2006).

After implementation alternatives 3 and 4, activities would raise the current risk ratios of 0.28 to 0.52 for surface erosion as determined by the USLE model slightly to 0.30 to 0.66. The small differences between alternatives are minor to negligible. These risk ratios are not considered elevated since they are mostly well below the 0.80–1.0 threshold of concern zone.

The cumulative risk ratios for mass wasting as determined by the GEO model shows that there is basically no difference in effects between alternatives 3 and 4. The differences between alternatives 3 and 4 in are not sufficient to change the risk ratios. These risk ratios of 0.18 to 0.42 are well below elevated (greater than 0.80) conditions. The modeled sediment increases are relatively minor and are not enough to affect channel conditions and water quality.

The increased cumulative risk ratios as determined by the ERA model for alternatives 3 and 4 are essentially the same for project watersheds. The increases are small and will not result in detectable effects on peak flows downstream of the project. The differences in alternatives 3 and 4 are very small and the differences in their effects would be minimal to none.

The surface erosion model (USLE) shows that surface erosion is slightly increased with the action alternatives, but these increases would probably be within the natural variability of sediment transport and turbidity. The cumulative effects of the project on the mass wasting risk (GEO model) are the same or mostly reduced due to road decommissioning, except for the Tennant-Antelope Creek Watershed, with implementing either alternative 3 or 4, including future foreseeable actions. All the increases in the risk ratio are small and would not result in detectable increased effects on peak flows. Project activity would not negatively affect channel conditions or water quality. Beneficial uses in the project area would not be significantly affected by these small increases in cumulative watershed effects.

3.3.3 *Geologic Resource*

Methodology

The ID team hydrologist conducted field reviews in the project area for soil data collection surveys and making other field observations.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. The cumulative effects analysis area is the entire Hi-Grouse Project area. The analysis timeframe is 10 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E. No foreseeable future projects overlap with the project area.

Affected Environment

The project area contains various lava deposits dominated by Quaternary- and Pliocene-aged basalt flows. The bedrock is basically unweathered and very competent. These flows have been subsequently covered by a mantel of volcanic ash. The majority of the project area has a low

slope stability hazard rating with a small inclusion of moderate hazard in relatively steeper areas. Mass wasting is not in evidence due to the relatively flat terrain making up the project area.

The Forest Plan standards and guidelines for geology and the physical environment (S&G 1-1 through 2-11, page 4-19–4-21) were reviewed for applicability to this project. The project is not within any geologic special interest areas, there are no known geologic hazards in the project area. The project could use local rock pits in the area, but there are no concerns or issues related to rock sources for the project.

Management activities were rated (low, moderate, or high) for the ability to meet the applicable evaluation criteria. A probability rating of moderate or high is just an indicator on the likelihood of the evaluation criteria being met. The ratings are more like achievement expectations. A rating of low would imply that there is a strong likelihood that the geologic resource objective would not be met.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

Existing conditions resulting from past disturbances and impacts in the project area include roads, logging activities, OHV use, and grazing. Current road density varies from 2 to 4 miles per square mile by 7th-field watershed. With no action, existing conditions would remain the same and recover over time. Effects of road density on the area would remain the same.

There would be no new indirect effects. The project area is dominated by high slope stability due to gentle slopes, competent bedrock, and highly permeable soils. Landslide rates would remain at its current levels which are minimal to none. Existing landings and roads have little to no cuts and fill slopes. OHV use would remain at its current use. Road-related runoff and erosion would remain the same.

Cave resources, if found during project layout or implementation, would remain the same as current conditions. Any cave resources would remain in their present condition; however, wildfires would have potential to adversely affect cave habitat.

Overall, this alternative will not change the current landslide rates which are very low to none. The cave resources would remain in their current condition. Road-related runoff and erosion as well as OHV use would remain at their current levels.

Cumulative Effects

With no action, risks for mass wasting would remain the same as current conditions. The risk ratios are well below elevated (greater than 0.80) conditions. Potential effects on the potential cave resources are minimal to none.

Existing effects could increase if vegetation increases in density to the point where a intense future wildfire would result in major increases in the slope stability hazard which would negatively affect water quality.

Alternatives 3 and 4

Direct and Indirect Effects

Direct effects are those occurring at the same time and place as the action. If caves are present, direct effects relating to lava tube or fault caves includes soil disturbance, ground shaking, and disturbance to cave entrances. Soil disturbance could change surface drainage and allow runoff and sediment to enter the cave or lava tube. Ground shaking can affect the cave by dislodging portions of the cave ceiling, thereby creating new openings or disturbing wildlife using the cave. Disturbances can change the size and shape of cave entrances as well as cave interiors. All proposed management activities for this project that could produce direct effects have a high probability of meeting the geologic resource standards and guidelines.

No adverse direct or indirect effects are anticipated from this project because there are no slope stability concerns and the cave resources will be adequately protected from disturbance and potential sediment. Overall, alternatives 3 and 4 have a high probability of meeting the geologic resource evaluation criteria, and therefore maintaining public health, safety, welfare, and property. The groundwater and cave resources will be adequately protected from potential adverse affects by the equipment exclusion buffers. There were no detectable differences between alternatives 3 and 4 regarding their effect on mass wasting rates (GEO model).

Given the proposed silviculture and fuels treatments in Alternative 3 and 4, there would be little to no change in mass wasting potential because the root strength of the stand would not be altered. The project area is dominated by high slope stability due to gentle slopes, competent bedrock and highly permeable soils. The landings and roads have little to no cuts and fill slopes. Decommissioning or closing of the temporary roads, including putting barriers at the road takeoff, would be beneficial over the long term as vehicle use (including OHV use) would be eliminated or reduced, allowing the road to revegetate and recover without additional disturbance.

Cumulative Effects

Since there are no adverse direct and indirect effects, there would be no cumulative effects anticipated from this project because there are no slope stability concerns due to gently sloping terrain, sandy loam soil material, and hard unweathered bedrock. Cave resources will be adequately protected from disturbance and potential sediment. Overall, alternatives 1, 3, and 4 would equally meet the geologic resource evaluation criteria, and therefore, maintain public health, safety, welfare, and property. The groundwater and cave resources will be adequately protected from potential adverse affects by the equipment exclusion buffers.

3.4 Social Environment

This section describes the aspects of the social environment of the project area.

Residents, tribes, and communities within or adjacent to the project area, and other members of the public, use the area in a variety of ways, and value these lands for diverse reasons. National forest management of public lands affects these uses and values. The Hi-Grouse Project involves vegetation- and road-modifying activities (e.g., thinning, prescribed burning, mowing, temporary road use). Discussions on social effects for this analysis include scenery, recreation, cultural resources, air quality, social-economic, transportation, environmental justice, and civil rights.

The Multiple Use-Sustained Yield Act, the Forest and Rangeland Renewable Resources Planning Act, and the National Forest Management Act direct the national forests to supply goods and

services and to be managed for a broad array of resources. Consistent with these guiding laws, the Forest Plan established land allocations and management direction for the Forest. The project does not propose changes in the management of the Forest, but rather is a mechanism for implementing management direction. Therefore, the social effects of this single proposal are limited in scope.

Forest Service Manual 1973 requires a social effects analysis if the potential social effects of Forest Service actions are important to the decision. Social effects are important. However, social effects were not identified as a significant issue for the Hi-Grouse proposal; therefore, an extensive analysis was not done nor required.

Effects to social values in this analysis are discussed in narrative form for many factors. Economic factors were estimated based on experienced costs. The discussions are supported by a number of more detailed documents, incorporated by reference, including: Social-Economic Report (North 2009a), Scenery Reports (Mattson 2009), Recreation Report (Desser 2009), cultural resource input (Goetz, J. 2009), Air Quality Report (Pfeffer 2009), environmental justice input (Pfeffer 2010) and the Transportation Report (North 2009b). These documents are available on the Forest Internet website at: www.fs.usda.gov/klamath.

3.4.1 *Social-Economic*

This section summarizes the social impacts and the economic costs and benefits of the Hi-Grouse Project. The project area is located entirely within Siskiyou County. Siskiyou County has local loggers capable of harvesting the timber, and has two large mills with the capacity to utilize timber from the project. The social effects are the direct and indirect impacts of the project on the residents of Siskiyou County. The economic costs and benefits include an estimate of the sales economic viability (return to the government), and estimates of the associated costs to the government for the planning and implementation of the project.

Regulatory Framework

A financial efficiency analysis is required at “gate 2” (project analysis, design and decision notice) (FSH 2409.18). The financial efficiency analysis of the proposed timber harvest, vegetation management, and transportation management activities is disclosed in this section. A comparison of the effects between the alternatives in regard to the following measures is also disclosed: harvest volume, estimated jobs supported, and estimated “25 Percent Fund” payment to county government.

Methodology

Social Impacts and Environmental Justice

The analysis focuses on the direct and indirect economic impacts of the Hi-Grouse Project on the citizens of Siskiyou County. The impacts are measured in terms of the estimated number of logging and sawmill jobs supported by the commodities produced by the project, and the economic value of these jobs as compared to the overall economy of the county. Entities outside of these counties may also benefit from the project.

The data sources for this analysis include local, county, State, and Federal economic databases and reports. The limitations of these data sources are primarily due to the relative small size of Siskiyou County’s population and economy. In many cases, there is not enough data available to quantify the actual importance of an industry sector to the overall economy, making the affect of the economic impacts difficult to judge.

Economic Costs and Benefits

This summarizes the “present net value” of the project. This calculation includes all monetary costs and benefits for the project. Future costs and benefits are discounted back to 2008 dollars using a 4 percent discount rate. The monetary benefits are the estimated stumpage value for the timber sale. The monetary costs include the costs of planning, preparing, and administering the project; and the costs associated with the pre-commercial thinning portion of the project. The model used for this analysis is the Quicksilver Economic Analysis program (USDA Forest Service 2009). Data sources include costs provided by the Forest for each type of activity.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted and are considered within the existing condition.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. The cumulative effects analysis area is bounded to the county. The timeframes used for both the social and economic analysis is 7 years, beginning in 2010. It is anticipated that this period of time will be sufficient to complete financial transactions for both the timber sale and the fuels treatments.

Affected Environment

The Hi-Grouse project area is located entirely within Siskiyou County with a population of 45,491 (2006 data) over an area of 6,287 square miles. Most of the population lives in small towns, ranches, or farms. Yreka is the county seat, and the largest city with a population of approximately 7,300.

The local economy in Siskiyou County has historically been based on government, forestry, light manufacturing, and tourism. The economic data available for Siskiyou County is limited due to the small size of the economy, much of the gross revenue data is not available at the county level to maintain confidentially for businesses. However, the jobs and income data provides a reasonable overview of the economy. The economy of Siskiyou County is moderately diversified. The timber industry in Siskiyou County currently provides about 25 percent of the manufacturing jobs and 45 percent of the manufacturing wages in Siskiyou County. The timber industry is stable.

The infrastructure (milling, trucking, and logging businesses) is sized proportionately to the supply of timber available from all sources, including Federal lands, and is highly dependent on the Federal timber to continue operating at the current levels. The Federal lands currently contributing 23 percent of the timber supplied to the industry. Large programmatic changes in timber volumes from the Federal lands will have a direct affect on the size of the industry. The existing industry is very important to Federal land managers. Without an existing infrastructure, implementing land management activities such as hazardous fuels reduction under the National Fire Plan and the Healthy Forest Restoration Act will be much more difficult and expensive.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

Under this alternative, there would be no timber harvest and no fuels treatments. Overstocked stands would remain overstocked, leaving them vulnerable to damage from insects and disease that could affect future product quality. No timber would be produced, so there would be no timber-related jobs and no "25 Percent" stumpage sharing with Siskiyou County.

Cumulative Effects

There are no foreseeable cumulative effects for this alternative.

Alternative 3, and Alternative 4 (Modified Proposed Action)

Direct Effects

The commercial thinning and restoration portions of the proposed action will result in the production of timber commodities (table 3.4-1). In addition to sawlogs, this project could also produce fuel for the biomass industry. The proposed harvest removal systems are exclusively ground based. The analysis assumed that the tops would be left attached, and skidded to the landing for processing and disposal. If no biomass market exists at the time of harvest, the tops and slash would be piled and either sold at a later date, or burned at the landing.

Table 3.4-1. Alternatives 3 and 4 approximate volumes, and harvest costs by logging system

Alternative	Sawlog Volume MBF[1]	Sawlog Volume CCF[2]	Sawlog Stump to Mill Costs per CCF[3]	Biomass Volume CCF	Biomass Landing to Plant Costs per CCF[4]
3	4,241	8,364	$132.15	4,084	$45.71
4	13,263	25,262	$105.29	6,603	$45.50

[1] MBF = Thousand board feet

[2] CCF = Hundred cubic feet

[3] Stump to Mill Cost: (Source) HG_Alt3_R5_sale_eval_v3.xls. Costs include all cost centers including harvest, load, trucking, temporary road construction and reconstruction, slash disposal, and erosion control. Sawlog costs include yarding of biomass to the landing.

[4] Biomass Landing to Plant Cost: (Source) HG_Alt3_Biomass_R5_sale_eval_v3.xls. Costs includes chipping, loading, and trucking to the biomass facility in Klamath Falls, Oregon.

Financial Efficiency. The financial efficiency of this project is measured by the present net value of the project (PNV). The PNV is calculated by subtracting the present value of future costs from the present value of future benefits. The present value is the 2008 value of costs and benefits earned or spent in future years, discounted back to 2008 dollars (table 3.4-2).

Table 3.4-2. Alternatives 3 and 4—Present net value summary

Alternative	Present Net Value – Stumpage	Present Net Value – Costs	Present Net Value
3	$58,696	-$879,343	-$820,647
4	$545,019	-$1,620,804	-$1,075,784

Source: QuickSliver Economic Analysis Program; 2009.

The present net value of alternatives 3 and 4 are -$820,647 and -$1,075,784, respectively. In simpler terms, the Forest Service will need to budget funding (in 2009 dollars) to accomplish all the objectives of this project.

Alternatives 3 and 4 would have indirect effects on the local economy. These effects include the number of jobs supported, income derived from the jobs, and payments of 25 percent of the stumpage value to Siskiyou County (table 3.4-3). Counties receive payments in lieu of taxes (PILT) to replace tax revenue lost due to the public nature of lands administered by Federal agencies as authorized under the 1976 Payments in Lieu of Taxes Act. The amount is based on the amount of acreage administered by certain Federal agencies, population, a schedule of payments, the Consumer Price Index, other Federal payments made in the prior year, and the level of funding allocated by Congress. These payments would not be affected by changes in revenue as a result of implementation of the proposed action or alternatives.

Harvesting and manufacturing timber will support jobs within the local economy. For this analysis, only direct jobs (logging and milling) were considered. Jobs are described as a person/year employment, and are based on the ratio of logging and milling employment to total volume harvested in 2007 within the State of California. The jobs and income are calculated using only the non-helicopter volume, as it is unlikely that the helicopter volume will be economically viable.

Table 3.4-3. Alternatives 3 and 4—Jobs, income, and payment to county

Alternative	MBF Harvested	Jobs Supported[1]	Income Supported	Estimated Stumpage Value	Estimated 25% Payment to County
3	4,241	13.0	$483,394	$29,115	$7,279
4	13,263	40.7	$1,511,635	$524,055	$131,014

[1] Direct Logging and Milling Jobs: *Source:* 2007 Bureau of Labor Statistics, 2007 California Board of Equalization.

Cumulative Effects

Timber volume harvested from this project contributes to the KNF's potential sale quantity. The KNF LRMP, as amended by the Northwest Forest Plan, forecasted an ASQ (allowable sale quantity) of 51 MMBF for the preferred alternative. The potential sale quantity only considers volume produced from matrix lands. The average volume sold between 1995 and 2006 was 25.4 MMBF per year, or 49 percent of the potential sale quantity. Alternative 3 would contribute 4.2 MMBF to the annual target, or 8 percent of the potential sale quantity. Alternative 4 would contribute 13.3 MMBF to the annual target, or 26 percent of the potential sale quantity.

3.4.2 *Environmental Justice*

Affected environment

Executive Order 12898 relating to environmental justice requires Federal agencies to consider disproportionately high and adverse environmental effects on minority and low-income populations; it also requires that minority and low-income populations be given access to information and opportunities to provide input to decision-making on Federal actions. The assessment area for this analysis is Siskiyou County, California, and Jackson County, Oregon, because these two counties are the geographic-political area that would encompass the "footprint" of the area impacted by the proposed project (also called the "community of comparison").

Census data from the U.S. Census Bureau (http://quickfacts.census.gov/) shows that the population of Siskiyou County, California, is made up of Whites (80.5 percent), Hispanic or Latino (9.7 percent), Native Americans (4.4 percent), Blacks (1.6 percent), Asians (1.3 percent), Native Hawaiian and other Pacific Islanders (0.2 percent), and persons reporting two or more races (3.4 percent) (2008 data). Approximately 16.4 percent of the population is below the poverty line (2008 data). The population of Jackson County, Oregon, is made up of Whites (85.8 percent), Hispanic or Latino (9.2 percent), Native Americans (1.2 percent), Blacks (0.7 percent), Asians (1.3 percent), Native Hawaiian and other Pacific Islanders (0.2 percent), and persons reporting two or more races (2.3 percent) (2008 data). Approximately 16.0 percent of the population is below the poverty line (2008 data).

The nearest community potentially impacted by the project is Tennant. Census data (2006–2008 data) was obtained (http://factfinder.census.gov/). Data shows the local population (63 persons) consists of Whites (88.9 percent), Hispanic or Latino (11.1 percent), Native Americans (1.6 percent), and persons of other races (6.3 percent) (2000 data). Approximately 34.8 percent of the population is below the poverty line (2000 data)

Environmental Effects

All Alternatives Direct and Indirect Effects

Based on the analysis of the environmental effects, alternatives 1, 3, and 4 would have no adverse effects on human health or the environment that are significant, unacceptable, or above generally accepted norms. Although there are modeled negative cumulative watershed effects, there will be no adverse effects to domestic water sources or fish. Census data for the local area suggests that the percentage of the local minority population is somewhat higher than the community of comparison and that there are a disproportionate number of low-income people. Therefore, implementation of alternatives 3 or 4 may have beneficial social effects in that local residents may benefit from the work generated by the project.

The project does not appear to have a disproportionately high or adverse effect on minority or low-income populations. Public involvement did not reveal any issues or concerns associated with the principles of environmental justice. All interested and affected parties will continue to be involved with the public involvement and decision process.

The project area has relatively high road densities, many of which result from non-system routes. Alternative 4 includes approximately 1.5 miles of closure of two spur roads (44N80A and 44N62A). These two road segments were previously physically closed (barricaded) from use and are not expected to disproportionately impact public use. The remaining roads in the project area would continue to provide access to the general area, and the Forest recreation opportunities will remain and should be similar for all persons. This is not expected to disproportionately affect any group.

All Alternatives Cumulative Effects

Based on the analysis of the environmental effects, alternatives 1, 3, and 4 would have no adverse cumulative effects on human health or the environment that are significant, unacceptable, or above generally accepted norms. This document reviews consequences for environmental justice by alternatives and fulfills the requirement for a civil rights impact analysis (CRIA). No additional CRIA is required.

3.4.3 *Scenery*

Viewing scenery is the single most enjoyed recreation activity on the KNF. Scenery provides the setting for all activities experienced by Forest visitors. Each setting is comprised of scenic attributes derived by the environmental context of topography, geology, and climate. These underlying factors are expressed and highlighted by the scenic attributes that they support. The activities proposed by the Hi-Grouse Project potentially affect the current and future condition of these valued scenic resources. Managing scenery resources involves the process of analyzing effects and implementing scenic conservation design features to achieve the KNF Forest Plan desired conditions and direction for scenery resources. Information is summarized from the Hi-Grouse Project Scenery Report (Mattson 2009).

Methodology

The scenery analysis applied KNF Forest Plan visual quality objectives to describe and measure degrees of expected visual disturbance. It also applied USFS Scenery Management System principles to track change to scenic character/image, and relative sustainability of that character through time (USDA Forest Service 1995d). Analysis used field studies and photography from inventoried sensitive viewpoints and other views of the project area, as well as coordination with project ID team members, and consideration of public preferences for scenic quality.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start). The analysis area for scenery resources comprises the immediate project area, as well as adjacent areas containing high points identified in the Medicine Lake Highland Cultural Area (USDA Forest Service 2004b).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. Cumulative scenic quality was within the geographic scope of roadways and other viewpoints within and adjacent to the project area. The analysis timeframe is 10 years for short-term effects such as temporary decreases in canopy closure after thinning treatments. Some long-term effects, such as the time it takes trees to mature, would occur in excess of 20 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and are displayed on maps A-7 and A-8 in appendix A, and described in appendix E.

Affected Environment

The Hi-Grouse Project Area is adjacent to the Medicine Lake Recreation Area. Scenic quality is the primary recreation value potentially affected by the Hi-Grouse Project, as viewed from recreational roads and trails. The project area is not located on steep terrain nor is it prominently viewed from areas outside of the project boundary, other than from the identified high points such as Red Cap Mountain and Little Mount Hoffman.

The Forest Service developed the Recreation NICHE process for recreation facilities analysis to define the particular recreation niche the Forest could provide for the public. The Hi-Grouse project area lies primarily within an area defined as “travelways” having no developed campgrounds or amenities other than the Four Corners Snowmobile trailhead. However, the area is used for dispersed camp recreation during the summer season, and snowmobiling during the winter season. Cultural uses include outdoor recreation, and seeking spiritual inspirations on various volcanic peaks.

Lodgepole Pine stands viewed from Tennant Road #77

Scenic Character. The major scenic attribute of the Hi-Grouse Project Area is the forest vegetation comprised of varying types of coniferous species including the open ponderosa pine stands with large tree character, the lodgepole stands of more densely stocked, smaller trees with small openings, composite stands of pine, and the stands that have a multi-layered appearance such as the pine/white fir species, and the red fir/pine species. Secondary attributes such as shrubs and rock formations, and small stands of red fir, are also valued in the foreground views. In distant views beyond the project area, the landform is comprised of numerous volcanic peaks and buttes of differing sizes and shapes, some rounded and others craggy and rugged amidst the broad sweeping landscape that varies 1,200 feet in elevation.

Scenic Character Context. The terrain of the project area is heavily influenced by past volcanic activity; volcanic peaks are common throughout the area. The 5,400 to 6,500 feet range in elevation provides enough diversity to support the varying plant associations that present differing scenic characteristics. Higher elevations support the red fir/pine associations; the cold air drainage areas support lodgepole. Lower elevations in the area tend to be drier and experience more frequent fire than ponderosa pine can tolerate. Mixed pine/fir compositions are found at the mid-level elevations.

Historic logging practices have eliminated the large tree component in much of this area, and fire suppression practices have increased the density of the timber stands and altered the species composition. Many of the stands are a multi-species conglomerate, and the forest has lost much of its varying characteristics. The open pine stands are now multi-layered with white fir and

other species. Due to these practices the vegetation allows for minimal views to the volcanic peaks. The density of the stands allows minimal views into the forest limiting the viewer to less than 30 feet from the road prism.

Although much of the project area has a natural appearance, these stands are modified to be excessively dense and uniform. The scenic attributes are vulnerable to large, stand-replacing fires, and insect and disease epidemics. The sensitivity level and related foreground (0 to 0.25 mile) VQO (visual quality objective) along project area roads varies from modification to partial retention.

Existing Scenic Integrity. Scenic integrity is the degree to which the scenery is free from visible disturbances that detract from the natural and socially valued appearance, including disturbances due to human activities or extreme natural events inconsistent with the historic range of variability. Scenic integrity is measured on the KNF through visual quality objective levels defined by the USFS Visual Management System's Chapter 1 USDA Handbook # 46211. These levels and descriptors of how people perceive them are shown in table 3.4-4.

Table 3.4-4. Visual quality objectives and perceived alternation

Levels of Scenic Integrity/Disturbance (Visual Quality Objectives [VQOs])	The Forest's Scenic Integrity as People by People
Preservation	Unaltered, complete
Retention	Unnoticeably altered
Partial retention	Slightly altered
Modification	Moderately altered
Maximum modification	Heavily altered
Unacceptable modification (is never an objective on national forest lands)	Unacceptably altered

The area is viewed primarily from inventoried sensitive Forest Roads 15 and 77, which travels south from the Four Corners Snow Park at the northern edge of the project area. Views from these and the project area's other sensitive routes are typically limited to foreground views (0 to 300 feet) by the dense forest stands on both sides of the road. The views that are most compelling are those of the distant volcanic peaks that dot the landscape; however, vistas of these peaks are very limited. The existing visual quality of the views along Forest Roads 15 and 77 meets partial retention. There is little evidence of human-caused impacts to the scenic quality of the project area as viewed from distances beyond 0.25 mile (foreground). Many of the sensitive viewpoints are on top of the volcanic peaks within and adjacent to the project area. Although these viewpoints are not along sensitive routes, the special place cultural designation within the Medicine Lake Highlands recognizes the social importance of views from these elevated viewpoints.

The project area is viewed at middle and background distances from high points such as Red Cap Mountain, Little Glass Mountain, Squaw Peak, and Little Mount Hoffman outside of the project boundary. These views are of particular interest to the native tribes in the area because they are culturally sensitive viewpoints. From these viewpoints the middleground and background scenery is comprised of a contiguous forest across gently rolling slopes with volcanic peaks and buttes. The coarse scale texture and color of the forest is perceivable at these distances. The most apparent distinction from these distances is large patches of dead and dying trees, as seen from Red Cap Mountain. The foreground views scenery is comprised of the subalpine fir and volcanic cinder.

This view from Red Cap Mountain looks northwest directly into the lodgepole pine stands that are heavily affected by the bark beetle; much of this stand is dead or heavily infested with bark beetles.

The sensitive routes along the southern portion of the project area are used regularly but lightly. During the winter months these routes are used as snowmobile routes. The views from these routes have no obvious human-caused impacts to the scenic quality. The existing visual quality of the views along these routes meets partial retention.

Scenic Stability. A new scenery indicator has been developed for use within the USFS Scenery Management System (applied in this analysis according to procedures described in the September 20, 2006, Draft Appendix J of the SMS Handbook #701). As size and intensity of fire events increase, community response is increasingly in favor of improving resiliency of forest stands. Improving resiliency of the forest stands reduces hazards such as loss of property, life, economic viability, and recreation settings. People value the landscape's unique scenic character and want it to be sustained.

Scenic stability is the degree to which the desired scenic character can be sustained through time and ecological progression. For the Hi-Grouse Project Area, the existing scenic stability analysis focuses on the single major scenery attribute of vegetation, addressing its ecosystem conditions identified by field observation and fire regime condition class (FRCC) 7 coarse-scale data on vegetation and fire history data. Ecosystem changes to other minor scenery attributes such as landform, rock outcrops, and winter snowfall are not nearly as critical to the Hi-Grouse Project's scenic character as its vegetation, since these changes are relatively stable over time regardless of fire behavior and human activities. Scenic stability levels are defined as follows:

Very High Stability—All dominant and minor scenery attributes of the valued scenic character are present and are likely to be sustained.

High Stability—All dominant scenery attributes of the valued scenic character are present and are likely to be sustained. However, there may be scenery attribute conditions and

ecosystem stressors that present a low risk to the sustainability of the dominant scenery attributes.

Moderate Stability—Most dominant scenery attributes of the valued scenic character are present and are likely to be sustained. A few may have been lost or are in serious decline.

Low Stability—Some dominant scenery attributes of the valued scenic character are present and are likely to be sustained. Known scenery attribute conditions and ecosystem stressors may seriously threaten or have already eliminated the others.

Very Low Stability—Most dominant scenery attributes of the valued scenic character are seriously threatened or absent due to their conditions and ecosystem stressors and are not likely to be sustained. The few that remain may be moderately threatened but are likely to be sustained.

No Stability—All dominant scenery attributes of the valued scenic character are absent or seriously threatened by their conditions and ecosystem stressors. None are likely to be sustained, except relatively permanent attributes such as landforms.

Existing Scenic Stability. Some stand types display greater degrees or amounts of change than others. For instance, lodgepole stands are dense and tend to have a short life span and break down more rapidly than other stand types. Within these stands, it is expected that the stand would slowly break down over a period of 50 to 100 years, and then the stands would begin a progression of rapid decay and mortality. This progression of decay and mortality has a visual appearance of a forest stand in decline, in poor health, looking sickly and very susceptible to large stand-replacement fire. Based on research, most people find that such conditions are not visually appealing (USDA-Forest Service 2005). The stability of lodgepole stands is different from other species. It is expected that there would be greater amount of change over 100 years within a lodgepole pine stand than there would be in a ponderosa pine stand. Pine stands have an open and sometimes park-like character (trees spaced 20 to 30 feet apart). Ponderosa pine stands tend to maintain health despite drought and low intensity fire; and are resistant to diseases and insects; therefore, the amount or degree of change over a 100-year period is much less than that of the lodgepole pine stands. The visual appearance of the ponderosa pine stands is valued for the large tree character, openness, and overall appearance of health.

At a landscape scale, both of these stand types are present. The FRCC data and the vegetative structure data take into account the varying stands and their lifecycle characteristics. When there is a departure from the natural, historic conditions, it is expected that the historic, desired scenic character of the landscape is at risk of experiencing changes that are outside of its temporal and spatial scale. With the conditions and trends present within this project area and at the landscape scale, it is expected that large scenic character changes beyond the natural and historic spatial and temporal scale would occur.

Evaluating scenic stability considers conditions necessary to sustain desired scenic character of stands within the natural and historic range of the landscape. When trends such as increasing stand density, encroachment of less resilient species, increasing fuel loads, and high levels of mortality exist, the expected consequences are change in the scenic character that are beyond the historic scale. Examples of these consequences are large canopy openings from large stands of dead and dying timber, and loss of distinctive characteristic such as open, large-tree-character pine stands, lodgepole stand mosaics, and multi-layered, mixed-species stands. Gradual trends over time have altered the species composition, stand structure, and age classes of the forest

vegetation. Stands of large mature ponderosa pine that provide an open forest are diminished due to encroaching mixed conifer species.

Much of the coniferous vegetation is trending toward unsustainable conditions. Stocking levels, fuel loads, and species composition has departed from the reference/historic conditions. The historic fire regime of the ponderosa pine type is one of frequent low-intensity fires which have maintained lower stand densities, and fuel loads at a healthy sustainable level. This low-intensity fire regime maintains a sustainable species composition of predominantly fire-resistant ponderosa pine. Even in cold pockets and in the upper elevations where lodgepole pine reside, the suppression of fire has caused a departure from historic conditions. The lodgepole stands are very decadent, overstocked and stressed. With this additional stress these stands are vulnerable to insect and disease infestations, that can lead to wide spread mortality.

The white fir/pine stands are densely stocked. The white fir is encroaching where ponderosa pine stands were once sustained by the low-intensity fire cycles. Stands are in poor shape with heavy mortality and stressed conditions. Bark beetle infestations have already killed much of the pine. Today these stands are beyond the historical range of variability, showing trends toward increasing risk of large stand-replacement fire.

The red fir stands are diminished as well, being crowded out by other species. These diminished characteristics are scenic attributes that make up the desired scenic character.

White fir stands viewed from Road 44N61

These continuing trends have created fuel conditions that cause concern for stand-replacement fire events. Approximately 90 percent of the project area is moderately or severely inconsistent with or trending away from historic “pre-settlement” vegetation structure conditions. Figure 3.4-1 shows these conditions (Creasy et al. 2007). There are widespread excesses of overly dense stands of smaller and intermediate trees, and accumulations of highly flammable forest woody debris. These conditions are largely due to wildfire suppression and logging within past decades. The conditions are such that the scenic character is at risk of being severely altered by large stand-replacement fire.

The Fire Regime Condition Class (FRCC) levels shown in figure 3.4-1 are:

FRCC I (Low) corresponds to the definitions for “High” and “Very High” scenic stability levels described above. They both should have scenery attribute conditions that are within the range of natural or historic variability. The green areas in the FRCC maps generally reflect these scenic stability levels.

FRCC II (Moderate) corresponds to the definitions for “Moderate and Low” scenic stability. They both include conditions outside the range of natural or historic variability. These scenic stability levels are generally reflected as yellow areas on the FRCC maps.

FRCC III (High) corresponds to the definitions for “Very Low” and “No” scenic stability. They are far beyond the range of natural or historic variability. The red areas on the FRCC maps reflect these two scenic stability levels (see above photo).

The FRCC-based maps (figures 3.4-1 and 3.4-2) show reliable coarse-scale estimates of “departures” from natural, historic vegetation conditions (“Vegetative Structure”) and wildfire cycles (“Fire Return Interval”); maps are the approximate scale. Most of the project area is highly departed from the natural vegetative structure and highly departed from the natural range of fire frequency (figures 3.4-1 and 3.4-2). A departure of natural fire return interval often indicates that future fire events would burn more intensely due to the conditions of the stands.

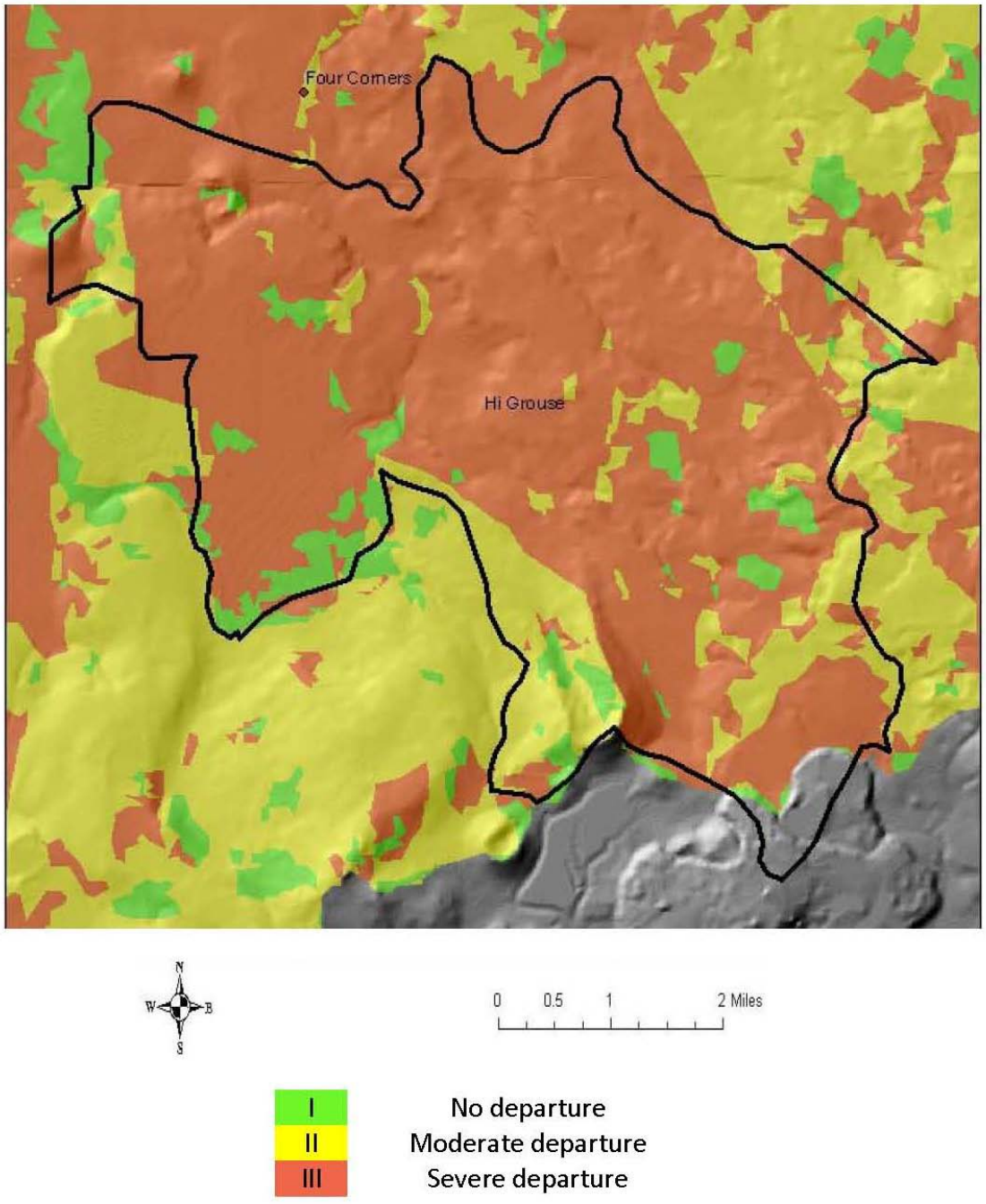

Figure 3.4-1. Departure from historic vegetation conditions within the project area (FRCC 2006)

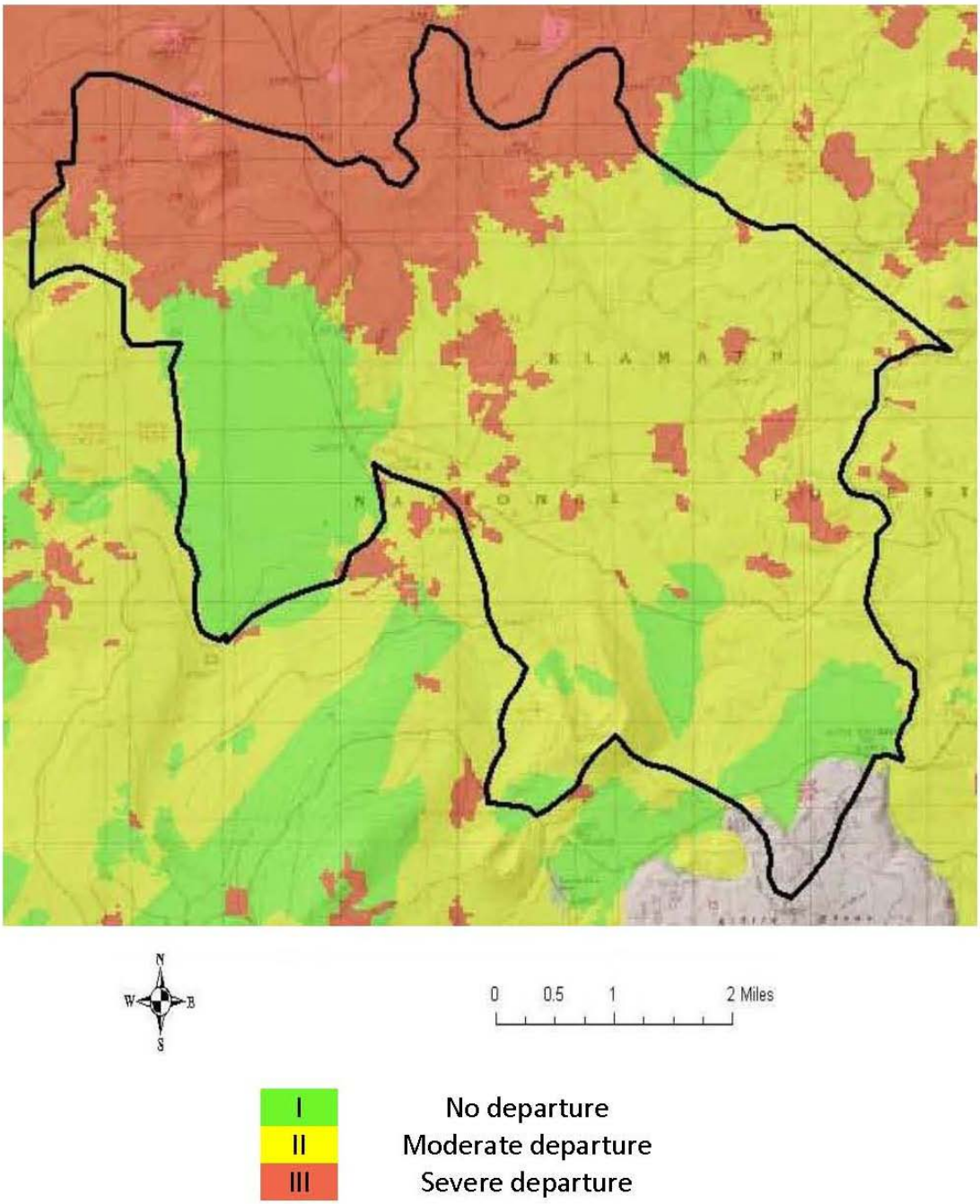

Figure 3.4-2. Departure from historic wildfire return interval within the project area (FRCC 2006).

The data indicates that condition of the vegetative structure is poor in 80 to 90 percent of the project area, and the stresses of drier/hotter weather, *annosus* root disease, and western bark beetle are moderate to severe across the project area and at a landscape scale. Within a landscape where most of the scenery attributes are the vegetative character, these conditions affect the scenic stability rating extensively. There is a high risk to most scenery attributes making the scenic stability "Very Low".

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

The no action alternative would not create direct scenery effects, nor would it address conditions and trends such as over stocking and non-resilient species compositions that pose a threat to the scenery resources. Leaving current conditions unaddressed as the climate continues to change would allow threatening conditions to increase.

Scenic Stability and Integrity. The no action alternative would continue existing trends and conditions that are increasingly hazardous to the stability of scenery attributes. Increased fuel loads combined with the existing stand density and species composition are very hazardous conditions. All of these factors would contribute to a large stand-replacing fire in the event of a lightning strike or a human-caused fire, which would damage or eliminate several vegetation scenery attributes, including the historic canopy pattern. The high incidence of the *annosus* root disease would continue to contribute to mortality of stands, many that already have heavy fuel loads and high stand densities. The greatest threat to scenic stability in this area is large stand-replacement fire.

The no action alternative would have no direct effect to the scenic integrity of the project area. The existing degree of visible disturbances would remain. Table 3.4-5 displays the existing scenic integrity/Forest Plan VQO level along with predicted outcome by alternative.

Cumulative Effects

Alternative 1 would perpetuate the existing conditions and trends that have created hazardous, unstable conditions for project area scenic quality, and have contributed to the loss of the attractive open ponderosa pine stands. Perpetuating these conditions would maintain low scenic stability in the area. An event such as a large fire or an insect or disease epidemic is very probable considering the existing and perpetuating conditions. The indirect effects to scenic integrity, if such an event were to occur, are all effects related to stand-replacement fire larger in size and intensity than what would occur if the vegetation conditions were within the natural, historical range of variability, as well as the potential adverse scenery disturbances arising from fire suppression activities.

Scenic Stability and Integrity. The no action alternative would perpetuate conditions and trends that increase the scenery hazards of stand-replacement fire. Table 3.4-5 displays the existing scenic integrity/Forest Plan VQO level along with predicted outcome by alternative. Without direct or indirect effects, there would be no cumulative effects to the scenic integrity of the project area.

Alternative 3 and Alternative 4 (Modified Proposed Action)

Direct and Indirect Effects

The action alternatives would cause short-term, low-intensity adverse effects to scenery in foreground views. These alternatives would reduce stocking densities and adjust species compositions to more resilient conditions. These actions would improve the potential for a fire event to be less intense than a fire event in the project area in its current condition. Scenic character attribute changes would improve scenic stability under the action alternatives.

The existing overall scenic quality would be altered by action alternatives by differing degrees based on the method and the amount of acres treated. Some treatments would have minimal effects to the scenery resource, while others may change the scenery substantially. This section will disclose the predicted effects, including whether the alternatives meet the minimum level of scenic integrity required in the KNF Forest Plan and the Medicine Lake Highlands Plan, as well as changes to the project area's scenic character and scenic stability.

In this landscape, the exclusion of fire has contributed to the trends and conditions that put scenic attributes at risk. By reintroducing fire into the ecological progression, resiliency of the historic vegetation scenery attributes can be improved. Forest canopy densities can be maintained while species composition is regulated to favor the historically dominant fire resistant species. Ladder fuels are minimized, and litter is consumed in a controlled manner, further stabilizing the ecosystem's vegetation scenery attributes. Large tree character is promoted by fire reintroduction, thus moving the landscape toward the desired scenic character.

Table 3.4-5. Comparison of effects for scenic integrity/Forest Plan VQO and scenic stability

	Alternative 1	Alternative 3	Alternative 4
Scenic Integrity/Visual Quality Objective			
Partial Retention	Meets VQO	Meets VQO	Meets VQO
Modification	Meets VQO	Meets VQO	Meets VQO
Scenic Stability			
Overall Project Area Existing Condition is Very Low Stability	No improvement	Minimal improvement	Minimal Improvement
Ponderosa Pine	No improvement	Improves to low stability	Improves to low stability
Ponderosa Pine/Mixed Conifer	No improvement	No improvement	No improvement
Lodgepole Pine	No improvement	Improves to low stability	Improves to moderate stability

Cumulative Effects

The action alternatives are expected to cause minor adverse effects to scenic integrity while causing beneficial long-term effects to the scenic character and scenic stability. The action alternatives address (to varying degrees) the conditions, stresses, and trends that currently pose a hazard to the scenic attributes. It is expected that the direct effects would be immediate and long term (10 to more than 50 years). The large tree character that is now lacking would begin to develop over the next 50 years and beyond. Reintroduction of fire into the landscape would be beneficial to maintaining open park-like stands of ponderosa pine. As continuing projects in the broader area are completed, it is expected that the scenic stability at a larger scale is expected to improve. The Little Horse Peak Project along the Tennant Road #77 to the north of the project area is a good example of projects being accomplished in the area that contribute to the larger effort to improve ecological conditions towards desired scenic character, which in turn improves scenic stability while meeting the visual quality objectives that minimize adverse scenic integrity effects.

The Hi-Grouse Project would help achieve the KNF's desired conditions for scenery, which is to perpetuate ecologically established scenery, and minimize visual disturbances (meet Forest visual quality objectives/VQOs).

3.4.4 *Recreation*

Viewing scenery is the single most sought after recreation activity on the KNF (Mattson 2009). Effects on scenery and scenic stability are discussed in the "Scenery" section directly above.

Dispersed recreation in the summer consists mainly of driving for pleasure (or sightseeing), bird-watching, nature hikes, hiking, biking, OHV riding (mainly in conjunction with hunting), and hunting. Dispersed recreation in the winter consists of cross-country skiing, snowmobiling, snowshoeing, and snow play.

Methodology

The Forest Service has developed the Recreation NICHE process for recreation facilities analysis (USDA Forest Service 2007c). This process was developed to define the particular recreation niche the Forest could provide for the public. The Forest defined spatial units that had particular characteristics which could support a defined set of recreational experiences. The Hi-Grouse project area was characterized as a travelway. Forest recreation maps were reviewed for recreation related facilities.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. Implementation of the Hi-Grouse Project is anticipated to start in 2010. The estimated duration of the harvest activities is approximately 7 years. It is likely that some pile burning and underburning could begin a few years after the last thinning units are completed (i.e., 9 or 10 years after project start).

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. The cumulative effects analysis area is the entire Hi-Grouse Project area. The analysis timeframe is 10 years. Past, ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E.

Affected Environment

Goosenest travelways and lookouts support scenery and wildlife viewing plus easy access to fishable lakes and high-elevation meadows accented by wildflowers, streams, aspen, and wildlife (Recreation NICHE Narrative 2007, page 1).

Roads 15 and 77 are the main routes through the project area and receive the most use by visitors. During the winter months these routes, and others, are used as snowmobile routes. The project area provides mostly dispersed recreation opportunities. Most popular dispersed recreational activities within the project area include snowmobiling, dispersed camping at primitive sites, hunting, viewing scenery, natural features and wildlife, and driving for pleasure.

Small dispersed campsites are located within the project area. “Dispersed recreation is outdoor recreation that involves relatively low density use and occurs over broad expanses of land and water. Dispersed recreational activity accounts for 80 percent of Forest recreational use. Most dispersed activity occurs during the summer and fall months. All dispersed areas are currently managed at low standard levels.” (Forest Plan, page 3-12) Few improvements exist within the area; the Four Corners trailhead facility is located north of the project boundary.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

Existing conditions and trends would be perpetuated. There are no direct effects on recreation and the potential for indirect effects based on changes in vegetation is remote.

Cumulative Effects

There are no cumulative effects from no action.

Alternative 3, and Alternative 4 (Modified Proposed Action)

Direct and Indirect Effects

Neither action alternative would result in measurable impacts to recreation. The proposed thinning and underburning treatments would not create openings large enough to stand-out along the snowmobile trails.

The operational impacts of the projects such as traffic, noise, and dust will be temporary. There is no reason to expect recreation use to measurably increase or decrease because of the proposed project. No recreation user conflicts have been identified.

Cumulative Effects

Cumulative effects of this project are limited to the planning area into the foreseeable future. The only other similar actions that may occur would be related to fire events and suppression activities. Since there are no direct and indirect effects from this project or other similar actions within the project area, there are no anticipated cumulative effects on recreation resources.

3.4.5 *Cultural Resources*

Methodology

Archaeological field inventories were conducted in the project area and are recorded in Archeological Reconnaissance Reports (ARRs) #05-05-933, -933A, -1100, -1100A, -1100B, -1100C, -1100D, -1100E, -1278, -1357, -1358A and -1425. In compliance with the Region 5 Programmatic Agreement for Compliance with Section 106 of the NHPA (Provision III. D. (2)), relevant archaeological sites have been identified and will be protected by applying standard resource protection measures in or adjacent to the area of potential effect.

Affected Environment

No designated cultural areas (MA-8) are within or near the project area. A portion of the project area does fall within the Central Highlands (Assessment Area) of The Medicine Lake Highlands Historic Properties Management Program: Including a Cultural Assessment and Guidelines for

Management (USDA Forest Service 2007a). This management tool was used as a guide in planning this project.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

No ground-disturbing activities would occur under the no action alternative; hence, there would be no direct or indirect effects on cultural resources.

Cumulative Effects

There would be no cumulative effects on cultural resources

Alternative 3, and Alternative 4 (Modified Proposed Action)

Direct and Indirect Effects

The treatments, as proposed under the action alternatives would have no direct or indirect effects on cultural resources because all archaeological and historic sites would be protected using standard design criteria.

Cumulative Effects

There would be no cumulative effects on cultural resources because all archaeological and historic sites would be protected using standard design criteria.

3.4.6 *Air Quality*

Air quality is managed through a complex series of Federal, State, and local laws and regulations designed to assure compliance with the Clean Air Act. The project area is located within the Northeast Plateau Air Basin. The Northeast Plateau Air Basin is comprised of Siskiyou, Modoc, and Lassen counties. Within Siskiyou County, the air quality regulating authority is the Siskiyou County Air Pollution Control District (SCAPCD) in Yreka, California. The SCAPCD monitors air quality at three sites throughout the county, and has the responsibility of enforcement to both the Federal and State air quality regulations at the local level.

Pollutants that will be released from project-related activities are the criteria pollutants, i.e., particulate matter smaller than 10 microns or 2.5 microns (PM_{10} or $PM_{2.5}$), carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic carbons (VOCs) and minute quantities of non-criteria air toxics. These pollutants and air toxics are considered unhealthy for the public. In addition, green house gases like carbon dioxide (CO_2) and methane (CH_4) are also emitted. These gases are known to impact climate change.

Methodology

Emissions estimates for burning were quantified through the First Order Fire Effects Model, version 5.0 (FOFEM). FOFEM is recognized by the Forest Service Pacific Southwest Region (Region 5) as being the most current and accurate analysis tool available for emissions prediction (Reinhardt et al. 1997). The model is based on extensive research in Western forest ecosystems. Due to the use of whole-tree yarding and biomass to remove tops of trees, minimal activity fuels would be created under any alternative. Machine and hand pile units were considered for the estimated actual acres of burning. Wildfires burning on the same affected acres would result in the similar levels of emissions as noted for the acres burned under each of the action alternatives.

Scope of Analysis: Affected environment includes recent past actions and historic actions that have impacted the existing condition. Past activities recorded in Forest databases were considered and displayed on map A-7 in appendix A, and described in appendix E.

Direct and indirect effects analyses consider the treatments associated with the no action alternative and the treatment areas in the action alternatives, along with the project design features. Implementation of the Hi-Grouse project is anticipated to start in 2010. This project can be divided into two phases in terms of air quality impacts. First phase will be the timber sale that will take 3 to 5 years for completion involving mechanized equipment and hauling. The second phase includes prescribed fires (understory and pile burns) that will also be spread over 5 to 10 years following harvest activities.

Cumulative effects considers current and future foreseeable similar actions (other fuel reduction and vegetation management projects) noted in the Forest's SOPA that overlap the analysis area in time. The cumulative effects analysis area is the project area, and how it would contribute to air quality in Siskiyou County. The analysis timeframe is 10 years. Ongoing and foreseeable future projects recorded in Forest databases were considered in the cumulative effects and displayed on maps A-7 and A-8 in appendix A, and described in appendix E.

Affected Environment

The project vicinity is forested, federally managed lands with no substantial emission sources other than fugitive dust from logging and recreation. Other contributions would be smoke and haze from seasonal wildland and prescribed fires from both within and outside the basin. The area is located approximately 15 miles southeast of Macdoel, California, in Siskiyou County. The project lies in the Northeast Plateau Air Basin and is managed by the Siskiyou County Air Quality Management District (SCAQMD).

According to CARB website (www.arb.ca.gov) the ambient air in portions of the SCAQMD exceeds the State PM_{10} standard during many of the winter months. Siskiyou County is identified as attainment for PM_{10} and $PM_{2.5}$ for Federal standards. Therefore the project is exempt from conformity determination. For state PM_{10}/$PM_{2.5}$ standards Siskiyou County is designated as “attainment” area for PM_{10} and “unclassified” for $PM_{2.5}$.

In Siskiyou County, PM_{10} generally comes from motor vehicles, wood burning stoves, dust from construction and logging operations, wildfires, and slash burning. Siskiyou County is in “non-attainment” status for ozone, a product of volatile organic compounds or nitrogen oxides; and is considered “unclassified” for CO. See the Air Quality Report, table 2, for detailed existing estimated emissions for Siskiyou County.

According to the Forest Plan (USDA Forest Service 1995a, page 3-4), air quality on the Forest has been considered very good, and complies with all NAAQS standards set by the EPA.

Environmental Consequences

Alternative 1 (No Action)

Direct and Indirect Effects

There would be no direct or indirect effects on air quality from no action.

Cumulative Effects

This alternative would lead to increased accumulation of ground fuels which could lead to increased high-intensity wildfires in the future. If a wildfire were to occur, the potential indirect effects include degraded air quality and reduced visibility. Consumption of the increased fuel loads and understory biomass would increase the amount of smoke emissions. These emissions would occur over a period of a few days to several weeks.

Alternatives 3 and 4

Direct and Indirect Effects

Forest air pollutant sources with the greatest impact are wildfire and prescribed burns. Other lesser pollutant sources are fugitive dust and vehicle exhaust emissions. Logging operations will produce some dust, primarily from tractor skidding of log bundles and hauling over earth surface roads. Dust from hauling will be minimized by requiring abatement with either water or an acceptable alternative. Logging operations are generally done over several years and localized dust from skidding and hauling dissipates rapidly. Vehicle exhaust emissions would be generated by logging equipment, pickup trucks, water trucks, chipper engines, and transport vehicles.

Due to the use of whole-tree yarding and biomass to remove tops of trees, minimal activity fuels would be created under any alternative. Machine and hand pile units were considered for the estimated actual acres of burning. Wildfires burning on the same affected acres would result in similar levels of emissions when compared to prescribe burning.

Burn emissions would occur over 3 to 5 years under approved burn plans. Hand pile burning will occur during the fall after significant moisture that prevents the spread of fire from the piles. Estimated 24-hour emissions are very unlikely to exceed the 24-hour standard (California) for PM_{10} and $PM_{2.5}$. Emissions at the project site (burn location) are not expected to exceed annual State or Federal standards, and would not degrade air quality or attainment status. See the Air Quality Report (Pfeffer 2009), tables 4, 5, and 6, for detailed estimated emissions by alternative for burning and vehicle emissions.

Alternative 4 would generate slightly higher amounts of vehicle emissions and dust than alternative 3 over the life of timber sale. Logging operations will produce vehicle emissions and some dust, primarily from tractor skidding of log bundles and hauling over dirt and gravel roads. Dust from hauling will be minimized by requiring abatement with either water or an acceptable alternative. Logging operations are generally done over several years and localized dust from skidding and hauling dissipates rapidly.

The burning of slash piles, concentrations, and prescribed burning will produce smoke and ash from partially burned plant matter. Smoke from proposed burning would remain in the area for about 1 to 2 days each time burning occurs. Permissive burn days are determined by the SCAQMD. The project area is in attainment for all criteria pollutants for Federal standards so no conformity determination is required.

The action alternatives will reduce the overall fuel loading on approximately 3,568 acres for alternative 3, and 3,847 acres for alternative 4. Treatments would remove biomass and would decrease the expected emissions from a wildland fire if it occurs in the project area.

Cumulative Effects

There has been pile burning over the past 10 years within the project area. Compliance with burn day designations and permits from the SCAPCD has minimized the effects of burning so that

Federal and State air quality standards have not been exceeded. Because impacts to air quality in regards to smoke from past wildfires and prescribed fire activities are short-lived, past activities do not contribute to cumulative effects. Past harvest activities reduced the amount and size of available material available for consumption in the event of a future wildfire.

Proposed management activities under alternatives 3 and 4, combined with present and foreseeable activities, would contribute to the emissions that affect air quality. These alternatives and their impacts on air quality are difficult to address in terms of cumulative effects. Large fires have occurred near the project over the past century as described in the fire/fuels analysis (Helmbrecht and Kurth 2009); however, those effects on air quality are gone and cannot be viewed cumulatively. If a wildfire occurred, there is a potential for the National Ambient Air Quality Standards (NAAQS) to be exceeded depending on the size and duration of wildfire.

Gaseous pollutants and airborne particulate matter (e.g., smoke and dust) would continue to be present into the future. Primary emissions sources contributing would include wood burning stoves, motor vehicle exhaust, emissions from recreational campfires, emission associated with development of private lands, prescribed fire, fugitive dust, and wildfires within or adjacent to the project area. Multiple prescribed burn activities, occurring at the same time, could cumulatively increase particulate levels. Generally, the effects of one burn activity are completed before another burn activity begins. Impacts to air quality would generally be confined to no more than a few hours, or at most a few days. The cumulative effect of prescribed fire on air quality is rather short-lived, because once the burn is over and the smoke has dissipated, the effect is over. However, it is more likely that the current projects will be completed before the Hi-Grouse Project treatments would be implemented.

Future wildfire frequency is expected to continue as it has in the past. If wildfire occurs in the future these effects could lead to negative cumulative effects. These negative cumulative effects are dependent upon the size and intensity of the wildfire. Visibility impairment and hazardous health impacts, due to sudden and dramatic releases, are likely with a large wildfire event. These events may temporarily reduce visibility and air quality. These events lead to production of high amounts of GHGs and reduced carbon sequestration from the burnt area for next few years following the fires. The cumulative effects are unknown, because the intensity and size of a wildfire is unknown. Research has indicated that wildfires can produce nearly twice the amount of smoke as prescribed fire (Huff et al. 1995).

One objective of the project is to prevent the occurrence of large, uncontrolled wildfires burning into the designated late-succession stands. Wildfires present a risk to the public and result in damage to both the environment (e.g., increased erosion, air quality degradation) and property. Wildfires are known to result in high levels of including GHGs and associated NAAQS violation and worst visibility. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality problems.

The SCAQMD regulates permissible burn days for prescribed fire use within their district. A smoke management plan (contained in all prescribed burn plans) will be submitted and approved by the SCAQMD prior to using prescribed fire on Federal lands. The improved wildfire suppression characteristics created by prescribed burning and thinning should lead to a reduction in size and intensity of wildfires in the treated areas. In the long term, the emissions from wildfires are expected to be reduced as a result of reduced fuel loading. Overall cumulative emissions are expected to be similar to the past years and are not expected to exceed Federal or State air quality standards.

3.5 Climate Change

Increasingly, the relationships between human-caused emissions, climate change, and the role of forests as carbon sinks are being documented (IPCC 2007). Although uncertainty exists in quantifying the impact of emissions on climate, a global warming of 1.4 to 5.8 degrees C is projected by 2100 (USDA Forest Service 2007l). Adapting to climate change and its potential impacts poses challenges and opportunities for managing resources, infrastructure, and the economy (ibid). Forests and rangelands are seen as part of the solution to reducing atmospheric carbon dioxide and other greenhouse gases; however, the magnitude of the opportunity for carbon storage and carbon trading is not well quantified or thoroughly understood (USDA Forest Service 20071; IPCC 2007).

The use of future climate scenarios and ecological models suggests that the impact of climate change on US ecosystems could include increases in ecosystem productivity in the short term and shifts in the distribution of plants and animals in the long term (Joyce and Birdsey 2000). As climate changes advance, there are some indications that there would be increases in disturbances such as forest fires, drought, and insects (USDA Forest Service 2007l).

Based on the best available science, it is too speculative to factor any specific ecological trends or substantial changes in climate into the analysis of environmental impacts of individual projects. For example, changes in wildlife ranges and habitat in forested environments due to climate change are not well understood; therefore, such issues are outside the scope of the Hi-Grouse Project analysis. Currently, the best available science concerning climate change is not adequate to support reliable predictions about ecological interactions and trends at the local (site-specific) scale.

In general, based on predictions of a warming climate and increases in disturbances such as insects and wildfire, it is expected that treatments proposed in the Hi-Grouse Project would benefit forests through thinning and fuels treatments designed to reduce stress on trees, increase growth, promote species diversity, favor fire resilient species, and reduce risk of loss due to wildfire.

Managing forests for carbon sequestration is a poorly understood science but utilization of durable wood products and active forest management is believed to be an effective method of carbon sequestration (IPCC 2007). Thinning and treatments will not likely eliminate fire from the project area but can help change fire behavior from more consumptive crown fires to less consumptive surface fires, thereby likely reducing carbon dioxide emissions resulting from wildfire.

For more information on the status and trends of the nation's resources and climate change, go to the Research and Development Resources Planning Act Assessment website at http://www.fs.fed.us/research/rpa/.

3.6 Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and

fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA, section 101).

Short-term use includes consumptive activities such as logging, hunting, and non-consumptive activities such as sightseeing and photography, which can affect the landscape in the short term. These uses can be sustained in the long term if the productivity of the land is not impaired. It is believed that maintaining the productivity of the land is realized by maintaining ecosystem structure and function.

All action alternatives proposed in this draft EIS protect the productivity of the land to one extent or another through the application of:

- Standards and guidelines for resource management
- Best management practices
- Design criteria incorporated into alternative development

Productivity may be affected as a result of some management activities. A short-term loss of productivity from soil compaction is expected from harvest activities, but would be alleviated with de-compaction after activities are completed.

3.7 Unavoidable Adverse Effects

Implementing any alternative would result in some degree of environmental effect that cannot be avoided. Management direction from Forest Plan standards and guidelines, best management practices, project design criteria, and mitigation measures are intended to keep the extent and duration of these effects within acceptable levels; but effects cannot be completely eliminated. Even with design criteria in place, ground-disturbing activities may produce temporary effects that cannot be avoided, such as a temporary effect to air quality from burning slash.

3.8 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. No irreversible commitments of resources were identified for the project.

Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a powerline right-of-way or road. For the action alternatives, there are irretrievable commitments of the growth of forest vegetation from the creation of temporary roads, new landings, and new skid trails. This loss is not irreversible. Upon project completion, the temporary roads will be closed and seeded. Landings, necessary for logging operations, have a low probability of maintaining long-term soil productivity. The type of vegetation growing on these sites will likely be grass and brush. The amount of areas in landings is small and meets the Regional and Forest guidelines. Skid trails are expected to recover and are expected to show little to no negative effects.

3.9 Other Required Disclosures

The DEIS fulfilled the requirements for environmental analysis found in NEPA and in the Council on Environmental Quality implementing regulations at 40 CFR, Parts 1500-1508. NEPA at 40 CFR 1502.25 (a) directs, “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with…other environmental review laws and executive orders.”

The action alternatives would be located entirely on national forest system lands. The action alternatives are not in conflict with planning objectives for Siskiyou County.

The National Forest Management Act (NFMA) requires projects to be consistent with minimum specific management requirements as provided in the implementing regulations at 36 CFR 219.12 and described in Forest Service Manual 1921.12a. NFMA also requires projects to be consistent with the intent of the Forest Plan. The action alternatives are consistent with the Forest Plan's long-term goals (Forest Plan, pages 4-4 through 4-9).

The project was designed to conform to Forest Plan goals, move toward desired conditions, and comply with standards and guidelines for Forest-wide management direction (Forest Plan, pages 4-3 through 4-66) and the following management areas: Special Habitat Late-Succession Reserve (Forest Plan, pages 4-84 through 4-89), Special Interest Area (Forest Plan, pages 4-97 through 4-100), Partial Retention Visual Quality (Forest Plan, pages 4-126 through 45-127), and General Forest (Forest Plan, pages 4-177 through 4-180). Consistency with Forest Plan goals, desired conditions, and standards and guidelines is addressed throughout the FEIS and supporting documents.

The Multiple Use-Sustained Yield Act, the Forest and Rangeland Renewable Resources Planning Act, and the National Forest Management Act direct the national forests to supply goods and services and to be managed for a broad array of resources. Consistent with these guiding laws, the Forest Plan established land allocations and management direction for the Forest. This project does not propose changes in the management of the Forest, but rather is a mechanism for implementing management direction. Therefore, the social effects of this single proposal are limited in scope. Forest Service Manual 1973 requires a social effects analysis if the potential social effects of Forest Service actions are important to the decision (USDA Forest Service 2008). Social effects are important; however, social effects were not identified as a significant issue in the FEIS, therefore an extensive analysis was not completed nor required (USDA Forest Service 1988).

All alternatives are in accordance with the Secretary of Agriculture Memorandum 1827 for prime farmland, rangeland, and forestland. "Prime" forestland is a term used only for non-Federal land, which would not be affected by proposed activities under any alternative.

There are no anadromous fish species or their habitat within the analysis area. There are no streams within the project area. The project activities will have no direct or indirect effect on anadromous fish species or their habitat.

All project activities including prescribed burning would be implemented in full compliance with the Siskiyou County Air Quality Management District (SCAQMD) and California Air Resource Board (CARB) air programs and the KNF LRMP standards and guidelines. The project is consistent with the Clean Air Act.

The project would not have adverse impacts on water quality and is consistent with the Clean Water Act, the California Porter Cologne Water Quality Act, and the North Coast Regional Water Quality Control Board Basin Plan.

Thorough analyses of federally listed species and consultation with the USDI Fish and Wildlife Service has been completed fulfilling section 7 of Endangered Species Act consultation requirements (19 U.S.C. 1536(c)).

Federally recognized Tribes were contacted early in project planning and consulted at various phases of this project in accordance with the Region 5 Programmatic Agreement, National Historic Preservation Act, and other laws and regulations (see section 1.7, "Public Involvement," in chapter 1. This project is in compliance with section 106 of the National Historic Preservation Act. The action alternatives will not result in any negative impacts to cultural resource sites.

Executive Order 12898 relating to Environmental Justice requires an assessment of whether minorities or low-income populations will be disproportionately affected by proposed actions. Proposed actions, including the road closures proposed in alternative 4, were reviewed in section 3.4.2, the action alternatives would have no adverse effects on human health or the environment that are significant, unacceptable, or above generally accepted norms and; therefore, there will be no disproportionate effects on minorities or low income populations. Since there are no amendments to the Forest Plan associated with the action alternatives and a Civil Rights Impact Analysis review was included as part of environmental justice (section 3.4.2), no further Civil Rights Impact analysis is required (FSM 1730 and FSH 1709.11).

Chapter 4 Consultation and Coordination

4.1 Preparers, Contributors, and Distribution

4.1.1 *ID Team Members*

Laura Allen: District Ranger, Goosenest Ranger District.

Blaze O. Baker: 19 years' experience in botany; B.S. Botany and B.S. Environmental Biology; responsible for botany and noxious weed analysis for the project.

Rochelle Desser: 30 years' experience in forestry, including National Environmental Policy Act analysis and compliance documentation; A.S. Geo-technology; responsible for NEPA and related assistance to the ID team leader.

Jeanne Goetz: 12 years' experience in cultural resource management; MA Anthropology, Archaeology emphasis; expertise in archaeology; responsible for archaeological reconnaissance report and heritage input into the EIS.

Cass Klee: 12 years' experience in GIS with the Forest Service as GIS analyst supporting National Environmental Policy Act analysis and Forest Plan revision, and GIS program management for 4 years; B.S. Natural Resource Planning, Graduate Studies GIS and Environmental Planning; responsible for project spatial data, support to resource specialist spatial analysis needs, and map production.

Laurie Kurth: 23 years' experience in plant ecology and fire behavior; MS Biology, Plant Ecology emphasis; expertise in geospatial fire behavior analysis; responsible for fuels and fire behavior report and input into the EIS.

Tom Laurent: 31 years' experience in soil and geologic analysis and assessment; BS Geology and MS in Soils; responsible for soil and geology field work.

Donna M. Mattson: 20 years' experience in scenery management, and landscape architecture; Bachelor of Landscape Architecture; responsible for scenery resource analysis for this project.

Michael McNamara: 22 years' experience in hydrology and soils analysis and assessment; B.S. Geology, M.S. Forest Hydrology; responsible for hydrology and soils input for the EIS.

Marynell Oechsner: 34 years' experience in wildlife management and analysis; B.S. Wildlife Management; responsible for wildlife analysis input for the EIS.

Lois Pfeffer: 23 years' experience in National Environmental Policy Act analysis and compliance documentation and forestry; B.S. Forest Resources with Soil Science Minor; responsible for ID team leading, writing and editing the EIS, environmental justice information, response to comments, and preparing air quality analysis.

Rob Schantz: 22 years' experience in silviculture and forest operations; M.F. Silviculture, B.S. Forest Management; responsible for stand diagnosis and prescriptions, unit design, silvicultural analysis, stand modeling, forest products volumes.

Maple Taylor: 20 years' experience editing technical documents; M.S. Wildlife Management, B.S. Wildlife Science; responsible for editing the EIS.

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Jim Stout, *District Resource Officer*
Sue Stresser, *Forest Wildlife Biologist*

4.1.3 *Consultation*

Karen West and Elizabeth Willy, *USDI Fish and Wildlife Service*

4.1.4 *Agencies, Organizations, and Individuals Sent Notice of the Availability of the DEIS Documents*

Siskiyou County Board of Supervisors
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U.S. Coast Guard
USDA APHIS PPD/EAD
USDA National Agriculture Library
USDA National Resources Conservation Service
U.S. DOE Office of NEPA Policy and Compliance
U.S. Environmental Protection Agency
USDI Office of Environmental Policy and Compliance
Western-Pacific Region Federal Aviation Administration
Andrew Whittome, Calpine Corporation
Tom Williams, California Regional Water Board

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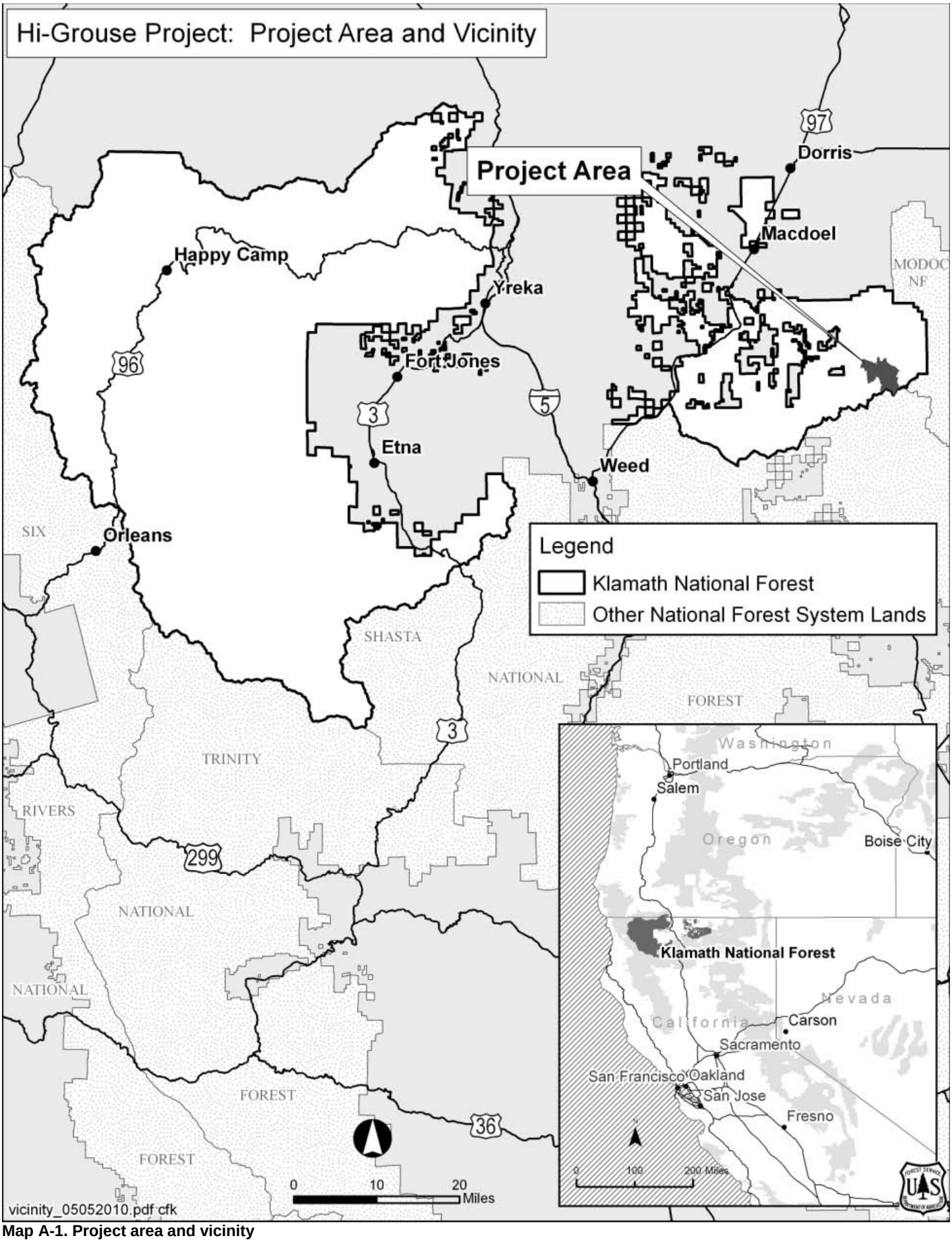
Hi-Grouse Project—Appendices

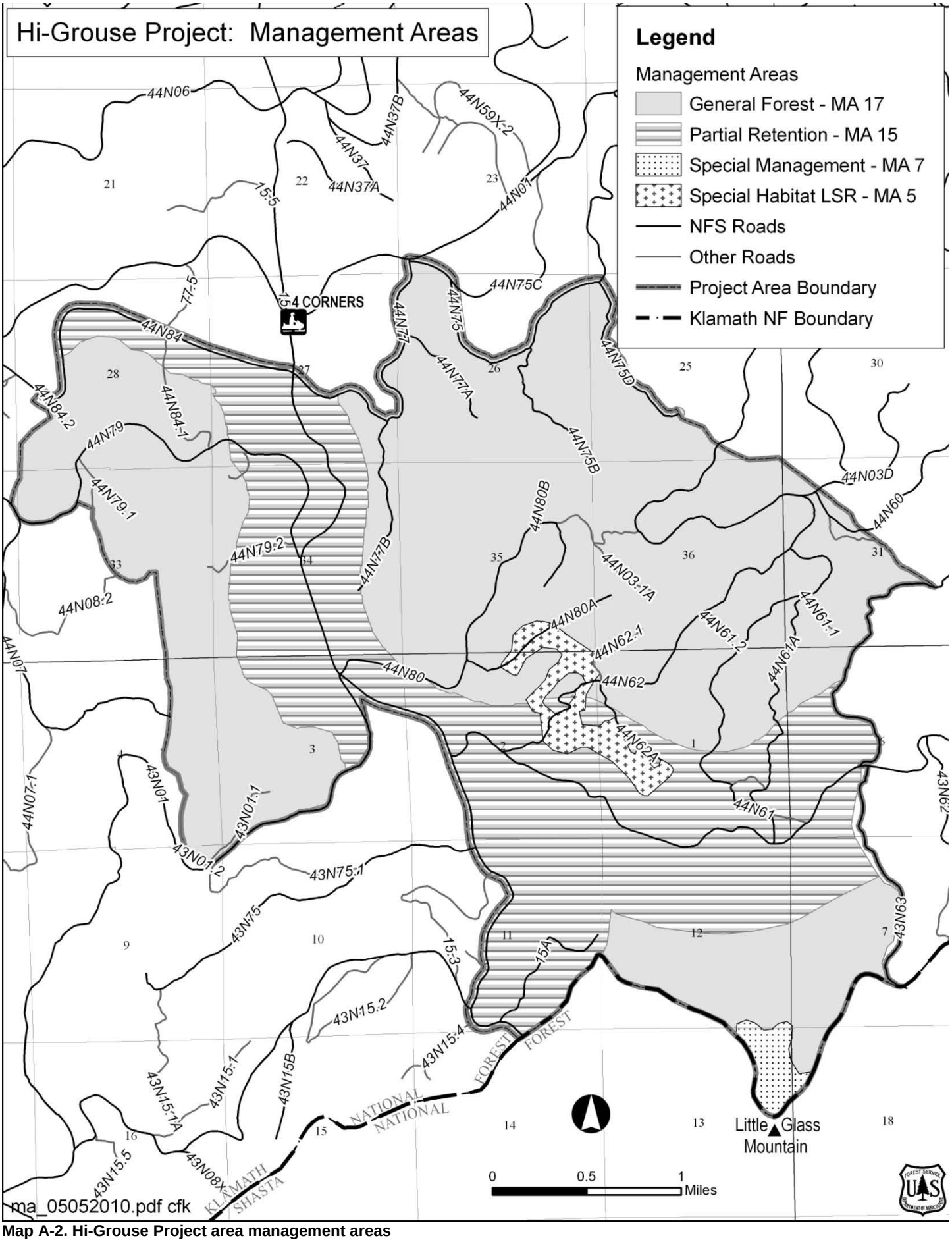
Table of Contents

Appendix A: Maps

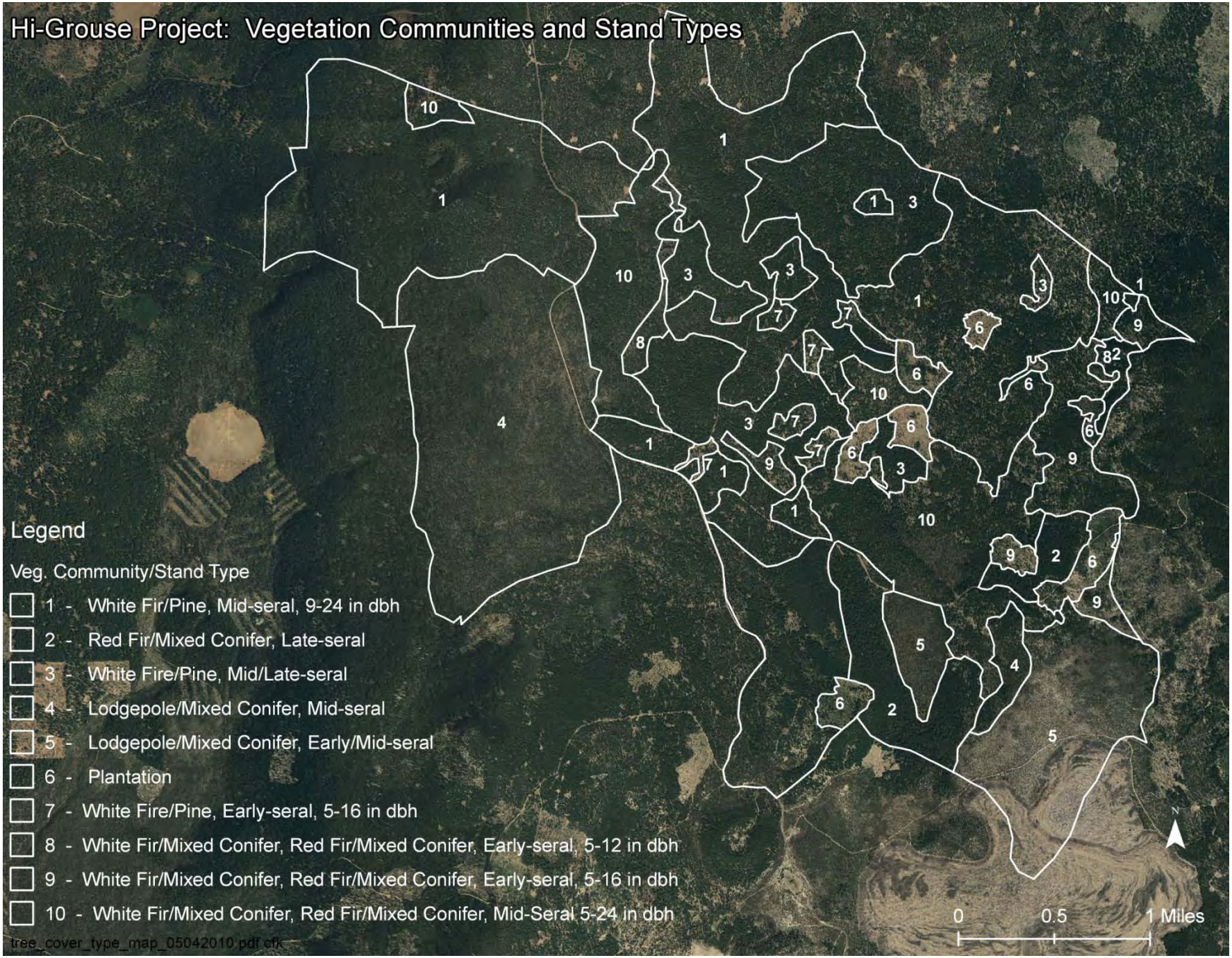
Note: *The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. Use of GIS products for purposes other than for which they were intended may yield inaccurate or misleading results. The USDA Forest Service reserves the right to correct, update, modify or replace GIS products without notification.*



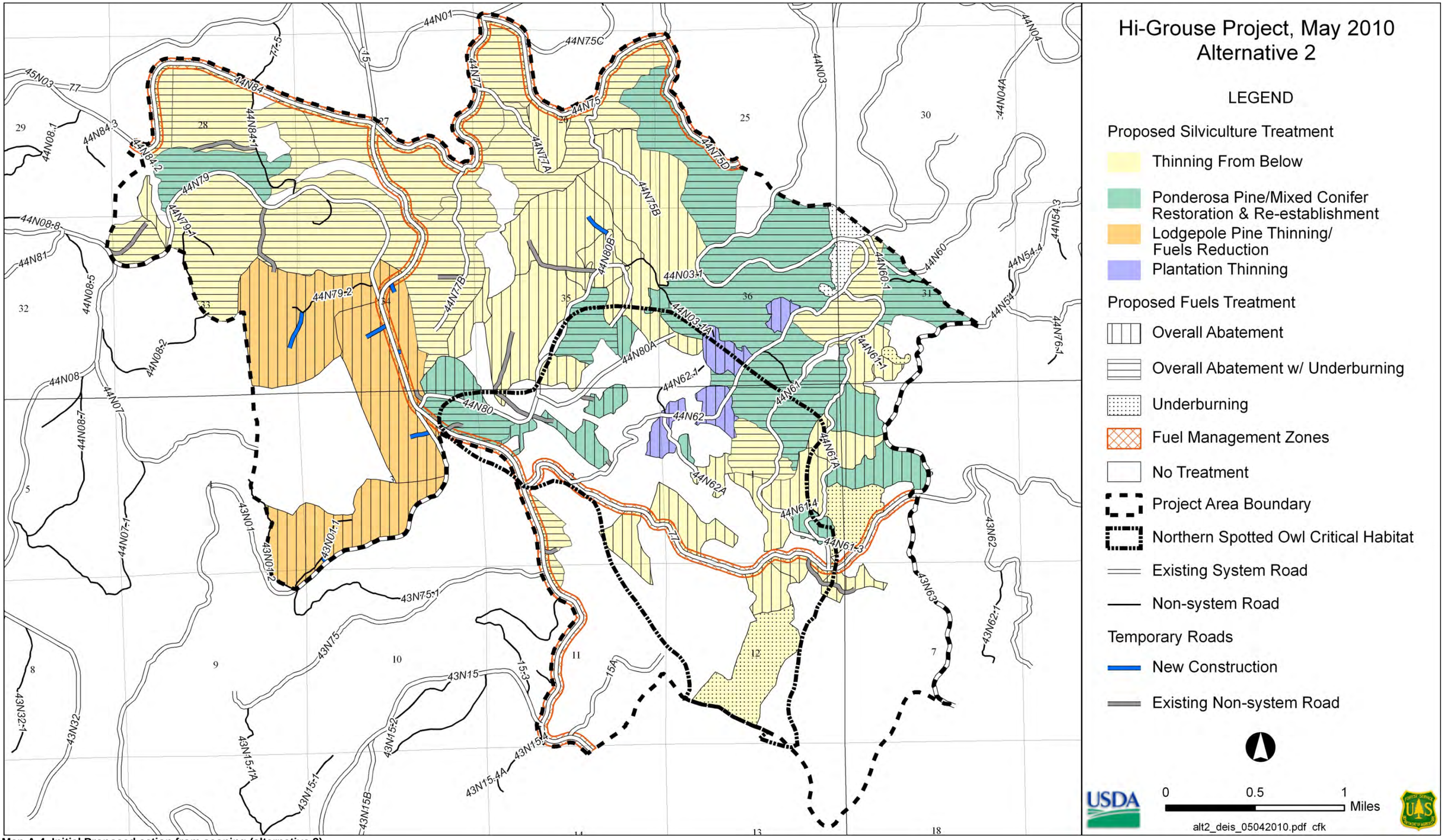
Map A-1. Project area and vicinity



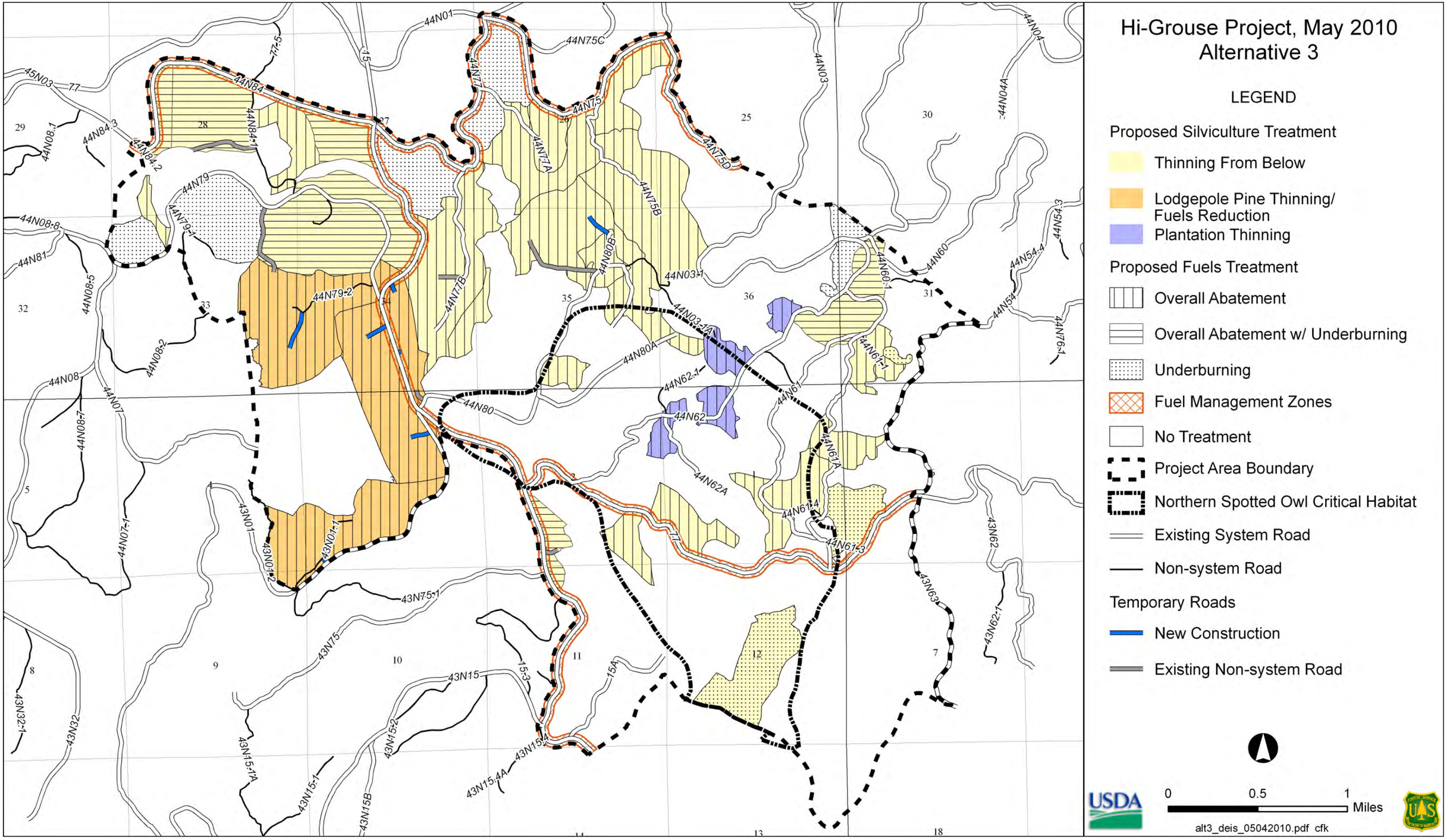
Map A-2. Hi-Grouse Project area management areas



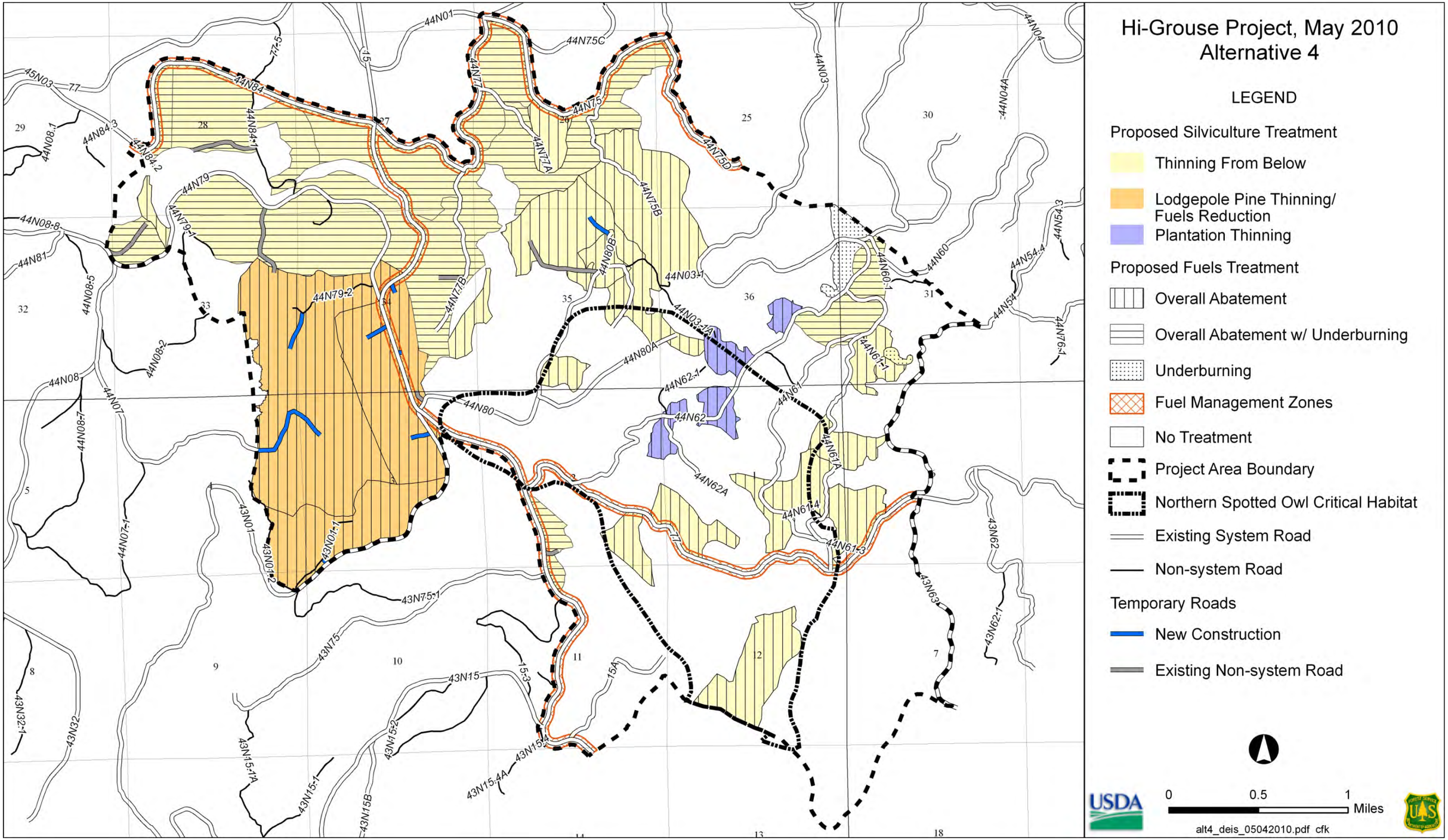
Map A-3. Vegetation communities and stand types



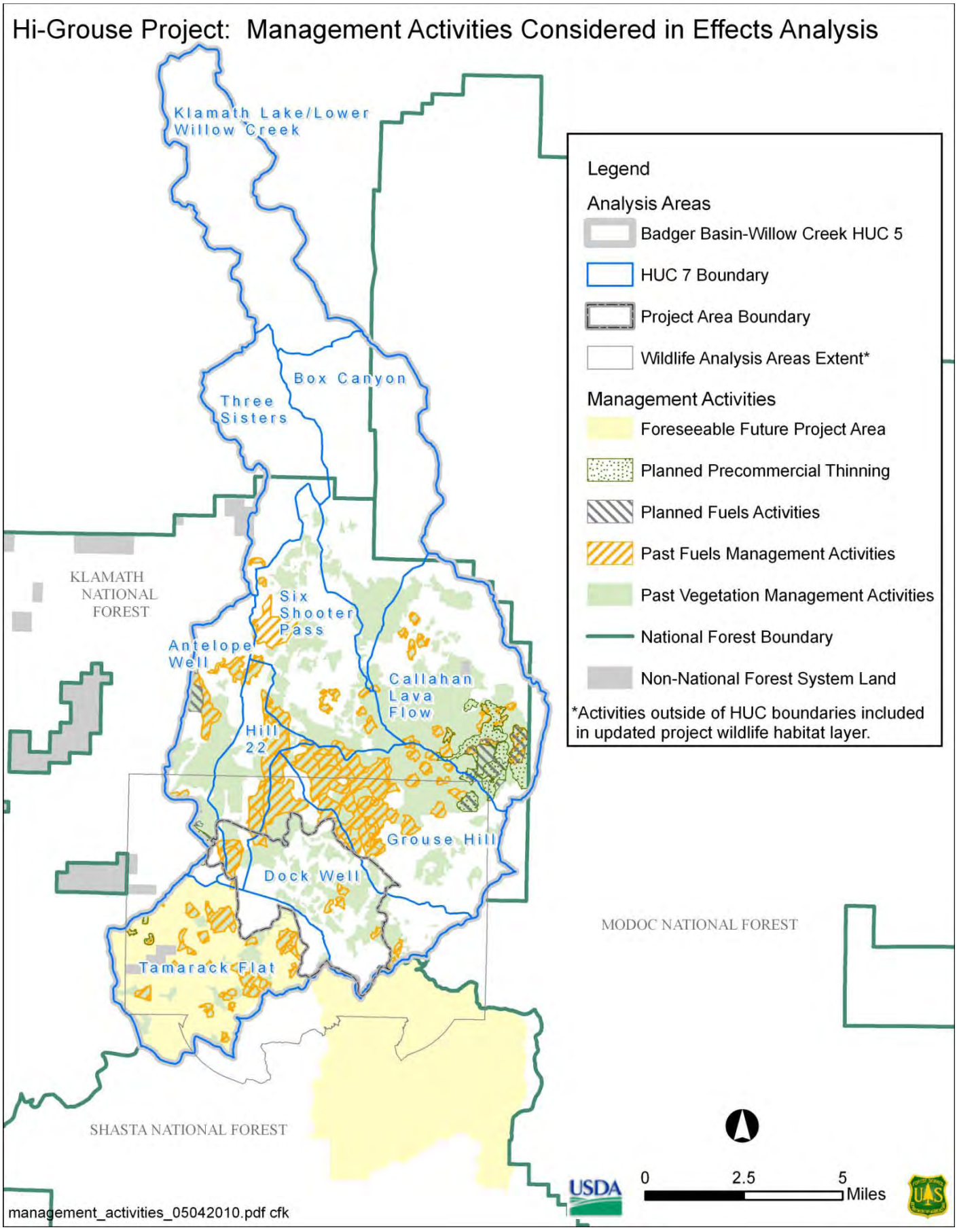
Map A-4. Initial Proposed action from scoping (alternative 2)



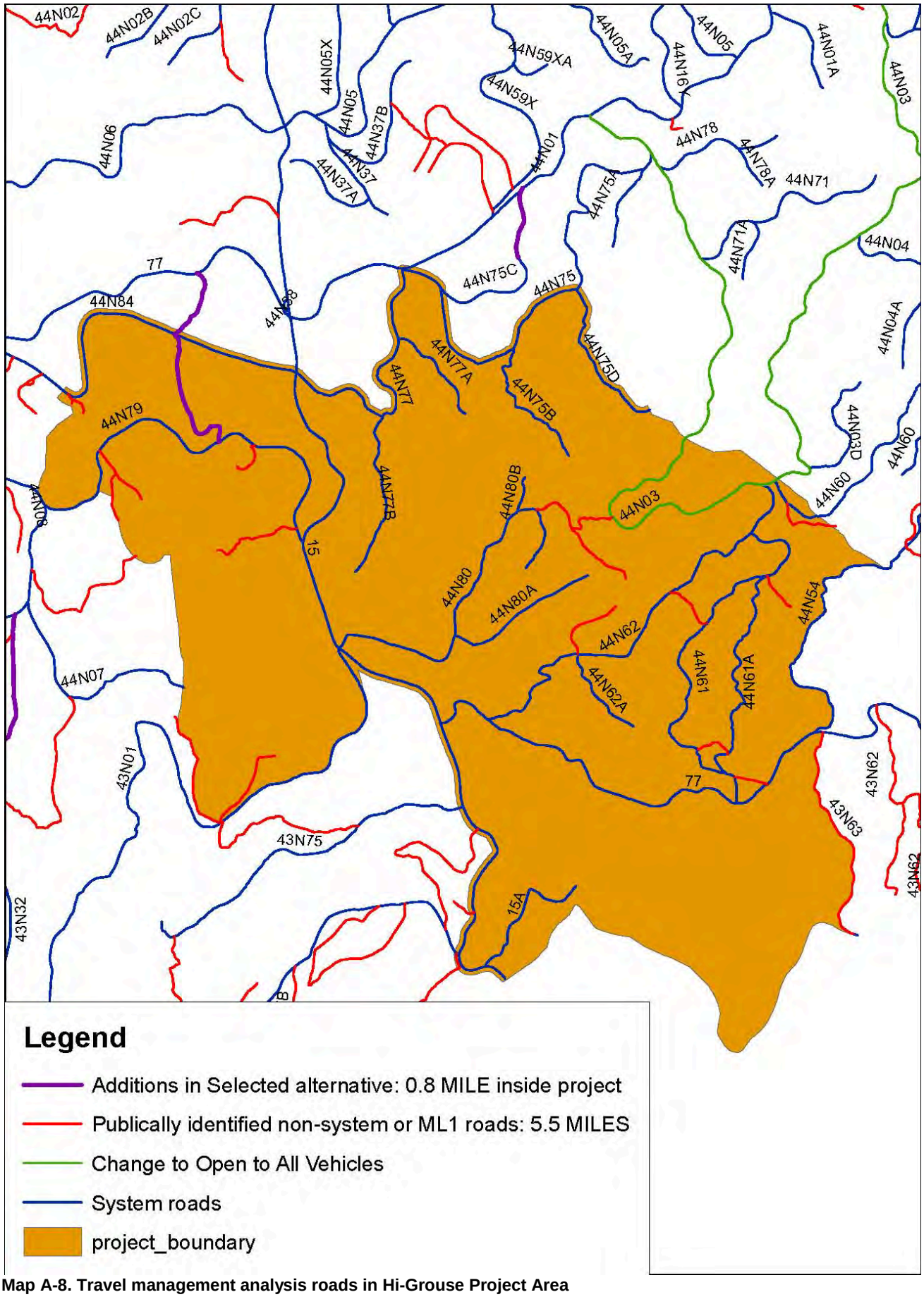
Map A-5. Alternative 3 proposed silviculture treatments



Map A-6. Alternative 4 (modified proposed action) proposed silviculture treatments



Map A-7. Management activities considered in effects analysis
(see also Map A-8 and appendix E)



Map A-8. Travel management analysis roads in Hi-Grouse Project Area

Appendix B: DEIS Comments and Responses

Introduction

This appendix summarizes public and agency comments received on the Hi-Grouse Project Draft Environmental Impact Statement (DEIS). The notice of availability for the DEIS was published in the *Federal Register* on May 28, 2010. All comments on the DEIS were received within the 45-day comment period, which ended on July 12, 2010.

Comment Summary

Seven comment documents were received during the comment period on the DEIS. Of the seven comment documents:

- one was from a private individual;
- two were submitted by industry (American Forest Resource Council and Sierra Pacific Industries);
- two were from environmental groups (Klamath Siskiyou Wildlands, Environmental Protection Information Center Wild, Klamath Forest Alliance, and Californians for Alternatives to Toxics); and
- two were from regulatory agencies (United States Department of Interior Office of Environmental Policy and Compliance, and United States Environmental Protection Agency).

Comments were read and categorized by subject in table B-1 (L# refers to the letter number, c# is the comment number). Comments are summarized with excerpts from the comment letters, and responded to appropriately. All comments on the DEIS have been considered in the production of this section. Where possible, the response includes a reference to the location in the analysis documents where the reader may find supporting information. Copies of the full comment documents follow table B-1.

Two reviewers expressed support of the purpose and need, and proposed management activities (L3 c1, L7 c1). Reviewers expressed various alternative preferences; one reviewer expressed preference for no action (L1 c1), two reviewers preferred alternative 4 (L2 c1, L6 c1), one reviewer preferred alternative 3 (L3 c2, c9), and one reviewer expressed no concern with the DEIS (L4 c1). In addition one reviewer suggested a stronger non-native invasive species plan be adapted (L5 c12), and two reviewers requested consideration of alternatives to use of borax for control of *Heterobasidion annosus* (L3 c31, L5 c3).

Comments received pertained to the following broad categories: air quality, borax, economic, fuels, National Environmental Policy Act (NEPA), non-native invasive species (NNIS), roads, scenery, soils, vegetation, and wildlife.

The focus during the review of public and agency comments was to identify if there was a need to:

1. modify alternatives including the proposed action;
2. develop and evaluate alternatives not previously given serious consideration by the agency;
3. supplement, improve, or modify its analyses;
4. make factual corrections; and
5. explain why the comments do not warrant further agency response, including reasons that support the agency's position (40 CFR 1503.4).

Comments that require substantial changes to the proposed action, identify significant new circumstances, or require significant new information will require preparation and recirculation of a supplemental EIS (40 CFR 1502.9). The analysis of comments indicates there are no comments that would trigger preparation of a supplemental draft EIS.

Table B-1 lists the comments and responses grouped by subject. The response includes a notation of the focus point [#] from the list (1 through 5) above.

Table B-1. DEIS comments and responses

Comment/Letter # comment #, [Letter # page#]	**[Focus Point #] Response**
Air Quality	
L7 c2 EPA recommends full disclosure of information regarding air quality emissions. …The final environmental impact statement (FEIS) should quantify the emissions from the Hi-Grouse project, determine if they will exceed *de minimus* thresholds for ozone precursors VOC and NOx, and whether a general conformity determination is needed that will demonstrate compliance with the SIP.	[5] The air quality discussion at section 3.4.6 summarizes information from the Air Quality Report (Pfeffer 2009), which is incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath. See the Air Quality Report tables 2, 4, 5 and 6 for the estimated existing daily emissions for Siskiyou County and the low levels of estimated project- related emissions for the alternatives analyzed.
L7 c3 The DEIS states that a smoke management plan will be submitted to Siskiyou County Air Pollution Control District (SCAPCD) prior to any prescribed burning. The FEIS should include details regarding the smoke management plan that sets forth how the project will comply with the SCAPCD regulations for pile burning and smoke management, an implementation schedule, the responsible parties, and monitoring and reporting requirements.	[5] Smoke management and burn plans are prepared prior to implementing prescribed burns. Burns will be coordinated with the State, and implemented when conditions are appropriate. An implementation schedule is not available because it depends on variables such as weather and funding, which vary from year to year. The burning is slated to be completed within a 10- year period.
Borax	
L3 c8 [L3 page 1] [We are concerned about] … and the widespread application of borax throughout the project area. **L3 c29** [L3 page 19] The DEIS gives no reasoning for the use of this herbicide, how much may be applied or site specific information regarding units that are proposed for application. **L3 c35** [L3 page 24] Borax: Other concerns – The agency must clarify *annosus* infection potential in the DEIS before authorizing borax for stump treatments. At a minimum, the U.S. Forest Service must develop safety protocols for mixing and staging areas. The protocols should include identification of areas suitable for staging and mixing that pose little threat to stream systems in the case of an accidental spill. Workers need to be sufficiently trained and experienced in safety procedures for mixing and transporting borax, as well as first-aid response, in the event of accidental contact or exposure. **L5 c1** Our concerns about the project as it is currently proposed center around the use	[5] Presence of the S-type *annosus* root disease was disclosed in section 1.3.1 and appendix C. The potential for *annosus* infection spread was discussed in section 3.2.1, which summarizes information from the Silvicultural Report (Schantz 2009) and the Forest Health Protection Report for Hi-Grouse (Angwin 2008). Both reports are incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath. The reason for borax application (as a fungicide) is noted in chapter 2 (section 2.2.4.1) under the thinning-from-below treatment as follows: "Cut conifer stumps will be treated with borax to prevent colonization and spread of the conifer root disease *Heterobasidion annosum."* Appendix C notes where borax would be used within the detailed prescription descriptions, and table C-2 lists the stands and treatments. Appendix D, Best Management Practices (BMP), notes the use of borax in BMP 5.8 through 5.11. The Silviculture Report gives the rationale for using borax, under Existing Condition – Insects and Disease. No mixing is involved with the borax application as a fungicide (Sporax®). Workers applying borax would be instructed to use label-required personal protective equipment to minimize exposure (long-sleeved shirt and long pants, shoes, socks, and waterproof gloves). In addition, State of California

Comment/Letter # comment #, [Letter # page#]	**[Focus Point #] Response**
of sodium tetraborate decahydrate (borate) to control *annosus* root diseases and thinning and fuel reduction methods that will successively require herbicide use to control excessive regrowth of native plants and invasion by non indigenous plant species. …It's clear that similar or the same types of forest disturbance proposed for the current project have, when used in the past, led to the development of root disease for which borate use is now proposed. What is to prevent the current project from causing the spread of root rot? …. It is not apparent that the project has taken into consideration an alternative that will PREVENT the spread of root disease by limiting, altering, or changing the proposed management activities. This analysis is necessary to provide the basis for the development of alternatives for the project, but it is missing. **L7 c4** … EPA recommends clarification regarding possible use of herbicides or pesticides. The list of applicable BMPs for the Hi-Grouse Project is included in appendix D. BMPs 5.8-5.11 list potential best practices for use of pesticides and/or herbicides, but the DEIS does not indicate that pesticides may be used. If pesticide use is included in the scope of the project, this information and all environmental impacts associated should be disclosed in the FEIS.	Department of Pesticide Regulations requires the use of eye protection. The Pesticide Use Proposal and Spill Plan identify sensitive areas to be avoided and procedures to follow in the event of a spill. Contract applicators are responsible for following all safety procedures. Previous management projects in the Hi-Grouse Project area did not treat stumps with borax to prevent infection with *annosus*, leading to some areas with high rates of infection as seen within this planning area. Borax has been shown to be effective in preventing infection in cut stumps. The no-action alternative would prevent any potential for introduction and spread through cut stumps, but does not address the purpose and need for the project. See also responses to L3 c33.
L3 c30 [L3 page 19] Borax (sodium tetraborate decahydrate) is a fungicide that is being liberally applied by the US Forest Service (USFS) throughout our public forestlands to prevent the spread of *Heterobasidion annosum* (formerly known as *Fomes annosus*), a root rot disease. It also has insecticide and herbicide properties. Human health concerns include: it is an extreme eye irritant; can cause inhalation irritation; is easily absorbed through broken skin; can be lethal when digested; and may be a reproductive toxin. Borax acts as a nonselective herbicide that can persist unchanged in the soils for at least a year. It can leach rapidly during heavy rains. …[L3 page 20] … According to the US Forest Service, the borax used in forestry is identical to the material sold as a household-cleaning agent (Dost 1996). **L3 c32** [L3 page 20] Toxicology … The US Forest Service (1995) reports that studies indicate chronic exposure to borax may cause reproductive damage and infertility. In the US EPA's Toxicological Review of Boron and Compounds (2004) the developing fetus of mammals is considered one of the most sensitive targets. The other most sensitive target is the testes of males, and adverse effects include testicular degeneration (US EPA 2004; USFS 2003, Evaluation of Human and Ecological Risk For Borax Stump Treatments).	[5] Borate (Sporax) is an EPA-registered fungicide that will be applied in accordance with all label requirements and instructions (see Appendix D, BMP 5.8). It will be applied directly to cut conifer stumps 14 inches diameter and larger at the rate of approximately one pound per 50 square feet of cut stump surface. This project will follow the pesticide use proposal and spill plan prepared for the Goosenest Ranger District. Sporax is not a herbicide formulation of borax. Its registered use is as a fungicide, with a lower concentration of borax. It is applied to tree stumps and not to living plants. Herbicide formulations for borate require much higher application rates. The only opportunity for Sporax to act as a herbicide is in the case of a spill. Spill instructions are to pick it up for reuse, thereby reducing its effectiveness as an herbicide. Quotes from the executive summary of the *Human Health and Ecological Risk Assessment for Borax (Sporax) Final Report* (USDA Forest Service SERA Inc. 2006) follow: "Except for the most extreme exposure scenario considered in this risk assessment - i.e., the direct consumption of Sporax from a tree stump by a child—the use of Sporax in Forest Service programs will not substantially contribute to boron exposures in humans. In addition, the use of Sporax in

Comment/Letter # comment #, [Letter # page#]	**[Focus Point #] Response**
	Forest Service programs will not typically or substantially contribute to concentrations of boron in water or soil." "Borax can cause eye irritation. Quantitative risk assessments for irritation are not derived; however, from a practical perspective, eye irritation is likely to be the only overt effect as a consequence from mishandling Sporax. This effect can be minimized or avoided by prudent industrial hygiene practices during the handling of the compound." "For terrestrial species, risk associated with the application of Sporax to tree stumps appears to be very low. …There also does not appear to be a risk to terrestrial plants exposed to boron through runoff of Sporax applied to tree stumps; however, this assessment is based on relatively limited toxicity data. Since borax is used effectively in the control of fungi and insects, adverse effects of environmental exposures to non-target insects and microorganisms are possible. However, given the atypical application method for Sporax, widespread exposures are not likely." "These results indicate that aquatic animals and plants are not at risk under the exposure scenarios considered; however, an accidental spill of large quantities of Sporax into a small pond may result in toxicity in amphibians and sensitive species of aquatic microorganisms." There are no perennial water sources within the project area.
L3 c31 [L3 page 19] Many *annosus* root disease prevention alternatives exist. These include limiting pre-commercial thinning activities; removing and burning infected stumps; seasonal cutting to avoid reproductive basidiospores; pre- and post-cut prescribed burns, and applying the competitive fungus *Phlebiopsis gigantea* to stumps as a biocontrol agent. Currently the USFS is failing to evaluate non-borax *annosus* prevention alternatives and failing to conduct project specific environmental effects analysis. [L3 pages 22-24] Borax: Alternatives … we are concerned that in Region 5 (California) the U.S. Forest Service is not using a true integrated pest management (IPM) strategy while managing national forests and dealing with this fungus. The Forest Service is ignoring the cause of *annosus* spread and needs to focus on controlling the vectors that facilitate its movement. Region 5 is reliant on borax for *annosus* disease prevention and has failed to develop non-toxic, non-borax treatment methods for protecting our forests. [L3 page 23]...Changes to current thinning activities are necessary to control *Heterobasidion annosum*. Reducing the number of thinning operations by	[5] The scoping packet noted the use of a fungicide (trade name Sporax) was proposed. Use of fungicides was not raised as an issue during scoping. Alternative 1, no action, would avoid all areas infected with *annosus*. An alternative was considered to avoid all known areas of root disease (section 2.4.2). Pre-commercial thinning is not expected to increase the potential for *annosus* infection. Stumps less than 14 inches diameter are not recommended for treatment with borax in the project area (Angwin 2008) (appendix D, BMP 5.9). Tree scars from logging are potential infection sites for the fungus. These wounds are kept to a minimum through contract clauses that fine operators for tree damage and through proper contract administration. No literature supports prescribed burning as a control of *annosus* in California ecosystems. In the western United States, *annosus* conks are most often found inside stumps or under the bark. In the southeastern United States, where the burning method was developed, conks are formed in the duff at the base of trees and could be killed by prescribed fire. Prescribed burning would not be

Comment/Letter # comment #, [Letter # page#]	**[Focus Point #] Response**
planting trees at wider spacing is recommended (Ammon and Patel 2000). It is also recommended to carry out thinning operations carefully to reduce incidence of tree wounds and thin only when reproductive basidiospore populations in the air are lowest (cold winter in the north, hot dry summer months in the south) (Schmitt et al. 2000; Ammon and Patel 2000; Flip and Morrison 1998). Removing injured trees in high-risk areas can also be effective (Schmitt et al. 2000). … This pathogen can be eradicated or reduced by a couple of simple pre- and post harvest techniques. One is using prescribed burns. Two pre-thin burns (one at least six months before thinning) and one or more post-thin burns will destroy reproductive basidiocarps and eliminate litter and other favorable *annosus* habitat and basidiocarp development environments (Ammon and Patel 2000, Flip and Morrison 1998). Prescribed fires can also start to return the forest to pre-historical natural conditions. The second *annosus* eradication and reduction method is mechanically removing and burning stumps and attached roots in infested sites (Ammon and Patel 2000). [L3 page24] … *Phlebiopsis gigantea*, an aggressive, highly competitive fungus is recommended as a borax alternative, as it colonizes stumps to the exclusion of the annosum root rot fungus (Annesi et al. 2005; Pratt et al. 2000; Ammon and Patel 2000; Pratt 1999; Flip and Morrison 1998; Rishbeth 1963). *Phlebiopsis gigantea* is incapable of causing disease in standing trees and is not regarded as hazardous to human health (Pratt 1999)…. This raises the question as to why we are not using this non-toxic protection method here in California. … *Streptomyces griseologalbus*, an actinomycete isolated from the rhizoplane of the nitrogen-fixing nodules of a common California native, has been identified as a strong antagonist of *annosus*, and a possible biological control in the Pacific Northwest (Rose et al. 1980). Stump treatment with borax is only recommended for sites with known *annosus* root disease potential and where cultural control is not viable (Schmitt et al. 2000). How much cultural control is occurring in national forests? **L5 c3** …Valuable research about alternative management for *annosus* root disease was not included in the analysis as required. Rather than contrasting a relatively extreme alternative (2.4.2), the USFS should develop an alternative that incorporates other, non-borate methods of managing *annosus*.	feasible as a control method for *annosus* because of the need to destroy the stumps. In the long term, re-introduction of surface fire such as proposed on a large scale in this project, would likely have a positive effect on control of *annosus* by removing old stumps with conks, but this hypothesis needs to be studied. Stump removal could be effective on sites with no control alternatives, but it would require removing stumps in units as well as surrounding areas, be very costly, and cause substantial soil disturbance. Prevention using borax and thinning practices that increase resistant species is thought to be more effective on the types of sites found in the project area. Seasonal cutting, limiting stump creation to dry periods when spore production is lowest, may reduce stump infection, but no data or studies support the efficacy of this method. Treating with *P. gigantea* is not feasible because it is not registered as a biopesticide either with the EPA or California, and there are no efficacy data for California forest conditions. Data suggest that *Phlebiopsis gigantea* would not be efficacious in California because it is too dry in summer and fall (Rishbeth 1963, Blakeslee and Stambaugh 1974). The EPA does not register *Streptomyces griseologalbus* as a biocontrol to prevent *annosus* infection. Logging creates one of the main infection sites for *annosus* root disease. However, application of borax is an easy, safe, and effective way to meet the purpose and need for this project, while preventing infection with this fungus. Meeting the purpose and need will break the cycle of mortality associated with *annosus* found in many of the stands proposed for treatment, primarily by increasing tree species resistant to the S-type of the fungus. Application of borax may also prevent colonization of antagonistic fungi, but these have not prevented the spread of *annosus* in the past, as evidenced by the high infection rates wherever old true fir stumps are found in the project area.Due to management practices such as logging of pines and fire exclusion in the eastside pine types, true fir has increased markedly. Cultural practices that favor the pines, which are resistant to the S-type of the fungus, are being widely practiced on the Goosenest Ranger District. The same practices are proposed in this project, but many sites are being managed to maintain a substantial component of true firs because of their current high numbers and because of the objectives for maintaining higher levels of canopy cover for northern spotted owls (NSOs) and and northern goshawks (NGHs). To maintain true fir while reducing stand density to more sustainable levels, it is necessary

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…The agent, *Phlebiopsis gigantean*, is useful in an integrated pest management system that should be developed as an alternative for the current project. …One reason to consider a non-borate alternative is that borates are not necessarily successful in preventing or eliminating *annosus*. In a study conducted by a USFS Region 5 scientist, R.S. Smith Jr. concluded, "there is continuing concern that *annosus* can infect stumps via the roots rather than just through the stump surface, and that borax treatment may not be fully successful in preventing the disease" (1989). Additional research by Region 5 Forest Service scientists found that borax (aka borate) may be ineffective because it washes off stumps, and evaluation of forests two decades later revealed that stands with borax-treated stumps failed to have significantly lower infection than untreated stumps (Edmonds at al. 1989). [L5 page 5] CATs suggests that…further alternatives to *Heterobasidium annosum* be researched and integrated into the USFS [Final] Environmental Impact Statement.	to control the spread of *H. annosum* spores to cut stumps created during thinning treatments. The purpose and need (section 1.4) to promote restoration of historic forest composition and structure includes: decreasing stand density over most of the project area to reduce disease and insects to endemic levels, and providing for resilient stocking levels of desired species (p 6). Section 2.4.2 notes that avoiding all known areas of root disease would not address this purpose and need. The no-action alternative would not treat known root diseased areas. Creating an action alternative that does not address the purpose and need identified for a project is outside the scope of this project. Also see response to L3 c33.
L3 c33 [L3 page 21] Environmental Effects Borax is generally active in soils and it remains unchanged in the soil for one year or more. High rainfall conditions can cause borax to leach rapidly and soil microorganisms do not break it down (USFS 1995). …The Forest Service's borax fact sheet (1995) warns "Borax may be a hazard to endangered plant species if it is applied to areas where they live" when applied as a forest fungicide on stumps. Also borax's noncrop herbicidal use may harm endangered or threatened plants. Therefore, the U.S. EPA is requiring three phytotoxicity studies (regarding seed germination, seedling emergence, and vegetative vigor) to assess these risks (U.S. EPA 1993). Borax is used as an insecticide and "relatively high concentrations of boron compounds are toxic to insects, even when used in forests (USFS 1995). What kinds of impacts are all these borax applications in our forests having on beneficial insects and overall ecosystem health? Since we have found no studies investigating the impacts of borax on amphibians, we are concerned that this salt, which remains active for a year in soils, may be having major impacts on amphibian populations. Amphibians, while aquatic during reproductive and other times, also are terrestrial and travel across the land. Amphibians are especially sensitive to chemicals and are believed to be useful indicator species within forest ecosystems. What impact	[5] The *Human Health and Ecological Risk Assessment for Borax (Sporax) Final Report* (USDA Forest Service SERA Inc. 2006) includes all the points that you mention. Sporax is not an herbicide formulation of borax. Its registered use is as a fungicide. It is applied to tree stumps and not to living plants. Herbicide formulations for borate require much higher application rates. The only opportunity for Sporax to act as an herbicide is in the case of a spill. Spill instructions are to pick it up for reuse, thereby reducing its effectiveness as an herbicide. See response L3 C30, which gives the summary risk statements associated with the concerns expressed here. The 1995 pesticide fact sheet states that the potential for borax leaching is low, because the mineral particles in the soil absorb the borax; however, it recognizes that leaching may occur under high rainfall conditions. The Edmonds et al. (1989) study, upon which the statement in the Fact Sheet is based, involved coastal northwest Oregon and Washington where rainfall amounts and distribution are different than in most parts of California. In Chavez et al. (1980), which established plots in the same area, they described annual rainfall amounts as 250 cm (98 inches). Under such high rainfall conditions,[borax] must be applied carefully, which is what is stated in Edmonds et al. (1989): "[borax] may be effective if applied very carefully to stumps, especially those close to the remaining trees" and was demonstrated in Nelson and Li (1980). In California forest conditions, and if borax is applied correctly, leaching is not expected, especially within this project area where precipitation

Comment/Letter # comment #, [Letter # page#]	**[Focus Point #] Response**
on amphibian populations is occurring from the current application of borax in our public forests? Porcupines (and many other species) are attracted to salt. Will porcupines ingest borax? If so what will the effects will result? **L5 c5** As stated in the DEIS: "the application of borax to freshly cut stumps is not expected to have adverse effects on wildlife or surrounding plants, invertebrates, or microorganisms." (DEIS 66) However, CATs contends that this is a misleading statement that skews analysis of the alternatives to support the favored alternative. A closer examination than that provided reveals additional research indicating that the use of borate has both direct negative impacts and possible long-term adverse effects on non-target organisms. According to a study on conifer forests conducted in Sweden in the summer of 2000, "Both borate and urea [in separate tests] caused severe damage to most ground-vegetation species tested." (Nohrstedt, Westland 2000) Borate as an herbicide interrupts photosynthesis in plants, and as an insecticide is abrasive to insects' exoskeletons. (IPM of Alaska 2002) Borate remains in the topsoil unchanged for at least one year. High rainfall and/or groundwater can leach chemicals, and soil microorganisms cannot break it down (USFS 1995). Because the chemical is not natural in forest ecosystems there is a general concern about its long-term, indirect effects on soil nutrient cycling. **L5 c6** Has research been conducted to determine if the Northern Spotted Owl (NSO) and Northern Goshawk (NGH)—as individual birds—are affected by borate? Borate is a pesticide with toxicological significance, and as such, an appropriate analysis of its effect on these species must be included in the development of the alternatives.	typically ranges from 8-12 inches per year. The Fact Sheet (USDA Forest Service 1995) states that borax is relatively non-toxic to bees (LD50 > 362 ppm), while recognizing that high concentrations of boron compounds are toxic to insects, and borax is used for insect control in some cases. It is known that boron compounds have insecticidal properties. The EPA (1993) states that beneficial insects will not be at risk from the uses of boric acid compounds. Widespread insect exposure is unlikely because the Forest Service only applies Sporax to stumps and it is not broadcast sprayed. Exposure of insects on the treated stump surface may result in toxicity to the individual. Sections 3.2.3.2 and 3.2.3.4 summarize effects to the NSO and NGH from the biological assessment (Oechsner 2010a) and biological evaluation (Oechsner 2010c) prepared for this project. These reports are incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath. Also see response to L3 c30.
L5 c2 If thinning and commercial logging of true-fir and white-fir stands is to remain sustainable, a primary objective of the Region 5 Forest Service and with the current project must be to develop forest management alternatives that will prevent the use of borate by preventing the need for disease management. **L5 c4** To minimize *annosus* spread to stump wounds, thinning should be done at low risk seasons, and with specific regulations on tree age, and diameter at breast height (DBH) (Morrison and Johnson 1999). It is apparent that this critical information was not integrated into the analysis presented in the DEIS.	[5] Limiting thinning to small cut surfaces would not meet the purpose and need of the Hi-Grouse Project. The Morrison and Johnson study is not applicable to this project area because it is based on pre-commercial thinning in stands up to 8 inches in diameter in the coastal zone of British Columbia (Douglas-fir, western hemlock, amabilis fir, and Sitka spruce). Their conclusion about 10 cm is not entirely supported by the data, as the relationship between d.b.h. and percent of surface area colonized is linear, and in the case of all but the amabilis fir, is not very steep (increasing stump diameter increases percent infected, but not by much). Age at time of thinning and season of

Comment/Letter # comment #, [Letter # page#]	**[Focus Point #] Response**
	thinning were not significant variables for percent of infection, although the data showed a response. The fact that annosum root disease is less likely to affect small stems is already incorporated in our regional direction on the use of Sporax (USDA Forest Service FSH 3409.11, chapter 60, February 2010). In Filip et al. 1992, results showed that the rate of infection of untreated true fir stumps 5 to 10 years after cutting was not related to stump diameter in the range sampled (12 to 23 inches+). Cutting when *annosus* spores are lowest has been suggested, but no data or studies support the efficacy of such treatment in California. Morrison (1999) determined there was no significant difference in season of cutting in coastal British Columbia. Schmitt et al. (2000) state that restricting cutting to summer months may reduce potential of stump and wound colonization, but give no data to evaluate, nor do they state that this would eliminate the need for Sporax. Ammon and Patel (2000) recommend thinning during dry, hot months in the southeastern United States or during winter months in the northeastern United States, but also give no data to evaluate, nor do they state that this would eliminate the need to treat the stumps otherwise. Phelps et al. (undated) demonstrated that in the southeastern United States, summer thinning only slightly reduced infection over controls and that borax treatment was much more effective. Filip and Morrison (1998) and Stambaugh (1989) report that cutting in the summer (April through August) in the southeastern United States, south of latitude 34°N appears to reduce losses caused by *annosus* root disease. Filip and Morrison (1998) state that seasonal logging has not been demonstrated in the interior west to be effective. In Russell et al. (1973), monthly spore patterns in Washington and Oregon peaked in the fall, with a lesser peak in the spring, but airborne spores were present in large numbers nearly year-round. In James and Cobb (1984), spores are produced in the Stanislaus and San Bernardino National Forests throughout the year. In their summary, Filip and Morrison (1998) state that although many materials have been tested, in the western United States only borax is recommended and used operationally. Based on the data in James and Cobb (1984) and Russell et al. (1973), it is likely that in the relatively mild climate of California, where spores are produced throughout the year, restricting logging to a certain season would not be effective in reducing *annosus* root disease infection.

Comment/Letter # comment #, [Letter # page#]	**[Focus Point #] Response**
L3 c34 [L3 page 22] Effectiveness The U.S. Forest Service has touted borax as highly effective and the only solution for preventing the spread of *Heterobasidion annosum* and *annosus* root rot disease. While the Forest Service has been liberally applying borax throughout public forestlands, there is some question as to whether or not it is as effective as believed. In a study review of research on *annosus* root rot disease, US Forest Service Region 5 scientist R.S. Smith Jr. reported, "there is continuing concern that *annosus* can infect stumps via the roots rather than just through the stump surface, and that borax treatment may not be fully successful in preventing the disease" (1989). Another interesting study was done by Region 5 Forest Service scientists, which reviewed the efficacy of borax stump treatment in protecting trees from *annosus* root disease. The authors reported "borax may be ineffective because it washes off stumps and that high stump densities in pre-commercial thinnings make it difficult to apply.	[5] The review by Smith describes borax as not being completely successful in keeping *annosus* out of true fir stands because of other avenues of infection, notably through root contact. However, he does state that borax is effective in blocking stump infection of true fir (Smith 1989, p 14). The study described as showing that high stump densities in thinning treatments make borax difficult to apply is not referenced, so that cannot be verified. Many projects in Region 5 have demonstrated the operational capability of applying borax in harvest and pre-commercial treatments where the stumps are not cut on an angle. Several studies have demonstrated the efficacy of using borax as a stump treatment in California. Graham (1971) demonstrated the efficacy of borax on Jeffrey and ponderosa pine. Smith (1970) demonstrated that borax prevented infection of white fir stumps. Kliejunas (1989) summarized the existing literature on borax effectiveness in the eastside pine type. Schmitt et al. (2000) state that stump treatment with borax is 90 percent effective at preventing new infections.
Economic	
L2 c8 The county is in dire financial condition and revenue needs to be derived from Forest Service projects and the public land base by funding through county payments. It is clearly displayed in the DEIS that Alternative 4 is more economically viable. Alternative 3 does nothing to assist with providing jobs, producing commodity products, and adds very little to county revenues.	[5] Thank you for your support of alternative 4.
Fuels	
L3 c7 [L3 page 1] [We are concerned about] … the long lag time between harvest and treatment of activity fuels [L3 page 2] [We are concerned about] …the impacts of delayed treatment of activity fuels and the proposed …under Alternative 3 are extremely problematic. fuels [L3 pages 3-4]…The contention on pages 47 and 49 of the DEIS that harvest activities that dramatically reduce forested canopy cover and do not treat activity fuels for up to 10 years will reduce fire behavior is inaccurate.	[5] Whole-tree yarding is proposed for this project as the primary method for minimizing thinning-generated slash (see section 2.2.5, VEG-8). Whole-tree yarding in addition to other proposed fuel reduction activities listed in section 2.2.4.5 will reduce fuel loading and meet the purpose and need for this project to promote restoration of fuels-related historic fire regime (section 1.4). The effects to fuels summarized in section 3.2.2, from the fuels report (Helmbrecht and Kurth 2009), reflects the proposed project with whole tree yarding. The fuels report is incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath. Machine piling of hazardous fuels outside landing areas is proposed in alternative 4, and is not included in alternative 3. Machine piling under

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Our scoping comments of January 2008 contained extensive references to peer-reviewed science regarding the increased fire hazard and fire severity that often results from the removal of overstory forest canopy. None of that science was meaningfully responded to in the DEIS. Please see the "Fire Mitigation" section of these comments below. We were particularly surprised by the agency's decision to neither analyze nor disclose the impact of leaving activity fuels on the landscape for up to a decade. Similarly, the analysis of the No Action Alternative fails to disclose or analyze the fire hazard benefits of retaining closed canopy cover and not producing un-treated activity fuels and slash. In addition, mechanical thinning generates large quantities of slash by transferring branches, twigs and needles from the canopy to the ground (Allen et al. 2002, Graham et al. 2004, Stephens 1998, USDA 1994, van Wagtendonk 1996, Weatherspoon 1996). …The DEIS (page 42) discloses that pile burning and underburning may not even start until up to a decade after commercial timber harvest commences. Yet the impacts of activity slash on fire hazard is not addressed anywhere in the DEIS. The KNF knows that both the Yellow fire (47,500 acres) and the Specimen fire (7,000 acres) originated in logging slash. Hence the widespread creation of untreated logging slash may directly inhibit the attainment of the project's purpose and need.	alternative 4 would be evaluated post-thinning to determine the need for this treatment and may be needed on up to 25 percent of the area of units where it is prescribed (see appendix C). Information cited in the literature regarding slash was considered. However, as noted above, whole-tree yarding is anticipated to minimize thinning-generated slash and related effects to available fuels.

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L3 c15 Time and Fire Severity [L3 page 7] Fire severity may diminish in mixed evergreen forests as the duration of fire return increases. Odion and colleagues (2004) studied fire severity patterns in the 1987 Klamath fire complex and learned that structurally diverse mature forests with closed canopies overwhelmingly experienced low and moderate severity fire effects (up to 13 percent high severity – expressed as tree canopy mortality due to data limitations). That study is attached to these comments. [L3 page 8] … Unfortunately, the assumptions presented in the No Action Alternative simply ignore the all of the peer-reviewed literature referenced above.	[5] The fire behavior assessment for this project used the FlamMap fire modeling system to account for the role of fuel, weather, and topography specific to the project area (section 3.2.2). This information was summarized in section 3.2.2 from the fuels report (Helmbrecht and Kurth 2009). The fuels report is incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath. FlamMap examines the spatial variability of fire behavior by performing fire behavior calculations independently for each cell in a gridded landscape (Finney 2006). Surface fuel models were adjusted to account for increases in understory *Ceanothus* based on the analysts' experience and information in the Fire Effects Information System (Anderson 2001). Forests with closed canopies due to long fire-free periods may exhibit less severe fire as observed by Odion et al. (2004) under certain conditions. Odion et al. (2004) also state that, although time since fire was found to be an important predictor of lower severity fire in their study, "further research in mixed-severity fire regimes is needed to answer questions about stand-age dependency and the role of fuel, weather, and topography."
L2 c3 We also continue to be perplexed as to why you and your employees continue to ignore findings and research completed that call for more aggressive treatments for the creation of safe and effective Fuel Management Zones (FMZ). **L2 c10** [L3 page 4] …FMZ The goal for establishing an adequate FMZ is to treat major road corridors and certain access roads for fire control and fire fighter safety. … We contend this type of treatment will not meet any of the objectives stated for creating an adequate FMZ. One of the primary objectives should be to reduce the susceptibility of a crown fire. You are not achieving this by leaving the overstory crown intact. By not being more aggressive in removing vegetation from all size classes there will be no long term effectiveness from this treatment. There are numerous research documents that highlight the need to more	[5] Fuel management zones are discussed at section 2.2.4.4 as follows: "Fuel management zones (FMZs) will be created along major road corridors and certain access roads for fire control." Approximately one-third of the fuel management zone areas fall within other proposed treatments. Fuel management zones areas that are located within the late successional reserve will maintain higher canopy levels to maintain habitat for NSOs and or NGH to comply with forest plan S&G 8-20. The fuel management zone treatments are anticipated to reduce wildfire flame lengths along the corridors which would contribute to reducing the fire behavior outside of the late-successional habitat and decrease the probability of fire spread into the habitat areas (see section 3.2.2, tables 3.2-9 and 3.2-11). Stand susceptibility to crown fire is determined by the surface fire intensity, foliar moisture content, canopy base height, and canopy bulk density. Canopy closure influences surface fire intensity through its affect on surface fuel moisture and wind reduction. Initiation of crown fire is more likely when the surface fire intensity exceeds a critical threshold that is defined by foliar

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aggressively treat stands in order to meet the FMZ objectives. These documents highlight the need to reduce canopy closure levels along with treating ground and ladder fuels to effectively offset the threat of a crown fire. We will highlight four. The four documents include; Fites-Kaufman, 2008; PNW Research Paper 117, 2009; Agee and Skinner, 2005; Peterson, Johnson, Agee, Jain. McKenzie, and Reinhardt, 2005. The District has previously received copies of these documents so they will not be attached to these comments. The Fites document clearly highlights the need to open up crowns in order to reduce the threat of a crown fire and detrimental fire effects. It states; "Further, it is my view that there is insufficient science behind existing fire behavior models to support choice of canopy cover thresholds for reduced crown fire threat—such as 40% or 50% cover. In fact, based on my observations and research on fires and that of very experienced Fire Behavior Analysts working for me, canopy cover should be reduced to less than 40% if the likelihood of crown fires is to be substantially reduced. This does not mean that I advocate forests with less than 40% canopy cover everywhere--but certainly more areas in fuel treatment locations at this level, and in particular around communities at risk." In order to meet the established objectives, all size classes need to be removed during implementation. The PNW Research Paper 117 (Bioenergy From Trees: Using Cost-Effective Thinning To Reduce Forest Fire Hazards) highlights the need to aggressively treat stands in order to reduce the likelihood of large, damaging high-severity wildfires and to promote ecologically resilient conditions. The following are important statements for consideration: •"They concluded that removing significant quantities of merchantable trees would be necessary to maximize treatment effectiveness based on the torching hazard." (Page 3) •"Fried was surprised by this finding. "It seemed plausible that removing small trees would take care of the problem," he says. "But it turns out that in most stands, you have to remove a significant fraction of trees that are 10 to 21 inches in diameter if you're going to be effective as measured by improvement in the torching and crowning indices." (Page 3) •"When you pick the treatment that minimizes the removal of merchantable wood, it tends to be a lot less effective—in fact, sometimes not effective at all." (Page 3) Agee and Skinner identify key principals of fire resistance of dry forests. They include; 1) reduce surface fuels, 2) increase height to live crown, 3) decrease crown density, and 4) keep big trees of resistant species. The current proposal	moisture content and canopy base height and results in torching or passive crown fire. Active crown fire, where fire spreads through the entire fuel complex (surface and canopy), begins as passive crown fire and is sustained by the canopy bulk density and crown fire rate of spread. The required reduction of stand density and basal area will vary considerably between stands, depending on the initial stand density and structure (Agee and Skinner 2005). The combination of reduced surface fuels, increased canopy base height, and decreased canopy bulk density, as proposed for the fire management zones, decrease the potential for crown fire. Literature cited was reviewed and considered for this analysis. •Fites-Kaufman 2008: The author notes "canopy cover should be reduced to less than 40 percent if the likelihood of crown fires is to be substantially reduced." Even holding the other variables relating to crown fire susceptibility constant, reducing canopy cover to 40 percent is probably not necessary and perhaps counterproductive due to increased surface fuel drying and wind speed. Reeves and others (2009) saw that for canopy cover of 50 percent and stand heights between 15 and 30 meters, canopy bulk density was slightly under 0.1 kg/m3, which Agee (1996) identified as a rough threshold for active crown fire spread. For comparison, Agee also shows canopy bulk density values under this threshold for Douglas-fir, ponderosa pine, and grand fir with a mean diameter of 8 inches at a 1,000 trees/acre density. Treatments were designed to promote conditions for an effective fuels management zones based on modeling and expert opinions of experienced Fire Behavior Analysts, and research (Agee and Skinner 2005). The proposed treatments would reduce surface fuels, increase canopy base height, and reduce canopy bulk density. Stand susceptibility to crown fire is determined by the surface fire intensity, foliar moisture content, canopy base height, and canopy bulk density. Canopy closure influences surface fire intensity through its affect on surface fuel moisture and wind reduction. Initiation of crown fire is more likely when the surface fire intensity exceeds a critical threshold that is defined by foliar moisture content and canopy base height and results in torching or passive crown fire. Active crown fire, where fire spreads through the entire fuel complex (surface and canopy), begins as passive crown fire and is sustained by the canopy bulk density and crown fire rate of spread. The required reduction of stand density and basal area will vary considerably between stands but is dependent on the initial stand density and structure (Agee and Skinner 2005). The combination of reduced surface fuels, increased canopy base height, and

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only achieves three of these four principals. Ignoring adequate treatment of crown density, one of the key components of fire resistance, won't achieve the desired objectives. The Peterson document also highlights the same four principals. It goes on to state "In forest stands that have not experienced fire or thinning for several decades, heavy thinning combined with (often multiple) prescribed-fire or other surface fuel treatments, or both, is necessary to effectively reduce potential fire behavior and crown-fire hazard." It also emphasizes that "effective fuel treatments in forest stands with high fuel accumulations will typically require thinning to increase canopy base height, reduce canopy bulk density, reduce canopy continuity, and require a substantial reduction in surface fuel through prescribed fire or mechanical treatment or both." Ignoring effective crown closure treatment will not reduce the canopy bulk density or canopy continuity enough to provide any protection for fire suppression crews. During my 30 plus year career I had the opportunity to be involved with hundreds of wildfire suppression operations. Based on observation during that time I would never feel comfortable putting me or a crew in a location considered an FMZ with the conditions and lack of treatment proposed in this project. …We currently believe this project as proposed will not meet the stated purpose and need identified. A fully functional FMZ needs more aggressive treatments than those proposed.	decreased canopy bulk density, as proposed for the fuel management zones, decrease the potential for crown fire. •The PNW Research Paper 117 (*Bioenergy From Trees: Using Cost-Effective Thinning To Reduce Forest Fire Hazards*)(USDA Forest Service 2009: is based on one specific study at one specific site. Canopy reduction will vary considerably based on the initial site conditions (Agee and Skinner 2005). This paper states that "removing significant quantities of merchantable trees would be necessary to maximize treatment effectiveness based on the torching hazard." However, torching hazard is driven by surface fire intensity, foliar moisture, and canopy base height. Agee and Skinner (2005) state that removing merchantable trees does little to affect torching. The references for this paper also defined success as increasing the wind speed required for torching (torching index) or crowning (crowning index) to levels that would be extremely rare occurrences. While removing a substantial number of merchantable trees is needed to be effective at these levels, it is not needed to be successful at the critical conditions modeled for this project (modeled at the 97th percentile). •Agee and Skinner 2005: This paper states that treatment of surface fuel, reduces potential surface fire intensity, and raising of the canopy base height reduces the potential for crown fire and that "low thinning will be more effective than crown or selection thinning, and management of surface fuels will increase the likelihood that the stand will survive a wildfire." Removal of dominant and codominant trees is not required to reduce canopy bulk density. Removal of any material within the canopy (generally over 6 feet in height) reduces canopy bulk density. As recommended within the above paper , this project would reduce surface fuels, increase canopy base height, and reduce canopy bulk density. •Peterson et al. (2005) note "Management of thinning residues affects the post thinning combustion environment, with an almost certain increase in fine fuel if stems and foliage are left on site (Carey and Schumann 2003). Ground-based equipment (e.g., a feller buncher) typically changes the spatial distribution of fuel. Equipment that removes large stems from the stand prior to further processing typically increases the fuel load less than felling and processing within the stand." Whole-tree yarding is proposed for this project (see section 2.2.5, VEG-8). Whole-tree yarding in addition to other proposed fuel reduction activities will reduce fuel loading and meet the purpose and need for this project to promote

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	restoration of fuels-related historic fire regime (section 1.4). The proposed actions include various fuel abatement activities (see section 2.2.4.5). Effects to fuels are summarized in section 3.2.2 from the fuels report (Helmbrecht and Kurth 2009), incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath.
NEPA	
L3 c23 [L3 page 15] Cumulative Impacts The future, present and the past management actions need to be considered in a comprehensive cumulative effects analysis. The project area has been heavily impacted by past management activities. We remain surprised that rather than disclosing the cumulative impacts of proposed actions and past activities, the Forest Service continues to rely upon on the illegal 2005 guidance of the CEQ to ignore 9th Circuit case law by obfuscating the collective impacts of multiple actions over time.	[5, 3] The affected environment describes the current conditions for the various resources, which factor in past activities. Past, present and reasonably foreseeable future actions were considered (see Map A-7) for the appropriate cumulative effects boundary by resource; see the related specialist report posted on the Forest web page. For clarity, appendix E has been added to supplement the information displayed in Map A-7.
NNIS	
L5 c10 …misplaced under the cumulative effects of Action 1 (no action), the assessment reads: "Short- term reductions of canopy closure and bare soil from landings and burn piles could increase available habitat for weeds." (DEIS 86) It is our understanding that short-term canopy reduction and fuels abatement are the results of Alternatives 3, and the USFS preferred Alternative 4. Being such an important component of responsible silvicultural practice, the noxious weed assessment for the Hi-Grouse project skews the overall analysis and integrity of the proposed environmental impact statement.	[4] The sentence was inadvertently misplaced and has been corrected for the FEIS.
L5 c11 As stated in the DEIS, "Monitoring for the introduction and subsequent spread of weeds introduced as a result of project implementation may be conducted as time and funding allow"; this implies that no post-monitoring is possible but not assured. Both alternatives appear highly undesirable for the land and biotic community because it does not aim to perform any post-treatment evaluations. This does not help assess the effects of borate, and seems redundant in the promotion of re-growth and renewable forest stands. It is likely that NNIS will be established without the oversight required in proper forest management. Within the proposed 3,850 acres to be treated for healthier forest generation are two roads (44N80a and 44N52a) that will be further closed and removed from	[5] Monitoring is noted in section 2.3. Monitoring for NNIS will be in conjunction with other forest monitoring efforts, as well as day-to-day observation by employees in the field as weeds are observed. Monitoring is planned for establishment of native vegetation to prevent erosion; weeds would be monitored at that time. Knowledge about weeds is widespread across the Forest Service and education is ongoing (posters, office information, seasonal refresher training, etc.). Reports on weed observations come from employees across many resource backgrounds. Additional information has been added to section 2.3 Monitoring, of the FEIS to

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the forest system. The management plan put forth by the USFS to restore these areas is to seed and replant with native, non-invasive grasses and/ or shrubs; there is roughly 1.5 miles of road to restore, with an additional 1.3 miles of additional contemporary road construction. It is a legitimate concern that this area could be infested with NNIS, particularly without the monitoring required to ensure that it does not.	clarify that the Northern Province Strategy for Monitoring (i.e., inventorying) areas for weeds will be followed.
L5 c7 The policy statement outlined in Forest Service Manual 2080 Noxious Weed Management (USDA 1995) as referenced in the noxious weed assessment cannot be used as a substitute for the missing analysis of the potential for invasion and spread of non-native, invasive species plants (NNIS). Nor does the Klamath National Forest Noxious Weed List September, 2008 or other documents cited in the assessment. The noxious weed assessment as it stands for the proposed project is inadequate, particularly for what it fails to mention (3.2.5.2). It finds the project area to currently be at low-risk to spreading weeds based on the "…weed-free nature of the area, low levels of disturbed areas, [and] high vegetative cover…" (DEIS 86) Although these are the current conditions, the opening of the canopy, thinning of up to 90% of particular stands and subsequent prescribed burning will inevitably alter the landscape, forest floor, and succession of plant species. … The results of both Alternative 3 and Alternative 4 will directly create habitat for noxious weeds; indirect, long-term effects of this project are not analyzed adequately for NNIS for when they are introduced and established as a result of the project, either within or beyond its immediate activities. No data supports the contention that the season is too short or nearby weed species too small to support the spread of invasive weeds as a result of the project as claimed in the noxious weed assessment. The analysis fails to address the range of possible means of introduction of invasive species. Evidence suggests that one means of spread is likely to be birds, with ingested seeds deposited locally and seeds carried in plumage deposited further. For example, the common North American bird the Yellow-rumped Warbler *(Dendroica coronata*) was reported by bird watchers to feed on the invasive Chinese tallow, glossy privet and European olive plants in California; researchers later confirmed these accounts through field observations. (Aslan et al. 2010). **L5 c9** The noxious weed assessment does not provide criteria for determining when	[5] Region 5 of the Forest Service developed a noxious weed management strategy (USDA Forest Service 2000) that outlines prevention and education objectives, including incorporation of noxious weed prevention and preparation of noxious weed risk assessments as part of project planning. The project design incorporates measures to prevent the potential spread of weeds from project activities (see table 2.2-3, items NNIS-1 through NNIS-3). Section 3.2.5.2 summarizes noxious weed effects information from the noxious weed risk assessment (Baker 2009c), which is incorporated by reference and is available on the Forest Web site at: www.fs.usda.gov/klamath. The points of consideration for weed risk used for this project are widely accepted in developing a risk assessment. Those points include proximity to known infestations, background and/or elevated amounts of vectors, level of disturbance, etc. Forest Service botanists and range scientists include new science of site-specific information in analyzing what may or may not increase weed risk as it becomes available. Non-project-related weed vectors (such as birds, wind, and recreational activity) have been present and would continue to be present after project implementation. Areas of bare soil are present in the project area in the form of native surface roads. Roads are often the first place weeds colonize because of the exposed soil and the proximity to vectors (vehicles, wildlife, etc.). All of these areas are weed-free within the project area. This indicates a few factors in the resistance to weed infestation from this project area such as limited vectors, long distance to existing infestations, and a short growing season (due to high elevation, weather patterns, and deep snows). Nothing indicates that this project would change that condition after project implementation in the long term. In addition, nothing indicates that non-implementation would prevent weeds from becoming established. The effects of a large disturbance such as wildfire or wind blow-down event in timber could provide weed habitat—potentially without the management oversight of a controlled project that would limit the potential for weed effects.

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tools for weed control would be utilized. For herbicides, it determines that the chemicals are not currently used by Klamath National Forest, which we commend, but this statement does not replace the analysis of the potential for weed control with herbicides that could be undertaken with a change of management. **L5 c12** CATs suggests that a stronger non-native, invasive species plan be adapted.	The noxious weed risk assessment (Baker 2009c) discloses control methods in appendix B. A review of effects would take place if a change in management happens at some future date. Addressing potential changes in management, not known at this time, is speculative and outside the scope of this analysis.
L5 c8 Invasive species, or as the project inappropriately identifies as "noxious weeds" are also adapting to climate change and may be more likely to infest the project area than has been the case historically, a potential that must be considered when the potential for NNIS is analyzed (Bradley 2010).	[5] Climate change is briefly discussed at section 3.5, including a notation that it is too speculative to factor specific ecological trends or substantial climate changes into the analysis of environmental impacts of individual projects. Noxious weeds are plants listed by the State of California Department of Food and Agriculture as Category A-B-C. The Forest Service cooperates with the State of California and the terminology carries over. NNIS (non native invasive species) is a general catch-all term used to describe other plant species not listed as "noxious."
Roads	
L3 c10 [L3 page 2] Also, please note that our organizations support the decommissioning of two road segments in NSO critical habitat that are proposed in Alternative 4. [L3 page 3]…One aspect of Alternative 4 that we would like to see implemented is the proposal to decommission two segments of closed Forest Service roads within NSO critical habitat. It is unclear to us why this action item was not included in Alternative 3. We support the request of the US Fish and Wildlife Service to decommission these road segments in order to benefit spotted owls and their critical habitat. **L3 c25** [L3 page 17] Northern Spotted Owls Why does only one action alternative call for decommissioning the two, (closed) roads in NSO critical habitat identified by the US Fish and Wildlife Service?	[5] Thank you for your support of the proposed road closures. Alternative 3 was developed to address public comments received during the scoping period. In consultation with the U.S. Fish and Wildlife Service, two road segments in NSO critical habitat were identified as a concern for late-successional habitat and determined not needed for long-term management. Decommissioning the two roads is included in alternative 4, and evaluated in the Wildlife Biological Assessment (Oechsner 2010a) and Biological Evaluation (Oechsner 2010c), these reports are incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath..
L3 c3 [We are concerned about]…the proposed new road construction activities **L3 c20** [L3 page 13] Nevertheless, the existing road density is far too high, and the agency must start looking for opportunities to reduce its road maintenance	[5] Road maintenance and temporary roads are discussed in section 2.2.4.6. No new system road is proposed with this project. Temporary road construction is limited to the minimum amount necessary to support the proposed actions and address the project's purpose and need. Most of the temporary roads are on existing non-system roadbeds. The new temporary roads will be constructed to design standards to minimize ground disturbance, protect resources, and

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overhead. [L3 page 14] … We have been told by the Klamath Forest Supervisor's office that needed reductions in road density will be accomplished on a project-by-project basis. We see no evidence of that in the Hi-Grouse proposed action despite the severe ecological and economic need to reduce road densities in the planning area. [L3 page 15] … We know that the forthcoming Travel Management Decision will further increase the amount of system roads in the Goosenest District. Why is the agency continuing to refuse to identify a sustainable transportation system as required by the Travel Rule and NFMA?	provide safe transportation at the least possible cost. Project design features and best management practices listed in appendix C will be followed. Reducing existing road density and overall road maintenance costs are not part of the purpose and need for this project, and are outside the scope of the project. At the time of alternative development, known district information regarding roads under review was considered. Alternative 4 incorporates the removal of two system road segments identified as a concern for late-successional habitat and determined not needed for long-term management. The Motorized Travel Management decision, decision published on August 13, 2010, may be implemented beginning November 29, 2010. The Motorized Travel Management selected alternative identified 5.5 miles of closed non-system roads in the project area (USDA Forest Service 2010b). Of that, one existing non-system road is being administratively added to the Forest System Roads; it is 0.84-mile long and runs between 44N84 and 44N79. Road 44N03 (Badger Loop) is going from Highway Legal Only, to Open to All Vehicles. See map A-8 showing the Hi-Grouse Project Area and the Motorized Travel Management decision.
Scenery	
L3 c28 Scenery The scenery analysis in the DEIS is lacking. Rather than disclosing and analyzing the impacts of logging, roads, landings and forest canopy openings on important and culturally sensitive high elevation viewpoints, the analysis is largely limited to claiming that the proposal will increase forest resiliency. Forest resiliency is a worthy goal, but it cannot be used as an excuse not to analyze or disclose the impacts of the project on scenic resources. Indeed, most of the scenery analysis consists of contending that the No Action Alternative will not produce resilient forested conditions and that logging will. Yet the impacts of logging on scenic resources is not disclosed or analyzed. NEPA does not permit this approach.	[5] Section 3.4.3 summarizes scenery information from the Hi-Grouse Project Scenery Report (Mattson 2009). Table 3.4-5 displays summary information; all alternatives meet forest plan visual quality objectives. The full report is incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath. See the Scenery Report pages 22 through 28 for more detailed discussion regarding specific impacts by treatment. Direct and indirect effects to scenic integrity describe the impacts of ground-based tree removal, silvicultural treatments, ponderosa pine/mixed conifer restoration, lodgepole pine thinning/fuels reduction, fuels prescription, and fuels treatment. The disclosed effects include skid trails, small openings, stumps, slash piles, mowing (manicured look), and scorching/blackened understory. The time frames of these effects were disclosed, along with the area where the effects would be visible, the distance, and therefore, the visual impact to scenes from highly visible areas and those areas known to be of value for tribal uses. Were landings and roads to be visible from the culturally sensitive high points, those locations and impacts would have been disclosed. It is expected that the distance from these elements and the oblique angle of the view would, in effect,

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	provide screening via the remaining timber stands. Upon disclosure of these effects, the project was evaluated in terms of what scenic integrity level would be met by alternative.
Soils	
L2 c5 We also believe there is no reason to eliminate the option of machine piling. The DEIS displays no significant difference in environmental effects between alternatives 3 and 4 for the soil resource. Machine piling can drastically reduce costs and can be very effective in treating heavy fuel loading and site preparation. It has been used for decades on the Goosenest Ranger District with very successful results. **L3 c4** [We are concerned about]…in-unit tractor piling **L3 c24** [L3 page 16] Soils and Tractor Piling We are very concerned about the potential impacts of ground-based slash piling on soil health and productivity. Mechanical piling is universally recognized as an outdated practice that has disproportionately harmful impacts on watershed and soil resources. Please further note that the proposed machine piling violates NFMA requirements that a given logging system cannot be chosen because of dollar value alone. There is no other justification for using the proposed machine piling provided in the record other than economic considerations and many reasons why using such systems is not appropriate. 36 C.F.R. 219.27(b)(3). Here the Forest Service has offered no justification for the proposed machine piling (as opposed to manual piling), despite the widely acknowledged impacts to soil resources.	[5] Effects to soils are summarized in section 3.3.1, from the Watershed Report (McNamara 2009), incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath.. The proposed alternatives would not exceed the forest plan and soil quality analysis standards and guidelines of 15 percent. Project design feature VEG-8, in section 2.2.5, incorporates whole tree yarding as the primary method for minimizing thinning-generated slash. Machine piling of hazardous fuels outside landing areas is proposed in alternative 4, and is not included in alternative 3. Machine piling under alternative 4 would be evaluated post-thinning to determine the need for this treatment and may be needed on up to 25 percent of the area of units where it is prescribed. [1] 36 CFR 219.27 (b) (CFR 2010) pertains to wilderness area reviews under special designations. Changes to special designation areas are not proposed with this project and are outside the scope of this analysis.
L3 c19 [L3 page 13] Roads …We are very concerned about the long-term impacts to soil health and hydrology from the construction of new (temporary) logging roads in the project area. We do appreciate that the Forest Service has identified non-system roads for 3 miles of the 3.75 miles of proposed road construction.	[5] Effects to soils are summarized in section 3.3.1, from the Watershed Report (McNamara 2009), which is incorporated by reference and available on the Forest Internet Web site. The proposed alternatives would not exceed the forest plan and soil quality analysis standards and guidelines of 15 percent. Project design features and best management practices are incorporated to meet forest plan direction and minimize effects to soils and hydrology (see table 2.2-3, items WS-2 through WS-18, and appendix D).
L3 c36	[4] Clarification: Bulldozers or small tracked or wheeled equipment assist with

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Bull Dozer Fire Lines? Page 32 of the Appendix to the DEIS makes reference to the use of dozers to create fire lines. We see no other reference to this practice in the DEIS. Is the Forest Service proposing to bulldoze fire line in the project? If so, why are the impacts to soils, wildlife, and botanical resources not analyzed and disclosed?	fire control line construction. The machinery may be used to mow/masticate material near control lines and/or plow control lines to mineral soil. Wherever possible, existing roads and skid trails would be used for prescribed fire control lines prior to the fall burns. Effects to soils from fire line activities would be temporary ground cover removal and soil disturbance, similar to the effects anticipated with temporary roads. Effects would last until vegetation re-establishes; this is anticipated during the following growing season. Prescribed fire line effects on soils are expected to be minimal. Fire lines are a linear feature where bare mineral soil is exposed to breakup surface fuels. Typically they will not be built downhill, are narrow in width, and as a result, will not contribute to hillslope erosion. Wildlife effects associated with fire lines include temporary removal of ground cover that may alter small mammal and bird habitat use and movement and/or increase their vulnerability to predation, similar to the effects anticipated with temporary roads. Effects would last until vegetation re-establishes; this is anticipated during the following growing season. No known sensitive plant locations are in the proposed treatment areas. Project design features (table 2.2-3) NNIS-1 through NNIS-3 would be followed to reduce potential for introduction and spread of non-native invasive species. Effects would last until vegetation re-establishes; this is anticipated during the following growing season.
Vegetation	
L2 c8 Our issues raised are not about increasing merchantable volume. It is about doing the right thing and fully meeting the objectives stated for the project. As a forest industry and being professional foresters, we are very concerned that good forestry be practiced on the Forest Service land base. We ask you to develop prescriptions that truly meet the particular needs of the stands and land base.	[5] The project silviculturist developed and field verified the prescriptions (see section 3.2.1, methodology). All prescriptions appropriate for the stands that would address the purpose and need were considered. Some prescription options were not the included in the final alternatives due to the need to maintain NSO Critical Habitat and to comply with NGH forest plan S&G 8-20. Detailed prescription descriptions are located in appendix C.

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L3 c11 [L3 page 3] Please note that alternative 4 (DEIS page 41) proposed logging Ponderosa Pine sites down to as little as 22 percent canopy. Such aggressive canopy removal has significant unanalyzed potential to influence both wildlife connectivity and fire hazard.	[5] One of the purpose and needs of the project is to promote restoration of historic forest composition and structure by increasing proportion of pines on suitable sites to mimic historical stand conditions (see purpose and need section 1.4). Under alternative 4, three stands (totaling 212 acres) are prescribed for heavy thinning of ponderosa pine (appendix C, descriptions and table C-2). These stands are heavily infected with *annosus* root disease, and dwarf mistletoe in associate with *cytospora* canker. Projected canopy cover is displayed in section 3.2.1, table 3.2-4. The effects of these proposed treatments on NSO and NGH territories were analyzed and disclosed in sections 3.2.3.2 and 3.2.3.4. Burn probability is decreased with alternative 4 when compared to the other analyzed alternatives (see table 3.2-12 and figure 3.2-1).
L3 c12 Fir Encroachment While we support thinning from below so-as to reduce white-fir encroachment, please note that harvest aimed at reducing various tree diseases and parasites has been shown to have the opposite effect in many instances. Indeed, disturbance agents that create small patches of dead trees are important for a myriad of species and ecological processes. This is how ecologically beneficial variability is introduced in these forests, particularly in the absence of fire. The Hi Grouse project should differentiate between areas where mixed conifer forests make up the reference condition and where pine forests are the natural vegetation. There should be consideration for the natural presence of white fir and large white fir trees should be retained in the mixed conifer settings. Generally, the agency can accomplish forest health and fuels reduction goals without removing the boles of large white fir from a forest stand	[5] The existing condition and need for change within the white fir/ponderosa pine community is discussed in section 1.3.1, with additional discussion in section 3.2.1 under affected environment. Detailed prescriptions are located in appendix C, Large white fir and red fir trees are retained in all treatments. Reductions in white fir are proposed where ponderosa pine was historically the dominant species, and where root disease is prevalent. White fir and red fir would be thinned where it is healthy—the objective is not to eliminate these species, but to increase the proportion of pines that have been reduced through logging and blister rust infection.

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L3 c14 Red Fir Mortality and Forest Health/Fuel Loadings Patch-scale tree mortality observed in the analysis area is consistent with historical stand development patterns recorded in other *Abies magnifica* forests unaffected by fire suppression or other silvicultural management. Stand development in red fir forest occurs both through episodic and continuous seedling recruitment, which is a function of periodic disturbance and the ability of red fir to colonize small gaps in the forest (Taylor and Halpern 1991). Red fir can establish in the partial shade of small canopy gaps or in the more severe microclimates of larger gaps (Selter et al. 1986). According to Agee (1993), the most important small-scale disturbances that promote red fir regeneration or the release of understory saplings include Indian paint fungus (*Echinodontium tinctorium*) or fir engraver beetle (*Scolytus ventralis*). Old-growth stands at Castle Point near Crater Lake featured red firs of various ages up to 525 years with a pronounced 30-to-60-year-old cohort that probably established in a group release after canopy gap creation by one or more such disturbance agents (Agee 1993). Thus, disease and beetle kill are intrinsic to the adapted gap dynamics of red fir forests. The DEIS should address the findings contained in Chappell and Agee, 1996, Fire Severity and Tree Seedling Establishments in *Abies Magnifica* Forests, Southern Cascades, Oregon. Ecological Applications, Vol. 6, No. 2 (May 1996), 628. A copy of this study accompanied our scoping comments of January 2008, but was not addressed in the text of the DEIS.	[5] Appendix C, table C-2 lists all stands identified for treatment, along with stand species composition information. Relatively little treatment is proposed in red fir stands, and all treatments would leave most of the existing stocking. Units that had been previously logged are infected with *annosus* root disease, and most of the original pine stocking has been removed by logging and blister rust. The Silvicultural Report (Schantz 2009) considered information from Chappell and Agee (1996) regarding fire regimes. The findings of Chappell and Agee (1996) support the conclusion that these forests had a mixed-severity fire regime with fire return intervals ranging from 16 to 65 years, which maintained the pine species as a component of this type.
Wildlife	

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L2 c8 The excuse of portions of the project being in an LSR, critical habitat designation, and nesting/roosting habitat is not valid reason to reduce treatments. The following highlights direction/guidance from the NWFP concerning treatments within LSR's. These statements are applicable to the East of the Cascades and in the Oregon and California Provinces. They are found on Page C-13 of the NWFP. "In some Late-Successional Reserves in these provinces, management that goes beyond these guidelines may be considered. Levels of risk in those Late-Successional Reserves are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those Late-Successional Reserves even if a portion of the activities must take place in currently late-successional habitat. While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the Late-Successional reserves from playing an effective role in the objectives for which they were established."	Analysis of NSO and NGH, species associated with the late successional habitats located in the project area are found at sections 2.6, 3.2.3.2, and 3.2.3.7. The Late-Successional Reserve (#5297) within the project area was identified as part of the NSO critical habitat subunit 67. Management of the NSO critical habitat was developed in consultation with the U.S. Fish and Wildlife Service (section 3.9).
L3 c22 [L3 page 15] Neotropical Migratory Birds The DEIS for this project failed to fully analyze and disclose the potential impacts of conifer thinning operations on neotropical bird population trends. The DEIS lacks qualitative or quantitative numbers and analysis needed for the public to make informed comments or the decision maker to make an informed decision regarding the impacts of the proposed logging on neotropical bird species.	[5] Information about anticipated effects to migratory birds was summarized in section 3.2.3.7 from the Management Indicator Species Report part II (Oechsner 2010e) and the Migratory Bird and Deer Report (Oechsner 2010f). These reports are incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath. Habitat information applicable to neotropical migratory birds was considered from the Management Indicator Species Report part II; specifically tables 11 and 12 provide supporting habitat information applicable to black-backed woodpeckers and mature ponderosa pine associates. A summary of the anticipated effects appears in section 3.2.3.7. No detectable adverse impacts to migratory birds are anticipated and the project will have several future beneficial effects on migratory bird populations. See the Management Indicator Species Report and the Migratory Bird and Deer Report for additional details.

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L3 c13 [L3 page 4] Please also consider future snag/large woody debris requirements when determining when and where you would cut larger diameter trees (>16" DBH). The Forest Service should consider snag creation (girdling, hot burns, etc) and leaving large logs on site, instead removing large wood from the stand identified in the DEIS. This is particularly important given that "thinning and fuel reduction treatments would result in short-term impacts to some important northern spotted owl habitat elements such as canopy cover and down woody debris." (Hi Grouse Scoping Notice page 9.)	[5] Snags and down woody debris are discussed under migratory birds in sections 3.2.3.2 and 3.2.3.7. Project design features include WL-9 to retain snags to meet forest plan direction (see section 2.2.5).
L3 c17 [L3 pages 10-12] Management Indicator Species (MIS) And Sensitive Species [L3 page10] The DEIS establishes that the Forest Service is relying on MIS habitat modeling and not conducting any surveys or population monitoring as required by NFMA. Indeed, the DEIS contains no actual analysis of the current status or potential impacts of the project on MIS populations. L3 page 12] … The Klamath Land Resource Management Plan requires that "Project areas should be surveyed for the presence of sensitive species before project implementation." ROD Standards and Guidelines p. 6-8; LRMP p. 4-23. "If surveys cannot be conducted, project areas should be assessed for the presence and conditions of sensitive species habitat . . ."ROD Standards and Guidelines p. 6-8. Nowhere in DEIS or project file in general, is there an explanation for why these surveys cannot be conducted for sensitive and MIS species such as Red Breasted Sapsuckers, White-headed woodpeckers, Vaux's swifts, Pileated woodpeckers or Black-backed woodpeckers. These "snag-associated" MIS species will lose habitat due to proposed logging of dead and dying trees in logging units, in proposed road locations, in landings, and along haul routes. Population numbers and trends have not been analyzed by the agency. L3 page 12] … Population treads for these species were not disclosed. Indeed, the agency has made no effort to determine whether these species are present in the planning area, let alone the trend of their populations. (See DEIS page 73). The agency does not provide any analysis or data on current populations of MIS to support its conclusion that the viability of these species is not likely to be threatened by the snag removal and road construction proposed in the timber sale.	[5] Monitoring requirements in chapter 5 of the Klamath National Forest LRMP do not require population monitoring or surveys on any management indicator species except for steelhead and rainbow trout. For management indicator species listed in the LRMP (pp 4-38 to 4-41), project-level management indicator species effects analyses are informed by project- and landscape-scale habitat analysis. Project-level effects on management indicator species are analyzed and disclosed as part of environmental analysis under NEPA. This involves examining impacts of the proposed project alternatives on management indicator species habitat by discussing how direct, indirect, and cumulative effects will change the quantity and/or quality of habitat in the landscape and project area (LRMP, p 4-39). Effects to sensitive species and management indicator species are summarized in section 3.2.3. Habitat effects were evaluated in the Biological Evaluation (Oechsner 2010c) and Management Indicator Species Report parts I and II (Oechsner 2010d, e). These reports are incorporated by reference and available on the Forest Web site. Project design features at section 2.2.5 include items to maintain snags (VEG-2, WL-9, WL-10, and WL-13).Available survey information was analyzed for NSO,, NGH, and American marten. Species were assessed based on the presence and conditions of sensitive species habitat. Survey or research information considered was briefly discussed at section 3.2.3.2 for northern spotted owl, section 3.2.3.3 for American marten, and section 3.2.3.4 for NGH. The management indicator species report part II considered additional information including the Klamath Bird Observatory, Redwood Sciences Laboratory, and Klamath National Forest Bird Monitoring Efforts at Antelope Creek 1994–2007 (Alexander et al. 2009). Andersen et al. (2004) noted that there are no reliable population trend data on NGH in the eastern United States. Salvage of dead trees is only proposed in the lodgepole pine thinning/fuels

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[L3 page 17] ... Northern Goshawk Page 69 of the DEIS indicates that the Forest Service has not collected reliable population trend data for NGH. Why is this? This data-gap, combined with proposed habitat loss (via Alternative 4) threatens violations of NEPA and NFMA.	reduction. In all other treatments, dead trees would only be cut for safety reasons. No permanent road construction is proposed with this project.
L3 c18 [L3 pages 10-11] Page 77 of the DEIS states that "removing insect infected dead and dying trees affects the amount of available foraging and nesting habitat of black-backed woodpeckers over the long term," yet makes no attempt to quantify or qualify the impacts of the project on this MIS species. This lack of analysis and disclosure is present of the snag associate and mature ponderosa pine associate MIS species in the planning area (see DEIS page 76). [L3 page 11] … Throughout the Wildlife BA/BE, and DEIS the Forest Service makes conclusory statements regarding the cumulative effects on management indicator and sensitive species not based on adequate quantitative data. The Forest Service fails to address past, present, and reasonably foreseeable future actions effecting MIS in the project area. The USFS fails to substantively address the cumulative watershed effects of all actions in the affected watersheds and the impact on MIS and instead discounts cumulative impacts as individually minor impacts without examining their collective significance. [L3 page 12] … The DEIS not only fails to provide monitoring information for all MIS species, but also fails to adequately analyze cumulative and direct impacts to pallid and Townsend's big-eared bats are not fully disclosed and analyzed.	[5] Forest plan standards and guidelines were developed to provide adequate habitat for species present. The project design features presented in table 2.2-3, incorporate item WL-9 to meet forest plan direction for snags (Forest Plan p 4-30). Effects from past, present, and reasonably foreseeable future actions were considered for all species. Cumulative effects are discussed under each species noted in section 3.2.3.1. Section 3.2.3.6 includes summary information from the Management Indicator Species Report Parts I and II (Oechsner 2010d, e). The report's summary tables 11 and 12 provide supporting habitat information applicable to black-backed woodpeckers and mature ponderosa pine associates. Section 3.2.3.7 includes summary information from the Migratory Bird and Deer Report (Oechsner 2010f). These reports are incorporated by reference and available on the Forest Internet Web site at: www.fs.usda.gov/klamath.
L3 c26 [L3 page 17] Please note that page 28 of the DEIS indicates that Alternative 4 would remove 129 acres of NSO foraging habitat. However, page 65 of the DEIS indicates that Alternative 4 would remove 1,704 acres of foraging habitat. We hope that page 65 is in error. Either way, implementation of Alternative 4 would directly inhibit the stated purpose of the project to improve and maintain late-successional suitable habitat. The removal of foraging habitat under Alternative 4 can be contrasted with Alternative 3 in which fuels concerns would be addressed via "light thinning from below treatments [that] would maintain NSO habitat in treated stands for the short and long term." Clearly Alternative 3 is preferable to Alternative 4 is this regard. As stated on page 65 of the DEIS, "within the [NSO] home range the amount of	[5] Table 2.6-1 displays the effects of alternatives on northern spotted owl habitat within the KL-3201 Activity Center spatial analysis areas of 0.5 mile core and 1.3 mile home range. The analysis discussion under 3.2.3.2 notes effects across the project area spatial area, as well as the effects of the alternatives within the KL-3201 Activity Center spatial areas. These are different spatial scales and the information is correct. Effects to the northern spotted owl are discussed in section 3.2.3.2. Section 3.9 notes that thorough analyses of federally listed species and consultation with the U.S. Fish and Wildlife Service have been completed.

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foraging habitat would decrease and the amount of non-habitat would increase after treatments due to stand density reductions."	
L3 c21 [L3 page 14] … Attached to our January 2008 scoping comments was a peer-reviewed article by Trombulack and Frissell (2000) detailing some of the negative impacts of road construction and use on Terrestrial and Aquatic ecosystems. The DEIS did not fully address and avoid the harmful impacts detailed in this study. [L3 page 14] … Please note that page 81 of the DEIS indicates that the project is located within the Goosenest AMA "critical deer fawning area." Page 82 of the DEIS indicates that the east fawning area has an extreme road density of 4.3 miles of road per square mile of forest. Yet neither action alternative proposes any road density reduction to address the needs of the critical deer fawning area.	[5] No new permanent road construction is proposed with this project. The majority of the temporary roads proposed are on previously disturbed areas. Temporary roads would not be placed remain on the transportation system. The overall effects to wildlife from the proposed project were summarized in section 3.2.3.1. The biological evaluation prepared for this project (Oechsner 2010c) analyzed road impacts at pages 18, 31, 34-36, 51 and 79. The biological evaluation and migratory birds and deer analysis (Oechsner 2010f) discusses road impacts at pages 7, 11, 12, and 15. The migratory bird and deer analysis also notes the cover to forage ratio within the project area at page 7 of the report. "The project area is densely timbered with little foraging habitat existing beneath the canopy. Use of the project area and fawning habitat by deer is likely limited by the amount of forage and water available." The biological evaluation and the migratory bird and deer reports are incorporated by reference. Effects to soils from disturbances, including roads, were analyzed and discussed in section 3.3.1, and noted to be within forest plan and SQAS standards and guidelines of 15 percent (USDA Forest service 2004). See also response to L3 c3 under roads. The Motorized Travel Management FEIS considered the Trombulak and Frissel (2000) paper within the effects discussions. The road effects discussed in the following excerpts from Motorized Travel Management FEIS (pages 261, 295,391, 392, and 393) (USDA Forest Service 2010b) are applicable to the Hi-Grouse project area and are incorporated by reference. Wildlife and Fisheries Management decisions related to motor vehicle travel can affect terrestrial species by increasing human-caused mortality, changing behavior due to disturbance, and modifying habitat (Gaines et al. 2003, Trombulak and Frissell 2000). It is Forest Service policy to minimize damage to vegetation, minimize harassment to wildlife, and minimize significant disruption of wildlife habitat while providing for motor vehicle use on NFS lands. Therefore, management decisions related to motor vehicle travel on NFS lands must consider effects to fish and their habitat. For purposes of this discussion, the term —fish is used to include species as well as habitat. Habitat is

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	considered to include both the stream environment and the associated riparian habitat. Therefore, management decisions related to motor vehicle travel on NFS lands must consider effects to wildlife and their habitat. In October 2006, Region 5 developed route designation project design criteria for threatened and endangered species and critical habitat to achieve —no effect‖ or —may affect not likely to adversely affect‖ determinations on a programmatic level. The Klamath National Forest was included in the programmatic consultation completed with the U.S. Fish and Wildlife Service on December 27, 2006, whereby the Service concurred that by following the criteria described, route designation activities would have no adverse affects. Plants Direct effects to plants include, but are not limited to: death or injury to plants and habitat modification, habitat fragmentation, decrease in habitat quality, including increased risk of weed introduction and spread, change in hydrology, increased erosion, compaction, and sediment, risk to pollinators, loss of vegetation, over collection, or other factors reducing or eliminating plant growth and reproduction (Trombulak and Frissell 2000). Indirectly, vehicle impacts to soils can also contribute to roadside invasions of exotic plant species by reducing native plant vigor and creating areas of competition-free space that are open to invasion (Ouren et al. 2007; Trombulak and Frissell 2000). Any of these changes in soil properties can create conditions unsuitable for seedling development such that the sustainability or expansion of plant populations could be affected. This would be especially problematic with rare plant populations that are, by definition, limited in size or distribution. Dust from motor vehicle use has also been shown to decrease native plant cover and vigor by reducing rates of photosynthesis, respiration, transpiration (Spellerberg and Morrison 1998, in Ouren et al. 2007), and in some cases to alter community structure (Trombulak and Frissell 2000).

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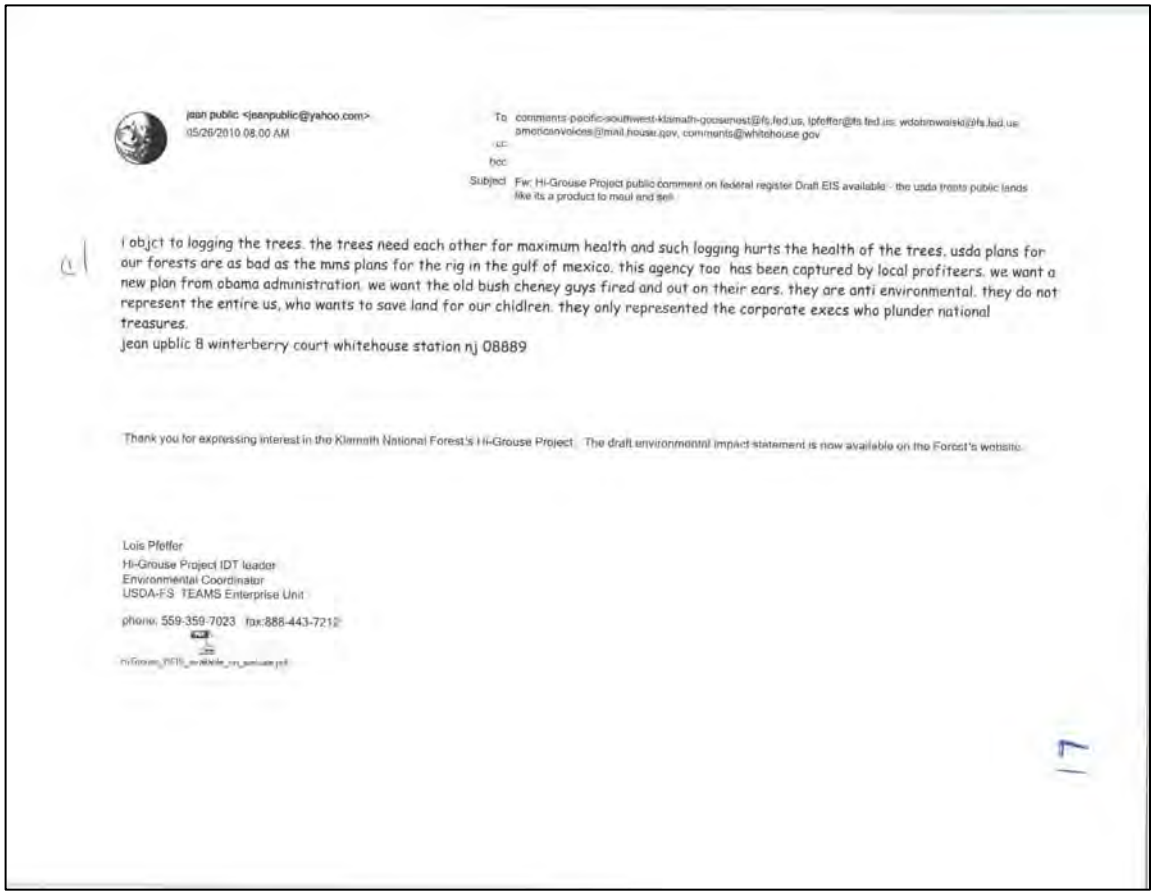
Comment Letters

The seven comment letters appear in their entirety as follows. "L#" refers to the letter number, "c#" is the comment number. Comments were categorized by subject and responded to in table B-1 (previous).



jean public <jeanpublic@yahoo.com>
05/26/2010 08:00 AM

To comments-pacific-southwest-klamath-goosenest@fs.fed.us, lpfeffer@fs.fed.us, wdolsmwalski@fs.fed.us, americanvoices@mail.house.gov, comments@whitehouse.gov
cc:
bcc:
Subject Fw: Hi-Grouse Project public comment on federal register Draft EIS available - the usda treats public lands like its a product to maul and sell

1 i object to logging the trees. the trees need each other for maximum health and such logging hurts the health of the trees. usda plans for our forests are as bad as the mms plans for the rig in the gulf of mexico. this agency too has been captured by local profiteers. we want a new plan from obama administration. we want the old bush cheney guys fired and out on their ears. they are anti environmental. they do not represent the entire us, who wants to save land for our chidlren. they only represented the corporate execs who plunder national treasures.
jean upblic 8 winterberry court whitehouse station nj 08889

Thank you for expressing interest in the Klamath National Forest's Hi-Grouse Project. The draft environmental impact statement is now available on the Forest's website.

Lois Pfeffer
Hi-Grouse Project IDT leader
Environmental Coordinator
USDA-FS TEAMS Enterprise Unit

phone: 559-359-7023 fax:888-443-7212

L2

AMERICAN FOREST RESOURCE COUNCIL

June 15, 2010

Patricia Grantham, Forest Supervisor
Klamath National Forest
1312 Fairlane Road
Yreka, CA 96097

Dear Patty:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (DEIS) for the Hi-Grouse Project. We believe the Modified Proposed Action (Alternative 4) is the only logical choice for implementation. We find it ironic that the one alternative (the original Proposed Action) that best meets the purpose and need for the project area had to be dropped from consideration due to conflicts with the current Klamath Land and Resource Management Plan (LRMP). It is another example of LRMP restrictions that are not compatible with needed management for east-side forests. c1 c2

We also continue to be perplexed as to why you and your employees continue to ignore findings and research completed that call for more aggressive treatments for the creation of safe and effective Fuel Management Zones (FMZ). c3

The project has identified three primary purpose and need statements:

Improve and maintain habitat for species associated with late-successional forests.

• Maintain sustainable owl habitat elements in the Goosenest AMA and the LSR MAs by promoting resiliency to fire, insect, and disease on the landscape, and by culturing young trees to increase growth and crowns for future suitable habitat.

Promote restoration of historic forest composition and structure

• Decrease stand density over most of the project area to reduce disease and insects to endemic levels, and provide for resilient stocking levels of desired species.

• Increase the proportion of ponderosa pine, sugar pine, and white pine on suitable sites to mimic historical stand conditions.

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• Release understory in lodgepole pine stands to increase stand diversity and remove dead and soon-to-be dead trees to reduce current and future fuel accumulations.

• Increase stand diversity to enhance overall vegetative diversity.

• Maintain aesthetic values, especially along sensitive routes and areas seen from high places.

• Identify appropriate monitoring (learning) objectives related to project activities in line with the Goosenest AMA.

Promote restoration of fuels-related historic fire regime

• Mimic natural processes through management actions to promote healthy ecological conditions and replicate the role of natural disturbances.

• Treat heavy fuel loadings to reduce the threat of stand-replacing wildfire, protect older forest habitat components in the project area, and provide for firefighter safety.

The Modified Proposed Action (Alternative 4) proposes to implement variable density thinning on 2,429 acres, mow 346 acres, underburn 1,495 acres, thin 970 acres of lodgepole pine stands, allow machine piling, and treat 13 miles of road as a FMZ. Approximately 3.2 miles of temporary roads would be developed.

The other action alternative (Alternative 3) proposes to complete variable density thinning on 2,094 acres, mow 254 acres, underburn 789 acres, thin 673 acres of lodgepole stands, not allow machine piling, and treat 13 miles of road as a FMZ. Approximately 2.3 miles of temporary roads would be developed. This alternative also has imposed a diameter limit of 20 inches.

Upon review of the impacts addressed in the DEIS we believe Alternative 4 is the only logical alternative for implementation. The following addresses why we believe this to be true. c1

EFFECTIVENESS

One of the driving goals for the project area is to promote restoration of historic forest composition and structure and promote restoration of fuels-related historic fire regime. Neither one of the action alternatives will meet these objectives as well as the original proposed action. Alternative 4 more closely meets these objectives. Leaving stands as dense as proposed in Alternative 3 will not even closely resemble historic vegetation conditions or historic live fuel conditions. Alternative 4 will more closely meet these objectives outside of the late-successional areas, Northern Spotted Owl (NSO) and Northern goshawk protection areas. The areas within NSO and goshawk concerns will continue to be at risk to loss from fire and insect and disease. This project will do nothing to meet your purpose and need for the project area within NSO and goshawk areas. c4

We believe the DEIS does a disservice to the public by not disclosing that these wildlife areas of concern will not meet the historic vegetative conditions and historic fire regimes. These are artificial habitats and should be recognized as that in the DEIS. c4

If NSO and goshawks have historically existed in these stands they must have survived in very different vegetative conditions. The conditions being left to support these species in the DEIS are artificial and not sustainable over the long term. The do not reflect historic vegetative conditions for east side forests. If left in their current condition they will either succumb to fire or insect and disease problems which will quickly render them unsuitable.

We also believe there is no reason to eliminate the option of machine piling. The DEIS displays no significant difference in environmental effects between alternatives 3 and 4 for the soil resource. Machine piling can drastically reduce costs and can be very effective in treating **heavy** fuel loading and site preparation. It has been used for decades on the Goosenest Ranger District with very successful results. c5

Diameter limits do nothing to alleviate the reduction of insect and disease issues or long-term fire risk reduction. Implementation of diameter limits cause stands to be too dense. These stands will quickly become overstocked and susceptible to loss. c6

We find it difficult to see how the long term canopy closure in Alternative 3 (Tables 3.2-1 and 3.2-2) will be less in 20 years than what currently exists, especially since the basal area will be higher. We contend crowns will close rapidly as the leave trees grow. Treatments proposed in Alternative 3 and the NSO and goshawk areas in Alternative 4 will do nothing to offset the potential for loss to crown fires. It must be noted that the one of the weakest points in the FVS program is crown closure predictions.

The county is in dire financial condition and revenue needs to be derived from Forest Service projects and the public land base by funding through county payments. It is clearly displayed in the DEIS that Alternative 4 is more economically viable. Alternative 3 does nothing to assist with providing jobs, producing commodity products, and adds very little to county revenues. c7

Alternative Comparison: The following is a brief comparison of some of the projected environmental affects for the two action alternatives.

Wildlife Determination – The effects for all analyzed wildlife species are similar for both alternatives. The following highlights statements for the NSO and goshawk. It needs to be noted the findings are the same for both alternatives.

- NSO – "may affect, but is not likely to adversely affect NSOs."
- Goshawk – "may impact individual goshawks but would not likely result in a trend toward listing or loss of viability."

Vegetation Management:

- Alternative 3 – "The target upper density level of basal area is generally not reached due to the 20-inch diameter limit, and the stands are projected to be well above the upper level by 2029 (table 3.2-1)." (page 38) There will not be a 20 year effectiveness period if

treatments are conducted as proposed in Alternative 3. This is contrary to Regional expectations of 20 year treatment effectiveness.

- Alternative 4 – "Resiliency to disturbance would improve. Thinning would reduce susceptibility to mortality from bark beetles and create stand structures more conducive to low-severity surface fires. The effects of the reduction in stand density would last for at least 20 years (table 3.2-4)." (page 40)

Soils –

- "Machine piling under alternative 4 is anticipated to be minimal because whole-tree yarding will be used to move trees to landing areas." (page 88)
- "Both alternatives 4 and 3 would retain sufficient soil cover to minimize soil erosion, maintain nutrient cycling, and maintain soil fertility and soil integrity/health, and therefore, maintain short– and long-term soil productivity." (page 90)

Social – There is a significant difference in effects on the social aspect between the two action alternatives. The following table is found on page 100 of the DEIS.

Table 3.4-3. Alternatives 3 and 4—Jobs, income, and payment to county

Alternative	MBF Harvested	Jobs Supported[1]	Income Supported	Estimated Stumpage Value	Estimated 25% Payment to County
3	4,241	13.0	$483,394	$29,115	$7,279
4	13,263	40.7	$1,511,635	$524,055	$131,014

FMZ

The goal for establishing an adequate FMZ is to treat major road corridors and certain access roads for fire control and fire fighter safety. The proposed action calls for the following: c3

- "Treatments will consist of small tree thinning and/or removal, pruning, mastication of brush, and hand or machine piling and burning of fuels concentrations. Treatments will extend 150 feet either side of the road. Along FMZ Road 77, due to critical habitat designation and nesting/roosting habitat, only trees less than 8 inches dbh will be removed and variably spaced except where openings exist. This will leave some areas clumpy for dispersal and habitat needs; some areas can be more open. Trees less than 10 inches dbh will be removed/spaced along the other FMZ roads in the project area."

We contend this type of treatment will not meet any of the objectives stated for creating an adequate FMZ. One of the primary objectives should be to reduce the susceptibility of a crown fire. You are not achieving this by leaving the overstory crown intact. By not being more aggressive in removing vegetation from all size classes there will be no long term effectiveness from this treatment.

There are numerous research documents that highlight the need to more aggressively treat stands in order to meet the FMZ objectives. These documents highlight the need to reduce canopy closure levels along with treating ground and ladder fuels to effectively offset the threat of a crown fire. We will highlight four. The four documents include; Fites-Kaufman, 2008; PNW

Research Paper 117, 2009; Agee and Skinner, 2005; Peterson, Johnson, Agee, Jain, McKenzie, and Reinhardt, 2005. The District has previously received copies of these documents so they will not be attached to these comments.

The Fites document clearly highlights the need to open up crowns in order to reduce the threat of a crown fire and detrimental fire effects. It states; **"Further, it is my view that there is insufficient science behind existing fire behavior models to support choice of canopy cover thresholds for reduced crown fire threat—such as 40% or 50% cover. In fact, based on my observations and research on fires and that of very experienced Fire Behavior Analysts working for me, canopy cover should be reduced to less than 40% if the likelihood of crown fires is to be substantially reduced. This does not mean that I advocate forests with less than 40% canopy cover everywhere--but certainly more areas in fuel treatment locations at this level, and in particular around communities at risk."**

In order to meet the established objectives, all size classes need to be removed during implementation. The PNW Research Paper 117 (*Bioenergy From Trees: Using Cost-Effective Thinning To Reduce Forest Fire Hazards)* highlights the need to aggressively treat stands in order to reduce the likelihood of large, damaging high-severity wildfires and to promote ecologically resilient conditions. The following are important statements for consideration:

- **"They concluded that removing significant quantities of merchantable trees would be necessary to maximize treatment effectiveness based on the torching hazard." (Page 3)**
- **"Fried was surprised by this finding. "It seemed plausible that removing small trees would take care of the problem," he says. "But it turns out that in most stands, you have to remove a significant fraction of trees that are 10 to 21 inches in diameter if you're going to be effective as measured by improvement in the torching and crowning indices." (Page 3)**
- **"When you pick the treatment that minimizes the removal of merchantable wood, it tends to be a lot less effective—in fact, sometimes not effective at all." (Page 3)**

Agee and Skinner identify key principals of fire resistance of dry forests. They include; 1) reduce surface fuels, 2) increase height to live crown, 3) **decrease crown density**, and 4) keep big trees of resistant species. The current proposal only achieves three of these four principals. Ignoring adequate treatment of crown density, one of the key components of fire resistance, won't achieve the desired objectives.

The Peterson document also highlights the same four principals. It goes on to state **"In forest stands that have not experienced fire or thinning for several decades, heavy thinning combined with (often multiple) prescribed-fire or other surface fuel treatments, or both, is necessary to effectively reduce potential fire behavior and crown-fire hazard."**

It also emphasizes that "effective fuel treatments in forest stands with high fuel accumulations will typically require thinning to increase canopy base height, **reduce canopy bulk density, reduce canopy continuity**, and require a substantial reduction in surface fuel through prescribed fire or mechanical treatment or both." Ignoring effective crown closure treatment will not reduce

the canopy bulk density or canopy continuity enough to provide any protection for fire suppression crews.

During my 30 plus year career I had the opportunity to be involved with hundreds of wildfire suppression operations. Based on observation during that time I would never feel comfortable putting me or a crew in a location considered an FMZ with the conditions and lack of treatment proposed in this project.

The excuse of portions of the project being in an LSR, critical habitat designation, and nesting/roosting habitat is not valid reason to reduce treatments. The following highlights direction/guidance from the NWFP concerning treatments within LSR's. These statements are applicable to the East of the Cascades and in the Oregon and California Provinces. They are found on Page C-13 of the NWFP. c8

"In some Late-Successional Reserves in these provinces, management that goes beyond these guidelines may be considered. Levels of risk in those Late-Successional Reserves are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those Late-Successional Reserves even if a portion of the activities must take place in currently late-successional habitat. While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the Late-Successional reserves from playing an effective role in the objectives for which they were established."

We currently believe this project as proposed will not meet the stated purpose and need identified. A fully functional FMZ needs more aggressive treatments than those proposed. c3

Our issues raised are not about increasing merchantable volume. It is about doing the right thing and fully meeting the objectives stated for the project. As a forest industry and being professional foresters we are very concerned that good forestry be practiced on the Forest Service land base. We ask you to develop prescriptions that truly meet the particular needs of the stands and land base. c9

CONCLUSION

c1

The only alternative we can support in the DEIS is Alternative 4. Alternative 3 does nothing in terms of meeting the long-term desired conditions for any of the vegetative components found in the DEIS. Diameter limits are counterproductive to any wise management of the public land base. Diameter limits are arbitrary designations that do not have any silvicultural merit. They are counterproductive to meeting most of your identified purpose and need statements, especially in terms of restoring historical vegetative conditions and fire regimes. AFRC does not and will not support diameter limits as they are not compatible with your current land management goals for this project area. c6

We will not support Alternative 3 or any other alternative that closely resembles it in the final Record of Decision (ROD). You have previously stated you will not select options that do not meet the purpose and need for a project or select alternatives that do not adequately treat the public land base. Alternative 3 does neither.

We ask that Alternative 4 be selected, as displayed in the DEIS, in the final ROD. Thank you for the opportunity to comment on the DEIS for the Hi-Grouse Project.

Sincerely,

/s/***Richard J. Svilich***

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Cell Phone: 530-905-0181
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L 3

July 2, 2010

Patricia Grantham
Wendy Dobrowolski
Klamath National Forest
Goosenest Ranger District
37805 Highway 97
Macdoel, CA 96058

RE: Hi Grouse DEIS Comments

Thank you for these comments from the Klamath-Siskiyou Wildlands Center (KS Wild), the Environmental Protection Information Center (EPIC) and the Klamath Forest Alliance (KFA) regarding the Hi Grouse Project. Contact information for our organizations may be found at the conclusion of this document. *Please continue to send us hard copies of forthcoming documents and decisions regarding this project.*

Broadly, we support the thinning of fire-suppressed forests, particularly tree plantations and forests prone to uncharacteristic wildfire near homes and communities. We support the many aspects of the proposed project that will accomplish the stated goals and management objectives. However, we do have some concerns regarding the methods to achieve forest health and fire mitigation goals that are outlined below. We hope to work collaboratively with the Forest Service on these issues so as to ensure that this project can move forward in a timely fashion. c1

Thank you for proposing thinning-from-below, mixed conifer restoration, lodgepole pine thinning and underburning treatments to improve forest health and reduce fire hazard in this planning area. We are very confident that those proposed actions will assist the Forest Service in reducing fuel hazard and promoting a diverse and resilient forest.

Our concerns center around the proposed "clearings" in the thin-from-below and mixed conifer treatment units, the proposed new road construction activities, in-unit tractor piling, extremely low basal area/canopy prescriptions in some stands, proposed canopy reduction in red-fir dominated stands, the long lag time between harvest and treatment of activity fuels and the widespread application of borax throughout the project area. c2 c3 c4 c5 c6 c7 c8

Alternative 3 Better Achieves the Purpose of the Project

Please note that implementation of Alternative 3 would result in far less direct removal of Northern Spotted Owl (NSO) and Northern Goshawk (NGH) habitat than would implementation of Alternative 4. Additionally, Alternative 3 would retain more forest c9

1

canopy closure and large diameter trees across the landscape which would aid wildlife connectivity and fire management. Alternative 3 does not require mechanical slash-piling in units and hence will result in fewer impacts to soil resources. Finally, Alternative 3 would require less new road construction than would Alternative 4. For these reasons we support implementation of many aspects of Alternative 3 as opposed to Alternative 4. C9

While Alternative 3 is largely preferable to Alternative 4 in respect to wildlife habitat and fire hazard, there are nevertheless a number of activities proposed for implementation in Alternative 3 that greatly concern our organizations. As will be discussed later in these comments, the impacts of delayed treatment of activity fuels and the proposed widespread application of Borax under Alternative 3 are extremely problematic. Also, please note that our organizations support the decommissioning of two road segments in NSO critical habitat that are proposed in Alternative 4. C7 C8 C10

The comparative benefits of Alternative 3 to Alternative 4 vis-à-vis wildlife habitat are significant. Page 62 of the DEIS concludes that under Alternative 3, "Light thinning from below treatments would maintain NSO habitat in treated stands for the short and long term." This can be contrasted with Alternative 4 which would "remove 1,704 acres of [NSO] foraging habitat" such that "within the home range the amount of foraging habitat would decrease and the amount of non-habitat would increase after treatments due to stand density reductions." (DEIS page 65).

Similarly, Alternative 3 would maintain (but degrade) nesting and foraging habitat for NGH while "Alternative 4 would result in a 60 acre reduction in the amount of nesting habitat and a 331 acre reduction of foraging habitat available to NGH across the project area. Non-habitat would increase by 391 acres across the project area in Alternative 4." (DEIS pages 71-72). C9

Please note that a key element of the purpose and need for this project is to "improve and maintain late-successional habitat," and that one of the two "significant issues" identified in the DEIS is impacts to late-successional species and their habitat. As evidenced by the quotations above, Alternative 3 clearly meets the purpose and need for late-successional habitat and species management much better than does Alternative 4.

Please note that page 6 of the DEIS indicates that part of the fuels strategy is to "protect older forest habitat components in the project area." The agency's Forest Ecosystem Management Assessment Team (FEMAT), the Northwest Forest Plan, and the Klamath National Forest LRMP, all identify the habitat components of late-successional forests as: (1) Large diameter old trees; (2) Multiple canopy layers with significant canopy cover; (3) Standing snags; and (4) Large down woody debris. Alternative 3 better addresses the fuels strategy identified in the DEIS than does Alternative 4 because it retains and protects more of these older forest habitat components while focusing fire hazard reduction on ground and ladder fuels where such treatments will be most effective.

2

Please note that Alternative 4 (DEIS page 41) proposed logging Ponderosa Pine sites down to as little as 22% canopy. Such aggressive canopy removal has significant un-analyzed potential to influence both wildlife connectivity and fire hazard. C11

Thank you for including a 20" diameter cap in Alternative 3. In addition to serving as the foremost habitat element of the "older forest habitat components" that the project is designed to protect, the diameter of large-diameter trees is a "measure of resistance to fire" as disclosed by Klamath National Forest planners on page 343 of the recent Thom-Seider FEIS on the Happy Camp Ranger District. Hence retention of 20" DBH trees as called for under Alternative may help to achieve both the wildlife habitat and fire hazard objectives of the Hi Grouse project. C9

One aspect of Alternative 4 that we would like to see implemented is the proposal to decommission two segments of closed Forest Service roads within NSO critical habitat. It is unclear to us why this action item was not included in Alternative 3. We support the request of the US Fish and Wildlife Service to decommission these road segments in order to benefit spotted owls and their critical habitat. C10

DEIS Analysis Largely Ignores Activity Fuels

The contention on pages 47 and 49 if the DEIS that harvest activities that dramatically reduce forested canopy cover and do not treat activity fuels for up to 10 years will reduce fire behavior is inaccurate. C7

Our scoping comments of January 2008 contained extensive references to peer-reviewed science regarding the increased fire hazard and fire severity that often results from the removal of overstory forest canopy. None of that science was meaningfully responded to in the DEIS. Please see the "Fire Mitigation" section of these comments below.

We were particularly surprised by the agency's decision to neither analyze nor disclose the impact of leaving activity fuels on the landscape for up to a decade. Similarly, the analysis of the No Action Alternative fails to disclose or analyze the fire hazard benefits of retaining closed canopy cover and not producing un-treated activity fuels and slash.

In addition, mechanical thinning generates large quantities of slash by transferring branches, twigs and needles from the canopy to the ground (Allen et al. 2002, Graham et al. 2004, Stephens 1998, USDA 1994, van Wagtendonk 1996, Weatherspoon 1996). The CRS noted:

> Timber harvesting removes the relatively large diameter wood that can be converted into wood products, but leaves behind the small material, especially twigs and needles. The concentration of these "fine fuels" on the forest floor increases the rate of spread of wildfires. Thus, one might expect acres burned to be positively correlated with timber harvest volume (Gorte 2000b).

3

The DEIS (page 42) discloses that pile burning and underburning may not even *start* until up to a decade *after* commercial timber harvest commences. Yet the impacts of activity slash on fire hazard is not addressed anywhere in the DEIS. The KNF knows that both the Yellow fire (47,500 acres) and the Specimen fire (7,000 acres) originated in logging slash. Hence the widespread creation of untreated logging slash may directly inhibit the attainment of the project's purpose and need.

Federal land managers working in the Siskiyou Mountains routinely report that mechanical density management projects increase fine surface fuels in the form of logging slash by three to 15 tons per acre, which could create faster rates of fire spread and greater flame lengths, resulting in intensified fire behavior and extended fire duration (USDI 2002a, 2002b). Indeed, the 2002 Squires Peak fire in the Middle Applegate watershed exploded past containment lines when it spread into logging slash in a desiccated and windy environment left after the Spencer Lomas timber sale accomplished significant crown bulk density reduction (Kettler 2002a, 2002b). Ironically, the Medford District BLM framed the purpose and need for the timber sale as fire hazard reduction (USDI 2001).

Fir Encroachment

While we support thinning from below so-as to reduce white-fir encroachment, please note that harvest aimed at reducing various tree diseases and parasites has been shown to have the opposite effect in many instances. Indeed, disturbance agents that create small patches of dead trees are important for a myriad species and ecological processes. This is how ecologically beneficial variability is introduced in these forests, particularly in the absence of fire. c 12

The Hi Grouse project should differentiate between areas where mixed conifer forests make up the reference condition and where pine forests are the natural vegetation. There should be consideration for the natural presence of white fir and large white fir trees should be retained in the mixed conifer settings. Generally, the agency can accomplish forest health and fuels reduction goals without removing the boles of large white fir from a forest stand.

Please also consider future snag/large woody debris requirements when determining when and where you would cut larger diameter trees (>16" DBH). The Forest Service should consider snag creation (girdling, hot burns, etc) and leaving large logs on site, instead removing large wood from the stand identified in the DEIS. This is particularly important given that "thinning and fuel reduction treatments would result in short-term impacts to some important northern spotted owl habitat elements such as canopy cover and down woody debris." (Hi Grouse Scoping Notice page 9.) c 13

Please also note that many of the generalizations in the scoping notice regarding white fir encroachment do not apply to native red fir stands. We do not support canopy reduction in Red fir stands. c 6

4

The DEIS (page 42) discloses that pile burning and underburning may not even *start* until up to a decade *after* commercial timber harvest commences. Yet the impacts of activity slash on fire hazard is not addressed anywhere in the DEIS. The KNF knows that both the Yellow fire (47,500 acres) and the Specimen fire (7,000 acres) originated in logging slash. Hence the widespread creation of untreated logging slash may directly inhibit the attainment of the project's purpose and need.

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Red Fir Mortality and Forest Health/Fuel Loadings

c 14

Patch-scale tree mortality observed in the analysis area is consistent with historical stand development patterns recorded in other *Abies magnifica* forests unaffected by fire suppression or other silvicultural management. Stand development in red fir forest occurs both through episodic and continuous seedling recruitment, which is a function of periodic disturbance and the ability of red fir to colonize small gaps in the forest (Taylor and Halpern 1991). Red fir can establish in the partial shade of small canopy gaps or in the more severe microclimates of larger gaps (Selter et al. 1986). According to Agee (1993), the most important small-scale disturbances that promote red fir regeneration or the release of understory saplings include Indian paint fungus (*Echinodontium tinctorium*) or fir engraver beetle (*Scolytus ventralis*). Old-growth stands at Castle Point near Crater Lake featured red firs of various ages up to 525 years with a pronounced 30-to-60-year-old cohort that probably established in a group release after canopy gap creation by one or more such disturbance agents (Agee 1993). Thus, disease and beetle kill are intrinsic to the adapted gap dynamics of red fir forests.

The DEIS should address the findings contained in Chappell and Agee, 1996, Fire Severity and Tree Seedling Establishments in Abies Magniffica Forests, Southern Cascades, Oregon. Ecological Applications, Vol. 6, No. 2 (May, 1996), 628. A copy of this study accompanied our scoping comments of January 2008, but was not addressed in the text of the DEIS.

Chappel and Agee conclude that:

-The role of disturbance in the development and dynamics of red fir forests has been perplexing, in part, because of a seeming contradiction: red fir is both (1) shade-tolerant and self perpetuating, and (2) regenerates abundantly after some major disturbances, including fire and wind (Taylor and Halpern 1991).

-Regeneration in clearcuts is highly variable and often inadequate from a silvicultural perspective (Gratkowski 1958, Gordon 1970.)

-Red fir seedling establishment and growth is strongly related to periodic disturbance. The existence of episodic regeneration after disturbance does not preclude however, the simultaneous occurrence of a more continuous, slower mode of regeneration that allows red fir to perpetuate itself indefinitely (Taylor and Halpern 1991).

-Retention of a partial canopy after disturbance favors red fir seedling establishment. The resultant shade ameliorates drought stress, a key mortality agent for red fir seedlings (Gordon 1970, Ustin et al. 1984, Selter et al 1986).

5

-As Picher (1987) noted in the southern Sierra Nevada, fire suppression in red fir forests probably has not altered fuel loads or stand structure to a point outside the natural range of variability within a stand, as it has in lower elevation mixed conifer stands.

Fire Mitigation

Effective Fuels Treatments Start Small

C2

We are very concerned that the DEIS indicates that the agency intends to create openings throughout the project area. While we recognized (and encourage) the thinning of ground fuels and ladder fuels, we are not convinced that removal of forest canopy will achieve the desire reduction in fuel hazard and increase in forest health.

Fire behavior and severity depend on fuel properties and their spatial arrangement. Fuel bed structure plays a key role in fire ignition and spread, and is central to developing an effective fuel management strategy (Graham et al. 2004).[1] The bulk density (weight within a given volume) of *surface fuels* consisting of grasses, shrubs, litter and dead woody material in contact with the ground are critical frontal surface fire behavior (heat output and spread rate - intensity) compared to simple fuel loading (weight per unit area) (Sandberg et al. 2001).[2] High surface fire intensity usually increases the likelihood of overstory canopy ignition and torching (Scott and Reinhardt 2001).[3]

The shrub and small tree fuel stratum also is important to crown fire ignition because it supports surface fire intensity and serves as *ladder fuel* that facilitates vertical movement of fire from the ground surface into the canopy. The size of the gap between the ground and tree canopies is critical to ignition of crown fire from a surface fire (*Id.*, Graham et al. 2004). Van Wagner (1977)[4] reports that crown fires are ignited after a surface fire reaches critical fire line intensity relative to the height of the base of aerial fuels in the crown. This crown ignition can become a running crown fire if its spread rate surpasses a certain canopy density threshold. Agee (1996)[5] suggests a *canopy bulk density* threshold of 0.1 kg/ha as a general determinant for crown fire activity under extreme weather conditions. However, Keyes and O'Hara (2002)[6] note the incompatibility of such open forest conditions with key forest management objectives including wildlife conservation and prevention of understory initiation and ladder fuel development, especially in the

[1] Graham, R.T., S. McCaffrey and T.B. Jain (tech. eds.). 2004. *Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity*. USDA For. Serv. Gen. Tech. Rep. RMRS-120. Ft. Collins, CO.

[2] Sandberg, D.V., R.D. Ottmar and G.H. Cushon. 2001. Characterizing fuels in the 21st century. *International Journal of Wildland Fire* 10: 381-387.

[3] Scott, J.H. and E.D. Reinhardt. 2001. *Assessing Crown Fire Potential by Linking Models of Surface and Crown Fire Behavior*. USDA For. Serv. Res. Pap. RMRS-29. Fort Collins, CO.

[4] Van Wagner, C.E. 1977. Conditions for the start and spread of crown fire. *Canadian Journal of Forest Research* 7: 23-24.

[5] Agee, J.K. 1996. The influence of forest structure on fire behavior. Pp. 52-68 in: J.W. Sherlock (chair). *Proc. 17th Forest Vegetation Manage. Conf.* Jan. 16-18: Redding, CA.

[6] Keyes, C.R. and K.L. O'Hara. 2002. Quantifying stand targets for silvicultural prevention of crown fires. *Western Journal App. Forestry* 17: 101-109.

absence of an institutional commitment to stand maintenance.

Omi and Martinson (2002)[7] sampled wildfire areas to describe the effectiveness of fuel treatments on subsequent fire severity. The strongest correlation they found was that between crown base height and "stand damage," which they used as a measure of severity. Importantly, canopy bulk density was not strongly correlated to fire severity. Instead, height to live crown, the variable that determines crown fire initiation rather than propagation, had the strongest correlation to fire severity in the areas we sampled... [W]e also found the more common stand descriptors of stand density and basal area to be important factors. But especially crucial are variables that determine tree resistance to fire damage, such as diameter and height. Thus, "fuel treatments" that reduce basal area or density from above (i.e., removal of the largest stems) will be ineffective within the context of wildfire management.

The Omi and Martinson (2002) study failed to collect information about fuel profiles before the fires, and the scale of events considered confounds replication. However, the authors claim that their results can be extrapolated widely to other sites. A key implication of the study is the importance of treating fuels "from below" in order to prevent widespread occurrence of stand replacing wildland fires. Keyes and O'Hara (2002) concur that increasing a stand's crown base height is critical and argue, "pruning lower dead and live branches yields the most direct and effective impact."

"To reduce fire damage from wildfires, future thinning operations must concentrate on small trees with operations called low thinning, removing the trees that have invaded these sites since fire exclusion began, and cleaning up the debris…By leaving the largest trees and treating fuels, fire tolerant forest conditions are created, so that fire severity can be significantly reduced." (Agee 1997)[8]

Time and Fire Severity

Fire severity may diminish in mixed evergreen forests as the duration of fire return increases. Odion and colleagues (2004) studied fire severity patterns in the 1987 Klamath fire complex and learned that structurally diverse mature forests with closed canopies overwhelmingly experienced low and moderate severity fire effects (up to 13 percent high severity – expressed as tree canopy mortality due to data limitations). **That study is attached to these comments.**

C 15

Most of the older forests in the study area had not burned since before 1911, when land managers began recording fires. Long unburned (pre-1911) forests displayed lesser

[7] Omi, P.N. and E.J. Martinson. 2002. *Effect of Fuels Treatment on Wildfire Severity*. Unpubl. report to Joint Fire Science Prog. Western Forest Fire Research Ctr., Colorado St. Univ. Fort Collins, CO. March 25. 36 pp.

[8] -Agee, J.K. 1997. *The Severe Fire Weather-Too Hot to Handle?* Northwest Science, Vol. 71, No.1: 153-156. Page 155) Note, this paper is also referenced in the FEIS prepared by the KNF for the Meteor timber sale at F-12.

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severity effects than did young tree plantations established after post-fire logging that followed the 1977 Hog fire. Accordingly, the researchers conclude that long absence of fire predicts low-severity fire effects in closed canopy mixed evergreen forests of the Klamath Mountains. This may be due to overstory shading, which decreases or eliminates combustible understory sclerophyllous plants (e.g., *Arctostaphylos, Ceanothus, Quercus, Arbutus spp.*) (Minore 1979, Thornburgh 1982), and moderates microclimate (Andrews 1986, Countryman 1956, Graham et al. 2004). Such conditions reduce surface heat output of fires and increase average tree canopy heights, two critical factors influencing the probability of canopy ignition (Agee 1996, Van Wagner 1977). Evidence from other forest types corroborates the hypothesis that overstory development and accompanying decreases of understory sclerophylls in the long absence of fire would lead to lower severity fires (Bond and van Wilgen 1996, Davis et al. 1988, Jackson 1968, Wells 1962). Agee and Huff (1987) studied surface fuel dynamics in wet temperate forests dominated by Douglas fir and western hemlock (*Tsuga heterophylla*) and found the lowest rates of fire spread and intensity would occur 110 to 180 years after stand-replacing fire.

Unfortunately, the assumptions presented in the No Action Alternative simply ignore the all of the peer-reviewed literature referenced above.

Density Management and Fire Hazard

Mechanical thinning is widely preferred over other means to reduce fire hazards because tree harvest can be profitable. Projects that utilize wood products derived from thinning are more likely to pay for themselves (Allen et al. 2002). Most federal thinning projects in the Klamath with a stated purpose of fire hazard reduction propose moderate-to-heavy low thinning or crown thinning (see Graham et al. 1999 for definitions) because removal and utilization of commercially valuable intermediate, co-dominant and dominant trees can determine a project's financial efficiency (Reed 2002).

Thinning in the context of commercial forestry is not new, but its usefulness as a tool to reduce fire behavior is controversial and experimental (Carey and Schumann 2003, DellaSala and Frost 2001, FEMAT 1993). The Congressional Research Service tried but failed to locate research documenting a relationship between timber harvest and decreased fire intensity or severity, even though the idea is "logical and widely accepted" (Gorte 2000a). It found that "other independent variables" such as weather and topography "are critical factors in determining the extent and severity of any particular fire," confirming similar findings by fire ecologists (Beaty and Taylor 2001, Bessie and Johnson 1995, Odion et al. 2004).

In a mixed conifer forest in the South Fork Trinity River watershed in northwest California, partially thinned stands burned *more* intensely and suffered *higher* levels of tree mortality than unlogged areas (Weatherspoon and Skinner 1995). In the Sierra Nevada, effects of timber harvest on forest structure and microclimate were the most important factors responsible for an increase in potential fire severity (SNEP 1996). In

8

eastern Washington, thinning that was intended to reduce fire hazard had the opposite effect, as logged areas showed increased rates of fire spread and greater flame lengths (Huff et al. 1995). Thinning treatments in the Rocky Mountain Front Range failed to prevent high intensity fire from overwhelming suppression forces and threatening residential communities outside Denver, Colorado (USDA 2002). That finding confirms earlier research indicating that tree thinning and biomass removal alone are unlikely to effectively reduce fire severity in dense stands (Graham et al. 2004, van Wagtendonk 1996).

Thinning may reduce total fuel loads (i.e., biomass weight per unit area), but it also opens forest canopies and allows increased solar radiation and wind to reach the forest floor (Agee 1996, Countryman 1956). The net effect is to reduce moisture and increase the flammability of surface fuels:

> In the open, solar radiation impinges directly on the earth's surface. Because both the earth and the air above it are poor conductors, heat is concentrated at the surface and in the layer of air next to it. Ground fuels can thus become superheated … A mature, closed stand has a fireclimate strikingly different from that in the open. Here nearly all of the solar radiation is intercepted by the crowns … Because of the lower temperature and higher humidity, fuels within closed stands are more moist than those in the open under ordinary weather conditions … [F]irebrands that do not contain enough heat to start a fire in a closed stand may readily start one in the open. Fires starting in the open also burn more intensely and build up to conflagration proportions more quickly since less of the heat produced by the fire is used in evaporating water from the drier fuels (Countryman 1956, 15-16).

c16

To the extent that the Forest Service strives to create "open-grown" forest conditions, changes to fire climate and intensified fire behavior are likely to occur. The DEIS did not address the potential for reduced canopy closure to increased solar radiation, ground level wind speed, surface fuel moisture and flammability to result from proposed density management.

In addition, mechanical thinning generates large quantities of slash by transferring branches, twigs and needles from the canopy to the ground (Allen et al. 2002, Graham et al. 2004, Stephens 1998, USDA 1994, van Wagtendonk 1996, Weatherspoon 1996). The CRS noted:

> Federal land managers working in the Klamath Mountains routinely report that mechanical density management projects increase fine surface fuels in the form of logging slash by three to 15 tons per acre, which could create faster rates of fire spread and greater flame lengths, resulting in intensified fire behavior and extended fire duration (USDI 2002a, 2002b). Indeed, the 2002 Squires Peak fire in the Middle Applegate watershed exploded past containment lines when it spread into logging slash in a desiccated and windy environment left after the Spencer Lomas timber sale accomplished significant crown bulk density reduction (Kettler 2002a, 2002b). Ironically, the Medford District BLM framed the purpose and need for the timber sale as fire hazard reduction (USDI 2001).

9

Other ecological effects of mechanical thinning

Scientific understanding of the ecological effects of mechanical thinning is incomplete, but evidence suggests that such treatments, even when carefully implemented, can adversely affect the environment in key ways. Mechanical thinning can:

- Remove large trees that are disease and fire resistant (DellaSala et al. 1995, USGAO 1999, Gorte 2000a, 2000b).
- Increase mortality of residual trees due to pathogens and mechanical damage to boles and roots (Filip 1994, Hagle and Schmitz 1993). c16
- Damage soil integrity through increased erosion, compaction and loss of litter (Harvey et al. 1994, Meurisse and Geist 1994).
- Create sediment pulses in streams that harm fish (Grant and Wolff 1991, Beschta 1978).
- Retain insufficient densities of large trees and woody debris to sustain viable populations of cavity nesting and woody debris dependent species (DellaSala et al. 1995).
- Reduce habitat quality for sensitive species associated with cool, moist micro sites or closed canopy forests (FEMAT 1993).

Please note that page 41 of the DEIS indicates that implementation of Alternative 4 would reduce canopy cover in old-growth Red Fir stands to 29% and ponderosa pine sites to 22%.

Management Indicator Species (MIS) And Sensitive Species

Please note that in Utah Environmental Congress v. Zieroth, 2002 WL 406715; --- F.Supp.2d (D. Ut. 2002) the Federal District Court held that Service's use of habitat trend data rather than actual or trend population data to analyze effect of proposed timber clearing project on management indicator species was insufficient to comply with requirements of National Forest Management Act (NFMA). The DEIS establishes that the Forest Service is relying on MIS habitat modeling and not conducting any surveys or population monitoring as required by NFMA. Indeed, the DEIS contains no actual analysis of the current status or potential impacts of the project on MIS populations. c17

Page 77 of the DEIS states that "removing insect infected dead and dying trees affects the amount of available foraging and nesting habitat of black-backed woodpeckers over the long term," yet makes no attempt to quantify or qualify the impacts of the project on this c18

10

MIS species. This lack of analysis and disclosure is present of the snag associate and mature ponderosa pine associate MIS species in the planning area (see DEIS page 76). c18

The National Forest Management Act (NFMA) imparts on the Forest Service a substantive duty to provide for the diversity of plant and animal communities on National Forests. 16 U.S.C. § 1604(g)(3). To achieve this goal, the regulations implementing NFMA specify that the agency ensure that viable populations of native animals are maintained by monitoring the impacts of the Forest Plans on selected MIS. 36 C.F.R. § 219.19(a)(6).

The Hi Grouse planning area is home to numerous species designated as Management Indicator Species (MIS) by the Klamath National Forest Land and Resource Management Plan (LRMP). Many of these species would be adversely affected by increased fragmentation caused by timber sale activities such as road construction, landing construction, snag removal and gap creation.

The Forest Service is required to determine the effects of the timber sale on MIS through the analyses put forward in the EIS and the Wildlife Biological Assessment/Biological Evaluation.

The Biological Evaluation (BE) is required to "ensure that Forest Service actions do not contribute to loss of variability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species," and to "provide a process and standard by which to ensure threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process." F.S.M. § 2672.41. To accomplish this task, BEs are required to assess cumulative effects of the proposed activity in relationship to all past, present, and reasonably foreseeable future actions regardless of what agency (Federal or Non-federal) or person undertakes such other actions. 40 C.F.R. § 1508.7; F.S.M. § 2672.42.

The findings of the EIS and Wildlife BA/BE must provide the decision maker and the public with enough information to conclusively know that the project will have no significant effect on threatened, sensitive, and management indicator wildlife species. 40 C.F.R. § 1508.27.

Throughout the Wildlife BA/BE, and DEIS the Forest Service makes conclusory statements regarding the cumulative effects on management indicator and sensitive species not based on adequate quantitative data.

The Forest Service fails to address past, present, and reasonably foreseeable future actions effecting MIS in the project area.

The USFS fails to substantively address the cumulative watershed effects of all actions in the affected watersheds and the impact on MIS and instead discounts cumulative impacts as individually minor impacts without examining their collective significance.

c18

11

The Klamath Land Resource Management Plan requires that "Project areas should be surveyed for the presence of sensitive species before project implementation." *ROD Standards and Guidelines p. 6-8; LRMP p. 4-23.* "If surveys cannot be conducted, project areas should be assessed for the presence and conditions of sensitive species habitat . . ." *ROD Standards and Guidelines p. 6-8.*

C17

Nowhere in DEIS or project file in general, is there an explanation for why theses surveys cannot be conducted for sensitive and MIS species such as Red Breasted Sapsuckers, White-headed woodpeckers, Vaux's swifts, Pileated woodpeckers or Black-backed woodpeckers. These "snag-associated" MIS species will lose habitat due to proposed logging of dead and dying trees in logging units, in proposed road locations, in landings, and along haul routes. Population numbers and trends have not been analyzed by the agency.

This duty to monitor management indicator species is non-discretionary. "Population trends of management indicator species will be monitored." 36 C.F.R. § 219.19(a)(6). The Forest Service must constantly monitor the Klamath National Forest Land and Resource Management Plan's (LRMP) impact, including the impact of specific management actions, so that compliance with the Forest Plan is achieved and any needed revisions are ascertained. Inland Empire Public Lands Council v. United States Forest Service, 88 F.3d 754, 760 n.6 (9th Cir. 1996).

In attempting to shirk its non-discretionary duty to survey, the USFS is fond of contending that Inland Empire only requires MIS population survey information when there is not enough underlying data to support habitat analysis. While this contention is incorrect and the duty to monitor (from both NFMA and the LRMP) is non-discretionary, even using the Forest Service's reading of Inland Empire we find that population surveys are required here.

Even using the Forest Service's reading of Inland Empire, it is obvious that there is no available data for numerous MIS in the project area, and that the Forest Service lacks the necessary underlying information for use of a habitat analysis in lieu of actual population studies. See Earth Island Institute et al.. v. Department of Agriculture, Eastern District of California, page 21.

C18

The DEIS not only fails to provide monitoring information for all MIS species, but also fails to adequately analyze cumulative and direct impacts to pallid and Townsend's big-eared bats are not fully disclosed and analyzed. Population treads for these species were not disclosed. Indeed, the agency has made no effort to determine whether these species are present in the planning area, let alone the trend of their populations. (See DEIS page 73).

C17

The agency not provide any analysis or data on current populations of MIS to support its conclusion that the viability of these species is not likely to be threatened by the snag removal and road construction proposed in the timber sale.

12

The FS may wish to re-familiarize itself with the holding in KS Wild v. USFS, Eastern District of California 2004, (which is binding precedent for this project) in which the federal district court held that the Klamath National Forest violated its LRMP, and NFMA, by failing to monitor and survey for snag associated MIS species in this very same watershed via the illegal Beaver old-growth timber sale.

As recognized by the court in KS Wild v. USFS, the KLRMP (at 5-3) clearly states that "[P]opulation trends of the management indicator species will be monitored and relationships to habitat changes determined." It simply doesn't get much clearer than that. Hence the court in KS Wild v. USFS ruled that in the Beaver Creek timber sale "because the habitat of the Snag Species Association MIS may be appreciably affected, use of habitat as a proxy for population surveys was arbitrary and capricious." Hopefully the Forest Service will not place our organizations in the position of requiring the court to issue the same opinion here.

Roads

"[Road density] may be an important indicator of such things as habitat fragmentation, the potential for wildlife harassment, visual quality, recreation opportunities, the cumulative potential for erosion and sedimentation from road surfaces, and cumulative increases in peak flow due to runoff from road surfaces and ditches."
-KNF Roads Analysis page 13.

"As the availability of road maintenance funds allocated to the Forest Service decreases, down nearly 50% in the past six years, the necessity to evaluate and implement measures which reduce the risk of road related impacts to aquatic ecosystems is greater than ever."
-Road Sediment Source Inventory and Risk Assessment: Grider, Horse and Main Stem Salmon River, Westside Project, Klamath National Forest March 15, 2002 Pages 4-5.

"The combination of no significant reduction in road miles or road maintenance levels with the declining budget does not make it feasible to fully maintain the existing road system given the current budget." Klamath National Forest Forestwide Roads Analysis page 24.

C19

We are very concerned about the long-term impacts to soil health and hydrology from the construction of new (temporary) logging roads in the project area. We do appreciate that the Forest Service has identified non-system roads for 3 miles of the 3.75 miles of proposed road construction. Nevertheless, the existing road density is far too high, and the agency must start looking for opportunities to reduce its road maintenance overhead. This is particularly important given the current proposal in the Klamath National Forest's Travel Management Planning process to add a significant amount of non-system roads to the travel system in the Goosenest Ranger District.

C20

Recent forest-wide condition surveys indicate that our current road maintenance funding only meets a small portion (approximately 25%) of the annual maintenance needs on the Klamath National Forest. (See KNF Forestwide Roads Analysis page 24). The deferred maintenance backlog for the Klamath exceeds $55.5 million dollars and will continue to grow until additional funds can be found or road densities are reduced (see KNF

13

Forestwide Roads Analysis page 25). We do not understand how the agency intends to draw adequate funding for maintenance of thousands of miles of existing roads and motorized trails while simultaneously proposing user-created additions to the motorized travel system in light of the existing and significant maintenance backlog. The USFS must consider in its current plan/EIS the closure and decommissioning of at least those roads that the agency identified in its Roads Analysis as having both low value and high risk. *We have been told by the Klamath Forest Supervisor's office that needed reductions in road density will be accomplished on a project-by-project basis.* We see no evidence of that in the Hi Grouse proposed action despite the severe ecological and economic need to reduce road densities in the planning area. c20

Attached to our January 2008 scoping comments was a peer-reviewed article by Trombulack and Frissell (2000) detailing some of the negative impacts of road construction and use on Terrestrial and Aquatic ecosystems. The DEIS did not fully address and avoid the harmful impacts detailed in this study. The abstract for the article reads as follows: c21

> Roads are a widespread and increasing feature of most landscapes. We reviewed the scientific literature on the ecological effects of roads and found support for the general conclusion that they are associated with negative effects on biotic integrity in both terrestrial and aquatic ecosystems. Roads of all kinds have seven general effects: mortality from road construction, mortality from collision with vehicles, modification of animal behavior, alteration of the physical environment, alternative of the chemical environment, spread of exotics, and increased use of areas by humans. Road construction kills sessile and slow-moving organisms, injures organisms adjacent to a road, and alters physical conditions beneath a road. Vehicle collisions affect the demography of many species, both vertebrates and invertebrates; mitigation measures to reduce roadkill have been only partly successful. Roads alter animal behavior by causing changes in home ranges, movement, reproductive success, escape response, and physiological state. Roads change soil density, temperature, soil water content, light levels, dust, surface waters, patterns of runoff, and sedimentation, as well as adding heavy metals (especially lead), salts, organic molecules, ozone, and nutrients to roadside environments. Roads promote the dispersal of exotic species by altering habitats, stressing native species, and providing movement corridors. Roads also promote increased hunting, fishing, passive harassment of animals, and landscape modifications. Not all species and ecosystems are equally affected by roads, but overall the presence of roads is highly correlated with changes in species composition, population sizes, and hydrologic and geomorphic processes that shape aquatic and riparian systems. More experimental research is needed to complement post-hoc correlative studies. Our review underscores the importance to conservation of avoiding construction of new roads in roadless or sparsely roaded areas and of removal or restoration of existing orads to benefit both terrestrial and aquatic biota
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> -Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14(1): 18-30.

Please note that page 81 of the DEIS indicates that the project is located within the Goosenest AMA "critical deer fawning area." Page 82 of the DEIS indicates that the east fawning area has an extreme road density of 4.5 miles of road per square mile of forest. Yet neither action alternative proposes any road density reduction to address the needs of the critical deer fawning area. c21

We know that the forthcoming Travel Management Decision will further increase the amount of system roads in the Goosenest District. Why is the agency continuing to refuse to identify a sustainable transportation system as required by the Travel Rule and NFMA?

C 20

Neotropical Migratory Birds

The regional decline of migratory birds is a significant issue for this project. Numerous studies have reported local and regional trends in breeding and migratory bird populations throughout North America (e.g., DeGraaf and Rappole 1995[9], Sauer et al. 2004[10]). These studies suggest geographically widespread population declines that have provoked conservation concern for birds, particularly neotropical migrants (Askins 1993[11], Terborgh 1989.[12]) The 2005 report from the Klamath Bird Observatory entitled Local and Regional Trends in Breeding and Migratory Bird Populations in the Klamath and Rogue River Valleys: Monitoring Results for 1993-2003 may be viewed at: http://www.klamathbird.org/Publications/pubs.htm. This paper indicates that several species on songbirds are suffering declining population trends at the regional level.

C 22

The DEIS for this project failed to fully analyze and disclose the potential impacts of conifer thinning operations on neotropical bird population trends. The DEIS lacks qualitative or quantitative numbers and analysis needed for the public to make informed comments or the decision maker to make an informed decision regarding the impacts of the proposed logging on neotropical bird species.

Cumulative Impacts

The future, present and the past management actions need to be considered in a comprehensive cumulative effects analysis. The project area has been heavily impacted by past management activities.

C 23

We remain surprised that rather than disclosing the cumulative impacts of proposed actions and past activities, the Forest Service continues rely upon on the illegal 2005 guidance of the CEQ to ignore 9th Circuit case law by obfuscating the collective impacts of multiple actions over time.

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[9] DeGraaf, R.M., and J.H. Rappole. 1995. Neotropical migratory birds: natural history, distribution and population change. Cornell University Press, New York, USA.

[10] Sauer, J.R., Hines, J.E. & Fallon, J. (2004). *The North American Breeding Bird Survey, Results and Analysis 1966-2003*. Version 2004.1 USGS Patuxent Wildlife Research Center, Laurel, MD.

[11] Askins, R. A. 1993. Population trends in grassland, shrubland, and forest birds in eastern North America. Current Ornithology 11.

[12] Terborgh, J. 1989. *Where have all the birds gone?* Princeton University Press, Princeton NJ.

Soils And Tractor Piling

C24

We are very concerned about the potential impacts of ground-based slash piling on soil health and productivity.

Please note that recently your colleagues in the Six Rivers National Forest concluded:

> "Machine piling/burn piles would increase ground disturbance and soil displacement when the machine turns."
> -Little Doe and Low Gulch Timber Sale DEIS p 110.

No similar analysis or disclosure is present in the Hi Grouse NEPA documents.

Mechanical piling is universally recognized as an outdated practice that has disproportionately harmful impacts on watershed and soil resources.

Please see:

> Evelyn Bull et al. Trees and Logs Important to Wildlife in the Interior Columbia River Basin PNW-GTR-391 (1977).
>
> BLM, USGS, Biological Soil Crusts: Ecology and Management (Technical Reference 1730-2 (2001) (Available from BLM Publication Management Distribution Service, Bldg 41, E-16 (BC-650B) Denver, CO 80255

We further encourage the agency to examine the soil compaction monitoring reports from 1985 through 1997 on the Payette National Forest. While the Payette contains different ecotypes and soil types than does the Hi Grouse project area, the monitoring reports clearly show long-lasting and significant soil damage from tractor piling activities. Similar monitoring in the Idaho Panhandle (Jerry Niehoff) and the Kootenai National Forest (Lou Kuennen) demonstrate significant impacts to soils.

We also encourage the agency to review the findings of Geppert, R.R., Lorenz, C.W., and Larson, A.G., 1984. Cumulative Effects of Forest Practices on the Environment: A State of the Knowledge. Wash. For. Practices Board Proj. No. 0130. Dept. of Natural Resources, Olympia, Wash.

Manual piling is far preferable to tractor piling. Manual piling has none of the negative impacts to soils associated with tractor piling, provides an increased opportunity for local employment and significantly reduces long term damage to soil health and productivity. Hence manual piling would better achieve the stated purpose and need for the project. Th

Please further note that the proposed machine piling violates NFMA requirements that a given logging system cannot be chosen because of dollar value alone. There is no other justification for using the proposed machine piling provided in the record other than economic considerations and many reasons why using such systems is not appropriate. 36 C.F.R. 219.27(b)(3). Here the Forest Service has offered no justification for the

16

proposed machine piling (as opposed to manual piling), despite the widely acknowledged impacts to soil resources.

Further, the NFMA regulations require the "conservation of soil and water." 36 CFR §219.27. Section 219.27(a)(1) provides that "[a]ll management prescriptions shall- [c]onserve soil and water resources and not allow significant or permanent impairment of the productivity of the land." Section 219.27(b)(5) provides that "[m]anagement prescriptions that involve vegetative manipulation of tree cover for any purpose shall- [a]void permanent impairment of site productivity and ensure conservation of soil and water resources." Further, [c]onservation of soil and water resources involves the analysis, protection, enhancement, treatment, and evaluation of soil and water resources and their responses under management and shall be guided by instructions in official technical handbooks." 36 C.F.R. §219.27(f).

Northern Spotted Owls

C25

Why does only one action alternative call for decommissioning the two (closed) roads in NSO critical habitat identified by the US Fish and Wildlife Service?

C26

Please note that page 28 of the DEIS indicates that Alternative 4 would remove 129 acres of NSO foraging habitat. However, page 65 of the DEIS indicates that Alternative 4 would remove 1,704 acres of foraging habitat. We hope that page 65 is in error. Either way, implementation of Alternative 4 would directly inhibit the stated purpose of the project to improve and maintain late-successional suitable habitat. The removal of foraging habitat under Alternative 4 can be contrasted with Alternative 3 in which fuels concerns would be addressed via "light thinning from below treatments [that] would maintain NSO habitat in treated stands for the short and long term." Clearly Alternative 3 is preferable to Alternative 4 is this regard.

As stated on page 65 of the DEIS, "within the [NSO] home range the amount of foraging habitat would decrease and the amount of non-habitat would increase after treatments due to stand density reductions."

Northern Goshawk

C27

Page 69 of the DEIS indicates that the Forest Service has not collected reliable population trend data for NGH. Why is this? This data-gap, combined with proposed habitat loss (via Alternative 4) threatens violations of NEPA and NFMA.

Please note that implementation of "alternative 4 would result in a 60-acre reduction in the amount of nesting habitat and a 331 acre reduction of foraging habitat available to NFH across the project area. Non-habitat would increase by 391 acres across the project area in Alternative 4." (DEIS page 72).

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This can be contrasted with Alternative 3 which would maintain nesting and foraging habitat for NGH (see DEIS page 71).

Again the purpose and need of the project is to reduce fuels, promote historic forest conditions and improve and retain suitable habitat. Alternative 3 does this, Alternative 4 does not.

c 9

Lodgepole

Simply proposing to eliminate all late-successional lodgepole pine will not restore historic conditions (a purposed of the project) or contribute to late-successional ecosystesms (another purpose of the poejct). As they say in retail, it's location, location, location.

c 27

Our organizations favor the killing and removal of lodgepole pine trees if said trees are invading either a riparian zone that was or should be comprised mostly of hardwoods or a natural ponderosa pine forest—and if it can be done without significant and/or permanent harm to soil, water and other forest resources. If such out-of-place lodgepole pine logs can be sold to offset ecological restoration costs, that's fine.

However, when lodgepole pine trees occupy a site that is naturally a lodgepole pine-dominated forest or where lodgepole pine trees are a natural component of a mixed-species forest, then leave the lodgepole be. It is the nature of a lodgepole pine tree to live briefly and to die both dramatically and rarely alone. Ponderosa pine forests are (or should be) sculpted by frequent low-intensity stand-maintaining fire. Lodgepole pine forests are (or should be) sculpted by infrequent high-intensity stand-replacing fire. That is the evolutionary scheme under which lodgepole stands developed and that is the habitat role they play. Many woodpeckers and other snag dependent species rely upon this successional process.

Scenery

The scenery analysis in the DEIS is lacking. Rather than disclosing and analyzing the impacts of logging, roads, landings and forest canopy openings on important and culturally sensitive high elevation viewpoints, the analysis is largely limited to claiming that the proposal will increase forest resiliency. Forest resiliency is a worthy goal, but it cannot be used as an excuse not to analyze or disclose the impacts of the project on scenic resources.

c 28

Indeed, most of the scenery analysis consists of contending that the No Action Alternative will not produce resilient forested conditions and that logging will. Yet the impacts of logging on scenic resources is not disclosed or analyzed. NEPA does not permit this approach.

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Borax

The DEIS gives no reasoning for the use of this herbicide, how much may be applied or site specific information regarding units that are proposed for application. C29

Borax (sodium tetraborate decahydrate) is a fungicide that is being liberally applied by the US Forest Service (USFS) throughout our public forestlands to prevent the spread of Heterobasidion annosum (formerly known as Fomes Annosus), a root rot disease. It also has insecticide and herbicide properties. Human health concerns include: it is an extreme eye irritant; can cause inhalation irritation; is easily absorbed through broken skin; can be lethal when digested; and it may be a reproductive toxin. Borax acts as a nonselective herbicide that can persist unchanged in the soils for at least a year. It can leach rapidly during heavy rains. C30

Many annosus root disease prevention alternatives exist. These include limiting pre-commercial thinning activities; removing and burning infected stumps; seasonal cutting to avoid reproductive basidiospores; pre and post cut prescribed burns, and applying the competitive fungus Phlebiopsis gigantea to stumps as a biocontrol agent. Currently the USFS is failing to evaluate non-borax annosus prevention alternatives and failing to conduct project specific environmental effects analysis. C31

The question here is one of quantity and appropriateness, as the Forest Service may be applying large quantities of boron salt compounds throughout public forestlands, without evaluating alternatives, while neglecting to consider potential human and environmental effects.

Common name: Borax
Common product name: Sporax
Chemical name: sodium tetraborate decahydrate ($Na_2B_4O_7 \cdot 10H_2O$)
Active ingredient: Borax 100%
Type: Fungicide (also acts as a herbicide and insecticide)
Other ingredients: None

Mode of action: Borax is a contact, preventative fungicide that inhibits the growth of fungi by preventing the production of spores on freshly cut stumps (USDA Forest Service, Borax Pesticide Fact Sheet 1995). As an herbicide, it causes desiccation and interrupts photosynthesis in plants. As an insecticide, the dry powder is abrasive to insects' exoskeleton, and acts as a stomach poison (IPM of Alaska 2002).

Target pests: Borax is used to control the fungus Heterobasidion annosum (formerly known as Fomes Annosus), which can cause root rot mortality or damage. The fungus often infects cut conifer stumps following thinning or cutting operations, and the disease can spread from infected stumps to other trees nearby (USFS 1995). Borax is also registered for use as an insecticide and herbicide (CDPR Pesticide Products Database and US EPA, R.E.D. Facts 1993).

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According to the US Forest Service, the borax used in forestry is identical to the material sold as a household-cleaning agent (Dost 1996).

Toxicology

Studies have prompted concern that borax is a human reproductive toxin (USFS 1995). A borax study resulted in blood and metabolism disorders, and effects to the testes, endocrine system, brain weight, and size ratios among various organs and glands (US EPA 1993). High dose levels of borax have been found to cause testicular effects and decrease body weights during chronic oncogenicity studies. During reproductive and developmental toxicity studies, maternal liver and kidney effects, decreased weight gain, and decreased fetal body weights were observed. At the highest dose levels, no offspring were produced in two of the studies as well as prenatal morality observed (US EPA 1993). After three generations were fed 1.03% borax, chronic toxicity was detected, as reproductive organs for both sexes were affected and fertility was reduced (USFS 1995). The US Forest Service (1995) reports that studies indicate chronic exposure to borax may cause reproductive damage and infertility. In the US EPA's Toxicological Review of Boron and Compounds (2004) the developing fetus of mammals is considered one of the most sensitive targets. The other most sensitive target is the testes of males, and adverse effects include testicular degeneration (US EPA 2004; USFS 2003, Evaluation of Human and Ecological Risk For Borax Stump Treatments).

Borax has been placed in Toxicity Category I for acute eye irritation effects (US EPA 1993, USFS 1995). Borax is rapidly absorbed through damaged skin (USFS 1995). The US EPA warns of the potential for dermal and inhalation exposure among applicators and people reentering treated areas (US EPA 1993). The Sporax material safety data sheet states that inhalation may cause slight nasal irritation (Wilbur-Ellis). The US Forest Service (1995) admits that there is insufficient information available to determine the potential for adverse health effects for humans from contacting or consuming borax treated vegetation, water or animals.

The Worker Protection Standard (WPS) for Agricultural Pesticides (40 CFR 156 and 170) established an interim restricted-entry interval (REI) of 12 hours for boric acid and its sodium salts. However, the US EPA sides with the chemical manufacturer and reports "there is no reasonable expectation that these pesticide uses may constitute a hazard or risk to people involved in, or near to, handling or application activities. Proper care and adhering to label directions and precautions should reduce exposure and any associated risk" (US EPA 1993).

The most common borax product used in forests, Sporax, has a signal word of danger and the label describes the hazards to humans and domestic animals as follows: "DANGER. Corrosive. Causes irreversible eye damage. Harmful if swallowed. Do not get in eyes or on clothing" (Wilbur-Ellis, Sporax label).

The green consumer website reports "Potentially lethal doses from borax ingestion are one teaspoon for infants, two for children, and five for adults. The most significant

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toxicity concerns for borax center around ingestion poisoning and its reproductive toxicity through ingestion.

The Sporax material safety data sheet warns, "Do not ingest. Wash thoroughly before eating, drinking or smoking" (Wilbur-Ellis).

Environmental Effects

C 33

Borax is generally active in soils and it remains unchanged in the soil for one year or more. High rainfall conditions can cause borax to leach rapidly and soil microorganisms do not break it down (USFS 1995).

Borax is partially soluble in water (USFS 1995). The US Forest Service (1995) warns not to apply directly to water, or to areas where surface water is present and not to contaminate water when disposing of equipment washwaters or rinsate. While boron salts have been observed to occur naturally in most unpolluted waterways, some areas have boron occurring in concentrations shown to be toxic to plants (US EPA 1993).

Borax may be toxic to many essential soil microorganisms at high levels (USFS 1995) and thus may adversely affect nutrient cycling functions within the ecosystem. This could mean major long-term changes in forest Borax's primary breakdown product in soils is boron. While boron is an essential nutrient for plants, high levels of borax will kill vegetation and thus it can be used as a nonselective herbicide (USFS 1995). The Forest Service reports that in high concentrations borax is "lethal to plants." It is also know to bio-accumulate in plants (Phelps et al. undated). The Sporax label reinforces this concern as it states, "Borax carelessly spilled or applied to cropland or growing plants – including trees or shrubs – may kill or seriously retard plant growth" (Wilbur-Ellis).

The Forest Service's borax fact sheet (1995) warns "Borax may be a hazard to endangered plant species if it is applied to areas where they live" when applied as a forest fungicide on stumps. Also borax's noncrop herbicidal use may harm endangered or threatened plants. Therefore the US EPA is requiring three phytotoxicity studies (regarding seed germination, seedling emergence and vegetative vigor) to assess these risks (US EPA 1993).

Borax is used as an insecticide and "relatively high concentrations of boron compounds are toxic to insects, even when used in forests (USFS 1995). What kinds of impacts are all these borax applications in our forests having on beneficial insects and overall ecosystem health?

C 33

Since we have found no studies investigating the impacts of borax on amphibians, we are concerned that this salt, which remains active for a year in soils, may be having major impacts on amphibian populations. Amphibians, while aquatic during reproductive and other times, also are terrestrial and travel across the land. Amphibians are especially sensitive to chemicals and are believed to be useful indicator species within forest

21

ecosystems. What impact on amphibian populations is occurring from the current application of borax in our public forests? C33

Porcupines (and many other species) are attracted to salt. Will porcupines ingest Borax? If so what will the effects will result?

Effectiveness

The US Forest Service has touted borax as highly effective and the only solution for preventing the spread of Heterobasidion annosum and annosus root rot disease. While the Forest Service has been liberally applying borax throughout public forestlands, there is some question as to whether or not it is as effective as believed. C34

In a study review of research on annosus root rot disease, US Forest Service Region 5 scientist R.S. Smith Jr. reported, "there is continuing concern that annosus can infect stumps via the roots rather than just through the stump surface, and that borax treatment may not be fully successful in preventing the disease" (1989).

Another interesting study was done by Region 5 Forest Service scientists, which reviewed the efficacy of borax stump treatment in protecting trees from annosus root disease. The authors reported "borax may be ineffective because it washes off stumps and that high stump densities in pre-commercial thinnings make it difficult to apply. Evaluation done twenty years after pre-commercial thinning revealed that plots with borax.

Borax: Alternatives

"Annosus root disease is a normal part of most forest ecosystems in the West contributing to structural and compositional diversity" (Schmitt et al. 2000). C31

We are sensitive to the need to protect public forestlands from excessive annosus root rot disease and related mortality. However, we are concerned that in Region 5 (California) the US Forest Service is not using a true integrated pest management (IPM) strategy while managing national forests and dealing with this fungus. The Forest Service is ignoring the cause of annosus spread and needs to focus on controlling the vectors that facilitate its movement. Region 5 is reliant on borax for annosus disease prevention and has failed to develop non-toxic, non-borax treatment methods for protecting our forests. This is of concern since other parts of the US and other countries (Canada, UK) effectively use non-borax prevention alternatives.

In California the Forest Service has been applying vast quantities of borax as part of forest health and fuel reduction projects, avoiding necessary public review, alternative evaluation and environmental effects analysis as required by the National Environmental Policy Act (NEPA).

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Logging has been shown by multiple studies to increase annosus root disease occurrence in western forests for a number of conifer species. The disease typically appears in stands several years after logging and is associated with stumps and logging wounds in remaining trees (Smith 1989). The incidence of annosus root disease increases as logging increases for true fir and ponderosa pine stands. Logged stands have a higher occurrence of the disease than un-entered stands, and stands with a history of multiple entries have the greatest rate of infection (Goheen and Goheen 1989).

Pre-commercial thinning is common in California's national forests. Yet, studies have shown it to increase the incidence of annosus root disease. Chavez et al. (1980) found that western hemlock tree infections increased greatly after pre-commercial thinning. Also thinning actions provide fresh stump sources and wounds to live trees from logging equipment, which can become infection courts for airborne annosus spores, and do contribute to higher rates of infection in thinned stands (Edmonds et al. 1989). In a true fir stand that had been logged five to ten years earlier, annosus root disease was found on 89% of the stumps (Filip et al. 1992).

Changes to current thinning activities are necessary to control Heterobasidion annosum. Reducing the number of thinning operations by planting trees at wider spacing is recommended (Ammon and Patel 2000). It is also recommended to carry out thinning operations carefully to reduce incidence of tree wounds and thin only when reproductive basidiospore populations in the air are lowest (cold winter in the north, hot dry summer months in the south) (Schmitt et al. 2000; Ammon and Patel 2000; Flip and Morrison 1998). Removing injured trees in high-risk areas can also be effective (Schmitt et al. 2000).

C31

In a study of coastal British Columbia precommercial thinnings, it was suggested that the increase of H. annosum infection can be minimized by thinning before age 15, by cutting only trees less than 10 cm in diameter and by thinning during low risk seasons (Morrison and Johnson 1999). The Forest Service should be requiring logging techniques that minimize accidental thinning wounds.

This pathogen can be eradicated or reduced by a couple of simple pre and post harvest techniques. One is using prescribed burns. Two pre-thin burns (one at least six months before thinning) and one or more post-thin burns will destroy reproductive basidiocarps and eliminate litter and other favorable annosus habitat and basidiocarp development environments (Ammon and Patel 2000, Flip and Morrison 1998). Prescribed fires can also start to return the forest to pre-historical natural conditions.

The second annosus eradication and reduction method is mechanically removing and burning stumps and attached roots in infested sites (Ammon and Patel 2000).

The agency should also be wary of overusing its magic bullet. The use of Sporax in already infested stands may worsen the problem by preventing natural annosus competitors from entering stumps (Ammon and Patel 2000).

23

Phlebiopsis gigantea, an aggressive, highly competitive fungus is recommended as a borax alternative, as it colonizes stumps to the exclusion of the annosum root rot fungus (Annesi et al. 2005; Pratt et al. 2000; Ammon and Patel 2000; Pratt 1999; Flip and Morrison 1998; Rishbeth 1963). Phlebiopsis gigantea is incapable of causing disease in standing trees and is not regarded as hazardous to human health (Pratt 1999). It has been utilized as a biological control agent for annosum root rot for approximately 40 years in Europe (Pratt et al. 2000). Canadian scientists have been testing P. gigantea for the same purposes and have been getting good results (Laflamme). In the southeast part of the US it has been shown that P. gigantea is completely effective in preventing stump colonization by H. annosum, with a cost only slightly more than that of borax (Flip and Morrison 1998). This raises the question as to why we are not using this non-toxic protection method here in California.

c 31

Streptomyces griseologalbus, an actinomycete isolated from the rhizoplane of the nitrogen-fixing nodules of a common California native, has been identified as a strong antagonist of annosus, and a possible biological control in the Pacific Northwest (Rose et al. 1980).

Stump treatment with borax is only recommended for sites with known annosus root disease potential and where cultural control is not viable (Schmitt et al. 2000). How much cultural control is occurring in national forests?

Borax: Other concerns

The agency must clarify annosus infection potential in the DEIS before authorizing borax for stump treatments.

c 35

At a minimum, the US Forest Service must develop safety protocols for mixing and staging areas. The protocols should include identification of areas suitable for staging and mixing that pose little threat to stream systems in the case of an accidental spill. Workers need to be sufficiently trained and experienced in safety procedures for mixing and transporting borax, as well as first-aid response, in the event of accidental contact or exposure. First aid materials must be readily available at all project sites, and include access to running water for flushing borax particles.

Bull Dozer Fire Lines?

c 36

Page 32 of the Appendix to the DEIS makes reference to the use of dozers to create fire lines. We see no other reference to this practice in the DEIS. Is the Forest Service proposing to bulldoze fire line in the project? If so, why are the impacts to soils, wildlife, and botanical resources not analyzed and disclosed?

Conclusion

24

We hope that this NEPA commenting process will provide the Forest Service with the opportunity to fine-tune the proposed action and address our concerns. In particular, we encourage the Forest Service to develop and implement a project that reduces the current road density, retains large trees and snags, avoids ground based machine piling, does not apply Borax throughout the forest and thins ladder and surface fuels while avoiding the creation of "1 acre openings" and the removal of overstory forest canopy. c37

Thanks for the chance to comment.

/s/ George Sexton
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United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Pacific Southwest Region
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IN REPLY REFER TO
ER# 10/491

Electronically Filed

9 July 2010

Laura Allen, District Ranger
Goosenest Ranger District
Klamath National Forest
Attn: Hi-Grouse Project
37805 Highway 97
McDowel, CA 96058

Subject: Review of the Draft Environmental Impact Statement (EIS) for the Hi-Grouse Project, Goosenest Ranger District, Klamath National Forest, Siskiyou County, California

Dear Ms. Allen:

The Department of the Interior has received and reviewed the subject document and has no comments to offer. C1

Thank you for the opportunity to review this project.

Sincerely,

Patricia Sanderson Port

Patricia Sanderson Port
Regional Environmental Officer

cc:
Director, OEPC

L5

Californians for Alternatives to Toxics

July 12,2010

Forest Supervisor Patricia Grantham
Klamath National Forest
ATTN: Wendy Dobrowolski
Goosenest Ranger District
37805 Highway 97
Macdoel, CA 96058

Re: Comments to the Draft Environmental Impact Statement, Hi-Grouse Project

Submitted electronically to: comments-pacificsouthwest-klamath-goosenest@fsfed.us

Dear Supervisor Grantham,

Californians for Alternatives to Toxics (CATs) submits the following comments regarding the Draft Environmental Impact Statement, Hi-Grouse Project of the Gooseneck Ranger District, Klamath National Forest (DEIS).

CATs is organized as a non-profit public interest organization with the mission of giving its members and the general public control over the use of toxic chemicals in their environment, primarily throughout the northern California region. This mission arises from a broader underlying concern for the membership in relation to their dependence on the environment for their sustained health, education, cultural activities and livelihood.

The comments below are submitted specifically on behalf of the CATs membership, particularly those who reside, recreate, study, engage in cultural activities, work or simply enjoy knowing that their public lands, including the Klamath National Forest, are managed to preserve and enhance the environmental quality of these places.

C1

Our concerns about the project as it is currently proposed center around the use of sodium tetraborate decahydrate (borate) to control annosus root diseases and thinning and fuel reduction methods that will successively require herbicide use to control excessive regrowth of native plants and invasion by non indigenous plant species.

As it currently is proposed, the project intends to commercially as well as non-commercially thin and harvest 2,429 acres of coniferous forest and the aim is to prevent further spread of *heterobasidum annosum* (annosum or root disease/root rot)by applying borate to fresh stumps.

As stated on page 34 of the DEIS, "The selective cutting prescriptions that removed larger true fir over the last several decades in the true fir-dominating stands has lead to annosus root disease impacts on stand structure, including mortality."(Angwin 2008) About one-

third of the Hi-Grouse project area is early and mid-seral true fir stands that "have a high incidence of annosus root disease, primarily as a result of past management." (DEIS 36)

US Forest Service acknowledges that annosus is spread directly through thinning and harvesting activities. Additional research confirms that on true fir stands logged up to a decade earlier, annosus root disease could be found on 89% of the stumps (Filip et al. 1992). It's clear that similar or the same types of forest disturbance proposed for the current project have, when used in the past, led to the development of root disease for which borate use is now proposed. What is to prevent the current project from causing the spread of root rot? Heavy-handed use of borate will not prevent the spread of disease caused by forest disturbance activities. It is not apparent that the project has taken into consideration an alternative that will PREVENT the spread of root disease by limiting, altering or changing the proposed management activities. This analysis is necessary to provide the basis for the development of alternatives for the project, but it is missing. c1

If thinning and commercial logging of true-fir and white-fir stands is to remain sustainable, a primary objective of the Region 5 Forest Service and with the current project must be to develop forest management alternatives that will prevent the use of borate by preventing the need for disease management. c2

In section 2.4.2 of the DEIS, an alternative eliminated from further study was to avoid all known root diseased areas; eliminating this alternative skews the analysis to inappropriately favor the preferred alternative.

What's more, valuable research about alternative management for annosus root disease was not included in the analysis as required. Rather than contrasting a relatively extreme alternative (2.4.2), the USFS should develop an alternative that incorporates other, non-borate methods of managing annosus. c3

In coniferous ecosystems often similar to those of northern California, scientists and forest managers have utilized a natural and biological control agent to successively control annosus. The agent, *phlebiopsis gigantean,* is useful in an integrated pest management system that should be developed as an alternative for the current project. This has been successfully demonstrated in annosus control with *phlebiopsis gigantean* in Canada, the United Kingdom and the southeastern United States. (Annesi et al. 2005; Pratt et all. 2000; Ammon and Patel 2000; Pratt 1999; Flip and Morrison 1998; Rishbeth 1963). In southeastern forests of the United States, it has been recorded that *phlebiopsis gigantea* is completely effective in preventing *heterobasidium annosus* from stump colonization, and costs only slightly more than borate treatment (Flip and Morrison 1998).

One reason to consider a non-borate alternative is that borates are not necessarily successful in preventing or eliminating annosus. In a study conducted by a USFS Region 5 scientist, R.S. Smith Jr. concluded, "there is continuing concern that annosus can infect stumps via the roots rather than just through the stump surface, and that borax treatment may not be fully successful in preventing the disease" (1989). Additional research by Region 5 Forest Service scientists found that borax (aka borate) may be ineffective because it washes off stumps, and evaluation of forests two decades later revealed that stands with borax-treated stumps failed to have significantly lower infection than untreated stumps (Edmonds at al. 1989).

To minimize annosus spread to stump wounds, thinning should be done at low risk seasons, and with specific regulations on tree age, and diameter at breast height (DBH) (Morrison and Johnson 1999). It is apparent that this critical information was not integrated into the analysis presented in the DEIS. c4

As stated in the DEIS: "the application of borax to freshly cut stumps is not expected to have adverse effects on wildlife or surrounding plants, invertebrates, or microorganisms." (DEIS 66) However, CATs contends that this is a misleading statement that skews analysis of the alternatives to support the favored alternative. A closer examination than that provided reveals additional research indicating that the use of borate has both direct negative impacts and possible long-term adverse effects on non-target organisms. c5

According to a study on conifer forests conducted in Sweden in the summer of 2000, "Both borate and urea [in separate tests] caused severe damage to most ground-vegetation species tested." (Nohrstedt, Westland 2000) Borate as an herbicide interrupts photosynthesis in plants, and as an insecticide is abrasive to insects' exoskeletons. (IPM of Alaska 2002) Borate remains in the topsoil unchanged for at least one year. High rainfall and/or groundwater can leach chemicals, and soil microorganisms cannot break it down (USFS 1995). Because the chemical is not natural in forest ecosystems there is a general concern about its long-term, indirect effects on soil nutrient cycling.

Has research been conducted to determine if Northern Spotted Owl (NSO) and Northern Goshawk (NGH)—as individual birds—are affected by borate? Borate is a pesticide with toxicological significance and as such an appropriate analysis of its effect on these species must be included in the development of the alternatives.

With 53% of the foraging and nesting habitat for NGH being treated with borates, it is likely that NSO and NGH populations could be indirectly effected, aside from the substantial direct effects both NSO and NGH face in habitat loss. The DEIS claims that there is no significant data reflecting NGH population trends in the western United States, but each both bird species is considered vulnerable; this adds to CATs' concerns regarding the paucity of research the USFS has to assess wildlife, especially endangered species, concerns in relation to. Yet the potential for significant impacts exists and must be analyzed for impacts that will result from implementation of the current project. c6

The policy statement outlined in Forest Service Manual 2080 Noxious Weed Management (USDA 1995) as referenced in the noxious weed assessment cannot be used as a substitute for the missing analysis of the potential for invasion and spread of non-native, invasive species plants (NNIS). Nor does the Klamath National Forest Noxious Weed List September, 2008 or other documents cited in the assessment.

The noxious weed assessment as it stands for the proposed project is inadequate, particularly for what it fails to mention (3.2.5.2). It finds the project area to currently be at low-risk to spreading weeds based on the "...weed-free nature of the area, low levels of disturbed areas, [and] high vegetative cover..." (DEIS 86) Although these are the current conditions, the opening of the canopy, thinning of up to 90% of particular stands and subsequent prescribed burning will inevitably alter the landscape, forest floor, and succession of plant species. (See attached Radosevich declaration for details. This document relates to another US Forest Service project but many of the issues are similar or the same as for the current project. Also see Radosevich 2008) c7

The results of both Alternative 3 and Alternative 4 will directly create habitat for noxious weeds; indirect, long-term effects of this project are not analyzed adequately for NNIS for when they are introduced and established as a result of the project, either within or beyond its immediate activities.

No data supports the contention that the season is too short or nearby weed species too small to support the spread of invasive weeds as a result of the project as claimed in the noxious weed assessment.

The analysis fails to address the range of possible means of introduction of invasive species. Evidence suggests that one means of spread is likely to be birds, with ingested seeds deposited locally and seeds carried in plumage deposited further. For example, the common North American bird the Yellow-rumped Warbler (*Dendroica coronata*) was reported by bird watchers to feed on the invasive Chinese tallow, glossy privet and European olive plants in California; researchers later confirmed these accounts through field observations. (Aslan et al. 2010)

Invasive species, or as the project inappropriately identifies as "noxious weeds" are also adapting to climate change and may be more likely to infest the project area than has been the case historically, a potential that must be considered when the potential for NNIS is analyzed. (Bradley 2010) c 8

The noxious weed assessment does not provide criteria for determining when tools for weed control would be utilized. For herbicides, it determines that the chemicals are not currently used by Klamath National Forest, which we commend, but this statement does not replace the analysis of the potential for weed control with herbicides that could be undertaken with a change of management. c 9

Furthermore, misplaced under the *cumulative effects* of Action 1 (no action), the assessment reads: "Short- term reductions of canopy closure and bare soil from landings and burn piles could increase available habitat for weeds." (DEIS 86) It is our understanding that short-term canopy reduction and fuels abatement are the results of Alternatives 3, and the USFS preferred Alternative 4. Being such an important component of responsible silvicultural practice, the noxious weed assessment for the Hi-Grouse project skews the overall analysis and integrity of the proposed environmental impact statement. c 10

As stated in the DEIS, "Monitoring for the introduction and subsequent spread of weeds introduced as a result of project implementation may be conducted as time and funding allow"; this implies that no post-monitoring is possible but not assured. Both alternatives appear highly undesirable for the land and biotic community because it does not aim to perform any post-treatment evaluations. This does not help assess the effects of borate, and seems redundant in the promotion of re-growth and renewable forest stands. It is likely that NNIS will be established without the oversight required in proper forest management. c 11

Within the proposed 3,850 acres to be treated for healthier forest generation are two roads (44N80a and 44N52a) that will be further closed and removed from the forest system. The management plan put forth by the USFS to restore these areas is to seed and replant with native, non-invasive grasses and/ or shrubs; there is roughly 1.5 miles of road to restore, with an additional 1.3 miles of additional contemporary road construction. It is a

legitimate concern that this area could be infested with NNIS, particularly without the monitoring required to ensure that it does not.

Given the scope of the project and its encompassing 3, 487 acres we believe a thorough and careful analysis of the DEIS is beneficial to the USFS' goal to assist and maintain healthy forests. CATs suggests that a stronger non-native, invasive species plan be adapted, and further alternatives to *heterobasidium annosus* be researched and integrated into the USFS Direct Environmental Impact Statement.

c 12
c 3

Sincerely,

Patricia Clary
Executive Director

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L6

SIERRA PACIFIC INDUSTRIES
Growing Forests For Our Future

Sierra Pacific Industries

Burney Division • P.O. Box 2677 • Burney, California 96013 • (530) 335-3681

7/9/10

Goosenest Ranger District
Klamath National Forest
Attn: Hi-Grouse Project
37805 Highway 97
Macdoel, CA 96058

Dear Patty,

I am writing on behalf of Sierra Pacific Industries in response to your letter dated may 24, 2010 inviting comments on the DEIS for the "**Hi-Grouse Project**." Sierra Pacific Industries supports such projects aimed at restoring and improving forest health as well as reduce hazardous fuels. C1
We support Alternative 4.

Thank you for the opportunity to comment on the **"Hi-Grouse Project."** If you have any questions please call me at 530-335-3681.

Sincerely,

Robert Hoover
Burney Division Forester
Sierra Pacific Industries

27

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

JUL 12 2010

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JUL 15 2010
KLAMATH N.F.

Patricia A. Grantham, Forest Supervisor
Klamath National Forest
1312 Fairlane Road
Yreka, CA. 96097-9549
Attn: Hi-Grouse Project

Subject: Draft Environmental Impact Statement for the Hi-Grouse Project, Siskiyou County, California (CEQ# 20100194)

Dear Ms. Grantham:

The Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the above project. Our review and comments are pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act.

The modified proposed action (Alternative 4) will manage vegetation through thinning and burning on approximately 3,847 acres across a 7,450 acre project area in the Klamath National Forest within the Goosenest Ranger District. 1,537 acres is proposed for prescribed underburning and about 3,498 acres will be utilized for commercial thinning. EPA understands that the project is intended to provide a sustainable timber supply for local communities and sustain diverse, fire-resilient ecosystems and a functioning forest and watershed.

EPA acknowledges the importance of the project's goals of improving forest health, reduce fuel loading, and decreasing fuels along important access roads to allow better access for fire suppression activities during fire events. We support the use of thinning and prescribed underburning as important measures necessary to reduce the risk of fire, promote biodiversity, and restore natural ecological processes within the forest. Project features such as limiting the amount of new road construction and road maintenance actions will help minimize adverse effects. We support the best management practices (BMPs) and resource protection measures included in the project design and have rated the DEIS as Lack of Objections—LO (see enclosed "Summary of Rating Definitions"). C1

EPA recommends full disclosure of information regarding air quality emissions. The document states that the project is exempt from a general conformity determination because Siskiyou County is in attainment for $PM_{2.5}$ and PM_{10} (pg. 115). However, Siskiyou County is in non-attainment status for ozone (pg. 115) and the Hi-Grouse C2

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project will release pollutants including the ozone precursors volatile organic compounds (VOC) and nitrous oxides (NOx) (pg. 114). In accordance with the Clean Air Act (CAA) General Conformity requirements, in federal non-attainment and maintenance areas, a determination must be made that emissions will not exceed the applicable *de minimis* threshold levels, measured in tons per year, for criteria pollutants of concern. If emissions would exceed an applicable *de minimis* threshold, a conformity determination is required to document how the federal action will affect the State Implementation Plan (SIP). The final environmental impact statement (FEIS) should quantify the emissions from the Hi-Grouse project, determine if they will exceed *de minimus* thresholds for ozone precursors VOC and NOx, and whether a general conformity determination is needed that will demonstrate compliance with the SIP. C2

The DEIS states that a smoke management plan will be submitted to Siskiyou County Air Pollution Control District (SCAPCD) prior to any prescribed burning. The FEIS should include details regarding the smoke management plan that sets forth how the project will comply with the SCAPCD regulations for pile burning and smoke management, an implementation schedule, the responsible parties, and monitoring and reporting requirements. C3

Additionally, EPA recommends clarification regarding possible use of herbicides or pesticides. The list of applicable BMPs for the Hi-Grouse Project is included in Appendix D. BMPs 5.8-5.11 list potential best practices for use of pesticides and/or herbicides but the DEIS does not indicate that pesticides may be used. If pesticide use is included in the scope of the project, this information and all environmental impacts associated should be disclosed in the FEIS. C4

We appreciate the opportunity to review this DEIS and are available to discuss our comments. When the FEIS is released for public review, please send one hard copy and one CD to the address above (mail code: CED-2). If you have any questions, please contact Stephanie Skophammer, the lead reviewer for this project, at (415) 972-3098 or skophammer.stephanie@epa.gov, or contact me at (415) 972-3521.

Sincerely,

Kathleen M. Goforth, Manager
Environmental Review Office

Enclosures: Summary of EPA Rating Definitions

cc: Siskiyou County Air Pollution Control District
Wendy Dobrowolski, Goosenest Ranger District

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

Appendix C: Detailed Prescriptions

The following prescriptions were used for the development of the proposed action and other alternatives, and are assigned to the GIS layer of potential units. The ID team, district staff, and District Ranger determined acres and spatial location of final units, and specific modifications to these prescriptions, which were developed with the purpose and need in mind.

Stand exams and field reconnaissance were the basis of the diagnosis of the stand and how it could be treated to meet the desired condition. Treatment options were field verified. A field trip to the site with Forest Health Protection staff from Redding, California, confirmed the presence of suspected insect and disease agents, most notably *annosus* root disease, dwarf mistletoes, and mountain and western pine beetle (Angwin 2008). In many stands, an intermediate treatment is not an option due to the almost exclusive dominance of white fir on what were historically pine-dominated sites—the removal of the pine and larger white fir has left diseased stands that would not respond to thinning- these stands were not included in the modified proposed action. In relation to late-successional habitat, the absence or scarcity of large ponderosa pine and large white fir with large limbs and long full crowns, which provide nesting structure, is a consideration in all of these prescriptions. In all treatments, the largest ponderosa pine and white fir will be left. In prescriptions that involve removing substantial amounts of true fir, the following elements will be retained: essentially all ponderosa pine/sugar pine/white pine, individuals and clumps of pre-dominant true fir, widely spaced true fir, and no-treatment clumps.

Unit numbers refer to the units in the modified proposed action, which became alternative 4. Some prescriptions are specific to alternative 3 and are noted as such.

Silvicultural Prescriptions—Terms

HTH ~ thinning from below in stands consisting mostly of trees 9 to 24 in. dbh. Sawlogs and fiber would be removed and in most cases these treatments are expected to cover costs of product removal and provide net timber receipts.

PCT2 ~ thinning of trees generally less than 12 inches dbh in natural stands; could yield biomass or other products and minor amounts of sawlogs; mostly mechanical methods, but some hand treatment.

PCT ~ thinning of trees generally less than 12 inches dbh in old regeneration cutting units; could be accomplished by mechanical or hand methods.

PP ~ ponderosa pine; **WF**=white fir; **RF**=red fir; **TF**=true firs; **LP**=lodgepole pine

MC ~ mixed conifer- ponderosa pine, white fir, lodgepole pine, and red fir in various aggregations.

Hvy ~ heavy thinning.

NGH ~ northern goshawk.

NSO ~ northern spotted owl.

Annosus root disease (*Heterbasidion annosum*) ~ S-type of disease affects white fir but not ponderosa pine.

Biodiversity Elements

1. No-Treatment Clumps: areas ranging from ¼ to several acres in size left un-thinned to provide biodiversity.

2. Openings/Gaps: areas ranging from ¼ to one acre in size where most trees are removed to provide biodiversity. These will not be clearcuts. Predominant trees, ponderosa/sugar/white pine, snags, and down logs will be left within gaps. If the previous elements do not exist, then one or two dominant true firs will be left. These openings will not be planted.

3. Predominant ponderosa/sugar/white pines and predominant true firs will be left to provide nesting structure and biodiversity.

Table C-1. Summary of treatment groupings

Treatments	Prescriptions Terms
Thinning from Below	HTH (all variations with-WF-PP-RF-MC), PCT2*
Lodgepole Pine Thinning/Fuels Reduction	HTH-LP, LPFR
Plantation Thinning	PCT
Overall Fuels Abatement	WTY, BMR, HP, MP, M, Bundle/LS
Underburning Only	UB

HTH-PP: Units 1, 2, 3, 4, 5, 6, 7, 11

This prescription will be applied to stands in the white fir/pine type with current stocking averages of at least 80 (square feet of) basal area per acre of ponderosa pine. The objective is to leave on average 80 basal area of ponderosa pine, ranging from 40 to 100 basal area. These stands would be dominated by the largest, healthiest ponderosa pine, with older white fir where they provide decadent-tree habitat. More open areas of pine will be thinned to 40 to 60 basal area, while denser areas will be thinned to 80 to 100 basal area to re-create structural patchiness. Disease-free white fir groups will be thinned to 100 to 140 basal area to create spatial heterogeneity, and all white fir and ponderosa pine predominant trees will be left. The emphasis is on leaving the largest pines regardless of spacing, including leaving clumps of larger trees while removing smaller trees within 40 feet of predominant fir and pines.

No-treatment clumps will be left in up to 10 percent of the unit, with emphasis on areas dominated by white fir. Openings of ¼ to 1 acres could be created in white fir disease centers and uniform pine aggregates in up to 10 percent of the unit area. Planting of pine will not occur in the gaps created by this prescription. Borax will be applied to ponderosa cut pine stumps in accordance with regional guidelines. Underburning will happen after fuels treatments are completed. **HTH-PP-lite- alternative 3 only- Units 1, 2, 3, 4, 6, 7, 45a**

This prescription modifies the units with the HTH-PP prescription in the modified proposed action to leave approximately 130 basal area (120 to 140 basal area) and 40 percent canopy cover where that amount or more currently exists. There will be a 20 inch dbh limit on trees cut, and understory trees will be thinned to 15 to 25 foot spacing where they exist.

HTH-WF-PP: Units 19, 21a, 22

White fir groups will be thinned to 120 to 140 basal area; white fir will be spaced 30 to 40 feet from pine clumps or individual dominant and co-dominant trees, to allow for these trees to increase resistance to beetle attack. The objectives are to reduce density, promote the remaining pine, and increase spatial variability.

No-treatment clumps will be left in up to 10 percent of the unit, with emphasis on areas dominated by white fir. Openings of ¼ to 1 acres could be created in white fir disease centers in up to 10 percent of the unit area. Planting of pine will not occur in the gaps created by this prescription.

Underburning will take place after mechanical fuels treatments are completed in unit 21a only. The fuels emphasis will be on whole-tree yarding (removing tops) in all units, and piling and burning of natural fuels accumulations where necessary. Borax will be applied to cut white fir and ponderosa pine stumps in accordance with regional guidelines.

HTH-WF-PP-lite- Alternative 3 only- Units 19, 21a, 22, 23, 24, 25b, 29

This prescription modifies the HTH-WF-PP prescription for alternative 3 to leave approximately 180 basal area (160 to 200 basal area) and 60 percent canopy cover where that amount or more currently exists. There will be a 20 inch dbh limit on trees cut, and understory trees will be thinned to 15 to 25 foot spacing where they exist. There will be no created openings.

HTH-WF-PP-lite-NGH: Units 23, 25b, 29

This prescription modifies the HTH-WF-PP prescription to leave approximately 180 basal area (160 to 200 basal area) and 60 percent canopy cover where that amount or more currently exists. There will be a 20 inch dbh limit on trees cut. Understory trees will be reduced to healthy ponderosa pine and white fir where they exist, focusing on future replacement trees to the overstory. There will be no created openings.

Trees removed will generally be 12 inch dbh and smaller. The primary objectives of this treatment are to reduce stand density to help maintain ponderosa pine, reduce ladder fuels, and provide future goshawk nesting habitat structure in the stand.

The fuels emphasis will be removing tops and piling and burning of natural fuels accumulations where needed. Borax will be applied to cut white fir and ponderosa pine stumps in accordance with regional guidelines.

HTH-WF-PP-lite-NSO: Unit 24

This prescription modifies the HTH-WF-PP prescription to leave approximately 180 basal area (160 to 200 basal area) and 60 percent canopy cover where that amount or more currently exists. There will be a 20 inch dbh limit on trees cut, and understory trees will be thinned to 15 to 25 foot spacing where they exist. There will be no created openings.

Same stand type as HTH-WF-PP, but objective for spotted owl habitat would lead to cutting trees generally 12 inches dbh and smaller. The primary objectives of this treatment would be to reduce stand density in order to help maintain ponderosa pine, reduce ladder fuels, and maintain habitat structure in the stand.

The fuels emphasis will be whole-tree yarding (removing tops) and piling and burning of natural fuels accumulations where needed. Borax will be applied to cut white fir and ponderosa pine stumps in accordance with regional guidelines.

HTH-PP-Hvy: Units 10, 20, 45a

This prescription will be applied to heavily-diseased stands of white fir/pine with current stocking averages at least 50 basal area ponderosa pine. White fir in these stands is heavily infected with *annosus* root disease, and dwarf mistletoe in association with *cytospora* canker. Essentially all ponderosa pine will be left, except in dense areas where pines would be thinned down to 80 basal area. The target stand will have a residual 40 to 80 basal area of ponderosa pine. These stands would be dominated by the largest, healthiest ponderosa pine with older white fir where they provide characteristics that mimic old-growth habitat.

Clumps of white fir will be left in areas without pines to retain a high short-term canopy cover and coarse woody debris on up to 15 percent of unit. Outside the clumps, other patches of white fir will be thinned to 40 to 60 basal area to allow pine regeneration to become established. Where ponderosa pine is present, the emphasis will be on leaving the largest pines regardless of spacing, including leaving clumps of dominant/co-dominant trees while removing smaller trees within 40 feet of the dominant trees. Openings of ¼ to 1 acre will be created in white fir disease centers in up to 15 percent of the unit area. Units will be evaluated post-treatment for planting. Pine generally will not be planted in the gaps created by this prescription in order to encourage open "clumpy" structure. After mechanical fuels treatments are completed, the stand will be underburned. Borax will be applied to cut ponderosa pine stumps in accordance with regional guidelines.

HTH-RF-lite

This prescription would leave approximately 180 basal area (160 to 200 basal area) and 60 percent canopy cover where that amount or more currently exists in stands dominated by Shasta red fir. There will be a 20 inch dbh limit on trees cut, and understory trees will be thinned to 15 to 25 foot spacing where they exist, leaving ponderosa pine, red fir, and lodgepole. There will be no created openings. Red fir, ponderosa pine, and younger age classes of lodgepole pine would compose the residual stand. No-treatment clumps will be left in up to 10 percent of the unit, with emphasis on areas dominated by true fir. Borax will be applied to cut true fir stumps in accordance with regional guidelines.

HTH-MC-Hvy: Units 18, 28

Thinning to a target basal area of 80 basal area, but may be as low as 50 basal area and occasionally lower in areas with less pine stocking and disease occurrence. As in all thinning treatments, non-uniformity of the residual stand would be encouraged by focusing on leaving the largest, healthiest pine, including leaving clumps of larger trees and removing all trees within 40 feet of the clump. Smaller diameter lodgepole would be the second choice for leave trees.

In areas devoid of pine, clumps of true fir will be left to retain a high short-term canopy cover and coarse wood on up to 15 percent of unit where amount exists. Outside the clumps, other patches of true fir will be thinned to 40 to 60 basal area to allow pine regeneration. Openings of ¼ to 1 acres will be created in true fir/lodgepole disease centers in up to 15 percent of the unit area. Pine will not be planted in the gaps. Areas of thinned true fir without residual pine will be

evaluated post-treatment for planting. Underburning will take place after mechanical fuels treatments. Borax will be applied to cut true fir stumps in accordance with regional guidelines.

HTH-MC-lite: Alternative 3 only- Units 18, 28, 30

This prescription modifies the HTH-MC-HVY prescription to leave approximately 140 basal area (120 to 160 basal area) and 40 percent canopy cover where that amount or more currently exists. There will be a 20 inch dbh limit on trees cut, and understory trees will be thinned to 15 to 25 foot spacing where they exist, leaving ponderosa pine, red fir, and lodgepole.

PCT2-MC: Units 44, 55, 58

Thinning/removal of trees generally less than 12 inches dbh to 20 to 40 foot spacing and emphasizing retention of pines where possible (designation by spacing, leave all pines). No openings or planting will occur. No-treatment clumps will be left in up to 15 percent of the unit. Borax will be applied to cut true fir stumps in accordance with regional guidelines.

PCT2-NGH: Unit 30

Understory thinning involves mainly thinning/removal of true firs 12 inches dbh and smaller by thinning to a 20 to 30 foot spacing (designation by spacing; leave all pines). No-treatment clumps will be left in up to 15 percent of the unit. The objective here is to thin the understory to maintain and promote goshawk nesting/foraging habitat over time. Borax will be applied to cut true fir stumps in accordance with regional guidelines.

PCT2: Units 9, 17, 21b, 53b, 59

Thinning spacing will average 20 to 25 feet, but would be variable. No-treatment clumps will be left in up to 15 percent of the unit. Objectives are to reduce fire hazard, manage stand density, reduce dwarf mistletoes, and promote pines and red fir in the species composition. Borax will not be applied due to the small cut tree diameters.

PCT2-OGRF- Old-growth Red Fir: Units 37, 41

Small tree thinning in the understory of old-growth red fir-sugar pine-ponderosa pine stands with a dense red fir understory. Objectives are to reduce fire hazard and stress on overstory trees to maintain these legacy stands. Treatment will consist of hand piling of cut trees generally less than 8 inches dbh. Tree spacing will be based on proximity to overstory old-growth trees and need for replacement trees. No-treatment clumps will be left in up to 15 percent of the unit. In alternatives 2 and 3, underburning to re-introduce fire into a mixed-severity fire regime will occur after hand-piling and burning treatments. Borax will not be applied due to the small cut tree diameters.

HTH-LP: Units 12a, 13

Useable timber from dead and diseased green trees will be removed. Grapple piling of large down fuels, and mastication of lodgepole understory in conjunction with release of suitable white fir and ponderosa pine will occur. The end result would be an open pole-sized stand with a few remaining overstory trees (mistletoe-free) which would develop over time into a mixed species stand still dominated by lodgepole, but with other longer-lived species also occupying the site. No-treatment clumps will be left in up to 10 percent of the unit. Borax will not be applied due to the small cut tree diameters, and cutting primarily of lodgepole.

LPFR-Lodgepole Fuel Reduction: Unit 12b

This treatment re-enters the old fuel break in lodgepole pine along Road 15. Residual mistletoe-infested lodgepole and snags will be removed, and the sapling-pole stand thinned to a wide spacing to reduce the amount of mistletoe in the stand. Mastication of brush will be done as needed. Under alternative 4 machine piling outside of landing areas may occur as needed.

PCT

Small tree thinning in old regeneration harvest units; residual tree spacing will be 15 to 20 feet.

Fuels Prescriptions

Fuels prescriptions were developed with the purpose and need in mind of restoring the historical role of fire in this area. Mechanical treatments will often be necessary during this first entry to remove fuel buildups from the missing of several fire cycles and the generation of slash from past overstory removal treatments and pre-commercial thinning. In the historic pine-dominated types, species composition is also currently very disadvantageous to re-introduction of fire, while in the lodgepole type fuel loadings are approaching maximum potential levels due to mountain pine beetle activity. To allow the most flexibility during implementation, all appropriate options have been identified; but not every option would be required in every case. For example, during post-thinning fuels surveys it may become obvious that grapple or machine piling is not necessary because natural fuels have become crushed and no longer represent as great a hazard.

Whole-tree yarding (WTY) ~ Tree tops will be moved to the landing for treatment (reoffer as forest by-products or burning) through whole-tree yarding. This would reduce fuel levels resulting from thinning operations.

Biomass removal (BMR) ~ Trees (generally less than 12 inch dbh) will be removed in thinning operations to reduce the potential of crown fire, improve species composition, and reduce competition. Small diameter tree boles may be processed into bundles and removed.

Piling and burning (HP, MP) ~ Following thinning, piling and burning by hand or mechanical methods would be used in fuels treatment corridors or where post-treatment fuels present a fire hazard or may lead to difficulty carrying out prescribed underburning. This method will not often be needed, since whole-tree yarding will minimize treatment-generated fuels. Hand piling and burning of slash and tree stems generated by the thinning or slashing of small diameter trees, generally less than 8 inches dbh, would be done by hand crews. Machine methods will involve piling of small trees, treatment slash, and natural fuels accumulations using a track-mounted excavator-type of machine with a boom-mounted grapple arm, or a small machine (example all-surface vehicle) with a brush-type (toothed) blade. This will only apply in units with heavy accumulations of either natural or past treatment-generated fuels where hand piling would be cost-prohibitive. Piling will be done from existing skid trails wherever possible, and the machine would pick up the slash and place it into piles, or make only one pass off-trail. Due to the types of machines used and the lack of multiple machine passes over the same ground, little or no detrimental soil disturbance is expected from these treatments (if conducted during proper site conditions). It is expected that this treatment will be needed on approximately 25 percent or less of the area of units where it is prescribed. Piles would be burned under appropriate meteorological conditions.

Lopping and scattering (LS) ~ This method will be used primarily to treat slash generated in thinning of plantations. Objective will be to reduce height and continuity of fuels and promote faster decomposition. It is not anticipated that this method will be used often since mechanical removal of thinned trees by bundling and skidding to landings for use as biomass would be the preferred method. In areas that are inaccessible or unsafe for mechanized equipment, this treatment is an alternative.

Mowing (M) ~ Shrubs, seedlings, and saplings will be mowed where they are major determinant to fire behavior. Lodgepole stands that are now dominated by small trees will also be mowed. Objectives will be to reduce shrub density and height and density of small trees to modify fire behavior.

Underburning (UB) ~ Prescribed fire will be used in varying intensities either as a stand-alone treatment or following thinning in pine-dominated stands. Prescribed fire will be used under controlled situations and favorable weather conditions to reduce surface and ladder fuels. The objectives of underburning are to reduce natural fuel loads, past activity slash, shrubs and white fir understory trees, while increasing herbaceous species and encouraging pine regeneration. Due to feasibility considerations, prescribed underburning treatments will not occur all at once, but incrementally throughout the life of the project. Detailed burn plans are prepared for all prescribed fire activities.

Fuel Management Zones (FMZ) ~ This treatment was identified along major road corridors and certain access roads for fire control. Treatments will consist of small tree thinning and/or removal, pruning, mastication of brush, and hand and burning of fuels concentrations. Under alternative 4 machine piling may occur outside of landing areas. Treatments will extend up to 150 feet either side of the road.

Due to critical habitat designation and nesting/roosting NSO habitat along FR 77 only trees less than 8 inches dbh will be removed and leave trees will be variably spaced except where openings exist. Some areas will be left clumpy for dispersal and habitat needs, while other areas can be more open. Trees less than 10 inches dbh will be removed/spaced along the other FMZ roads in the project area.

Table C-2 lists treatments by unit under all alternatives.

Table C-2. Stand treatments by alternative

Unit_ No	Unit_ Subdiv	Silv_Rx	Fuels_Rx	Spp_Comp	Acres	Applicable Project Design Features from Table 2-5
Alternative 3						
1	1	HTH-PP-lite	WTY/M/UB	PP	31	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3;VEG1-10; VIS8-12; WL 2-4, 7-10, 12, 13; WS1-17
2	2	HTH-PP-lite	WTY/M/UB	PP-WF	129	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2-4, 7-10, 12, 13; WS1-17
3	3	HTH-PP-lite	WTY/PCT2	PP-WF-LP	58	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2-3, 7-10, 12, 13; WS1-17
4	4	HTH-PP-lite	WTY/M/UB	PP	57	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2-3, 7-10, 12, 13; WS1-17
5	5	UB	UB	PP-WF-LP	92	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
6	6	HTH-PP-lite	WTY/UB	WF-PP-LP	78	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
7	7	HTH-PP-lite	WTY/UB	WF-PP	175	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
9	9	PCT2	HP	PP-WF-LP	16	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
10	10	UB	UB	WF-PP	42	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
11	11	UB	UB	WF-PP	193	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG10; VIS6-12; WL 2, 4, 7-10, 12, 13; WS1-17
12	12a	HTH-LP	WTY/PCT2/M	LP-WF-PP	245	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-12; WL 2-10, 12, 13; WS1-17
12	12b	LPFR	WTY/PCT2	LP	256	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
13	13	HTH-LP	WTY/PCT2/M	LP-WF-RF	183	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12;WL 2-10,12,13; WS1-17
17	17	PCT2	HP	LP-WF-PP	29	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3;VEG1-10; WL 2, 4-10, 12, 13; WS1-17

Unit_ No	Unit_ Subdiv	Silv_Rx	Fuels_Rx	Spp_Comp	Acres	Applicable Project Design Features from Table 2-5
18	18	HTH-MC-lite	WTY/PCT2	PP-WF-LP	204	AIR1; ARCH1-4; GEO1-8; NNIS1-3;REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
19	19	HTH-WF-PP-lite	WTY/BMR	WF-PP	154	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
20	20	UB	UB	WF-PP	109	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3;VEG10; VIS1-5, 8-12; WL 2, 7-10, 12, 13; WS1-17
21	21a	HTH-WF-PP-lite	WTY/BMR	WF-PP	188	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3;VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
21	21b	PCT2	WTY	WF-PP	44	AIR1; ARCH1-4; GEO1-8; NNIS1-3;REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
22	22	HTH-WF-PP-lite	WTY/BMR	WF-PP	211	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3;VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
23	23	HTH-WF-PP-lite	WTY/BMR	WF-PP	32	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
24	24	HTH-WF-PP-lite	WTY/BMR	WF-PP	72	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3;VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
25	25b	HTH-WF-PP-lite	WTY/BMR	WF-PP	25	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3;VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
28	28	HTH-MC-lite	WTY/PCT2/UB	WF-PP	35	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
29	29	HTH-WF-PP-lite	WTY/BMR	WF-PP	37	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3;VEG1-10; VIS1-5, 8-12; WL 1-2, 4-10, 12, 13; WS1-17
30	30	HTH-MC-lite	WTY	WF-RF-LP-PP	56	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; W-2, 4-10, 12, 13; WS1-17
32	32	PCT	Bundle/LS	LP-WF-PP	25	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
35	35b	HTH-RF-lite	WTY	WF-PP-LP-RF	86	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3;VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
37	37	PCT2-OG-RF	HP/UB	RF-WF-LP	116	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3;VEG1-10; VIS8-12; WL 2-4, 7-10, 12, 13; WS1-17
41	41	PCT2-OG-RF	HP/UB	RF-PP-SP	64	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10;

Unit_ No	Unit_ Subdiv	Silv_Rx	Fuels_Rx	Spp_Comp	Acres	Applicable Project Design Features from Table 2-5
						VIS1-5, 8-12; WL1- 2, 4, 7-10, 12, 13; WS1-17
44	44	PCT2-MC	WTY	RF-WF	45	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
45	45a	HTH-PP-lite	WTY/UB	WF-PP-RF	61	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3;REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4-10, 12, 13; WS1-17
46	46	PCT	Bundle/LS	LP-PP	28	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
48	48	PCT	Bundle/LS	PP-LP	30	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
52	52	PCT	Bundle/LS	LP-WF-PP	15	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
53	53a	UB	UB	PP-WF	42	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG10; VIS1-5, 8-12; WL 2-4, 7-10, 12, 13; WS1-17
53	53b	PCT2	WTY/UB	WF-PP	37	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4-10, 12, 13; WS1-17
55	55	PCT2-MC	WTY/M	RF-WF-LP-PP	37	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12;WL 2,4-10,12,13; WS1-17
58	58	PCT2-MC	WTY	RF-LP-PP	10	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
59	59	PCT2	HP/UB	PP-WF	6	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
Alternative 4						
1	1	HTH-PP	WTY/M/UB	PP	31	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2-4, 7-10, 12, 13; WS1-17
2	2	HTH-PP	WTY/M/UB	PP-WF	129	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2-4, 7-10, 12, 13; WS1-17
3	3	HTH-PP	WTY/PCT2/MP/UB	PP-WF-LP	58	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2-3, 7-10, 12, 13; WS1-17
4	4	HTH-PP	WTY/M/UB	PP	57	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2-3, 7-10, 12, 13; WS1-17
5	5	HTH-PP	WTY/PCT2/M/UB	PP-WF-LP	92	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10;

Unit_ No	Unit_ Subdiv	Silv_Rx	Fuels_Rx	Spp_Comp	Acres	Applicable Project Design Features from Table 2-5
						VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
6	6	HTH-PP	WTY/MP/UB	WF-PP-LP	78	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3;VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
7	7	HTH-PP	WTY/MP/UB	WF-PP	175	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
9	9	PCT2	HP	PP-WF-LP	16	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
10	10	HTH-PP-Hvy	WTY/MP/UB	WF-PP	42	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
11	11	HTH-PP	WTY/MP/UB	WF-PP	116	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4, 7-10, 12, 13; WS1-17
12	12a	HTH-LP	WTY/PCT2/MP/M	LP-WF-PP	545	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-12; WL 2-10, 12, 13; WS1-17
12	12b	LPFR	WTY/PCT2/MP	LP	256	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-12; WL 2, 4, 7-10, 12, 13; WS1-17
13	13	HTH-LP	WTY/PCT2/MP/M	LP-WF-RF	183	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2-10, 12, 13; WS1-17
17	17	PCT2	HP/MP	LP-WF-PP	29	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
18	18	HTH-MC-Hvy	WTY/PCT2/MP/UB	PP-WF-LP	204	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
19	19	HTH-WF-PP	WTY/BMR/MP	WF-PP	154	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
20	20	HTH-PP-Hvy	WTY/PCT2/MP/UB	WF-PP	109	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 7-10, 12, 13; WS1-17
21	21a	HTH-WF-PP	WTY/BMR/MP/UB	WF-PP	188	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
21	21b	PCT2	WTY/MP	WF-PP	44	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
22	22	HTH-WF-PP	WTY/BMR/MP	WF-PP	211	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17

Unit_ No	Unit_ Subdiv	Silv_Rx	Fuels_Rx	Spp_Comp	Acres	Applicable Project Design Features from Table 2-5
23	23	HTH-WF-PP-lite-NGH	WTY/BMR/MP	WF-PP	32	AIR1; ARCH1-4; GEO1-8; NNIS1-3; RDS1-3; REC2-4; SAF1-3; VEG1-10; VIS6-12; WL 2, 4-10, 12, 13; WS1-17
24	24	HTH-WF-PP-lite-NSO	WTY/BMR/MP	WF-PP	72	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
25	25b	HTH-WF-PP-lite-NGH	WTY/BMR/MP	WF-PP	25	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
28	28	HTH-MC-Hvy	WTY/PCT2/MP/UB	WF-PP	35	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
29	29	HTH-WF-PP-lite-NGH	WTY/BMR/MP	WF-PP	37	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 1-2, 4-10, 12, 13; WS1-17
30	30	PCT2-NGH	WTY/MP	WF-RF-LP-PP	56	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 1-2, 4-10, 12, 13; WS1-17
32	32	PCT	Bundle/LS	LP-WF-PP	25	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
35	35b	HTH-RF-lite	WTY	WF-PP-LP-RF	86	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
37	37	PCT2-OG-RF	HP	RF-WF-LP	116	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2-4, 7-10, 12, 13; WS1-17
41	41	PCT2-OG-RF	HP	RF-PP-SP	64	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 1-2, 4, 7-10, 12, 13; WS1-17
44	44	PCT2-MC	WTY/MP	RF-WF	45	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
45	45a	HTH-PP-Hvy	WTY/MP/UB	WF-PP-RF	61	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4-10, 12, 13; WS1-17
46	46	PCT	Bundle/LS	LP-PP	28	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4, 7-10, 12, 13; WS1-17
48	48	PCT	Bundle/LS	PP-LP	30	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
52	52	PCT	Bundle/LS	LP-WF-PP	15	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4, 7-10, 12, 13; WS1-17
53	53a	UB	UB	PP-WF	42	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG10;

Unit_ No	Unit_ Subdiv	Silv_Rx	Fuels_Rx	Spp_Comp	Acres	Applicable Project Design Features from Table 2-5
						VIS1-5, 8-12; WL 2-4, 7-10, 12, 13; WS1-17
53	53b	PCT2	WTY/MP/UB	WF-PP	37	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC1-4; SAF1-3; VEG1-10; VIS1-5, 8-12; WL 2, 4-10, 12, 13; WS1-17
55	55	PCT2-MC	WTY/MP/M	RF-WF-LP-PP	37	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
58	58	PCT2-MC	WTY/MP	RF-LP-PP	10	AIR1; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17
59	59	PCT2	HP/UB	PP-WF	6	AIR1-2; ARCH1-4; GEO1-8; NNIS1-3; REC2-4; SAF1-3; VEG1-10; VIS8-12; WL 2, 4-10, 12, 13; WS1-17

Appendix D: Hi-Grouse Best Management Practices (BMPs)

Best management practices (BMPs) are measures certified by the State Water Quality Board and approved by the Environmental Protection Agency (EPA) as the most effective way of protecting water quality from impacts stemming from non-point sources of pollution. Effective application of the Region 5 U.S. Forest Service BMPs has been found to maintain water quality in conformance with the Water Quality Objectives in the North Coast Regional Water Quality Control Board Basin Plan. These practices have been applied in timber sales and road construction projects across the KNF over the last 25 years and have been found to be effective in protecting water quality.

The Region 5 Forest Service BMPs have been monitored and modified since their original implementation in 1979 to make them more effective. Numerous onsite evaluations by the North Coast Regional Water Quality Control Board have found the practices to be successful in maintaining water quality and protecting beneficial uses.

The Forest monitors the implementation and effectiveness of BMPs on randomly selected projects each year. BMP effectiveness requirements were met on 90–100 percent of the sites sampled in 2000–2008. The success rate for effectiveness has been in the high 80s and 90s each year since 1993. Results of this monitoring can be found on the KNF webpage.

The complete list of BMPs was evaluated and the following BMPs were determined applicable to the Hi-Grouse Project. These BMPs would be implemented as part of the Hi-Grouse Project during implementation of the proposed action. A description of the objective of each BMP is included, as well as how this practice would be implemented in this project. These BMPs assist the timber sale administrator in implementing the specifications, BT and CT provisions of the timber sale contract. Where applicable, BT provisions of the timber sale contract (April 2008 issue) are referenced under the BMP description. In addition, the EIS contains a detailed description of specific measures—project design features—that would be implemented to prevent resource damage. There are no perennial waterways in the project area and no fisheries would be impacted from project activities. Watershed specialists in hydrology, soils, and geology, along with the ID team, developed the BMPs for this project.

BMP 1.1 – Timber Sale Planning Process: Requires the ID team to incorporate water quality and hydrologic considerations into the timber sale planning process.

- A hydrologist and soil scientist were assigned to the project and participated in the interdisciplinary process for this project.
- Project-wide as well as site-specific water quality protection measures were developed and incorporated into the project as part of the project design features.
- These project design features are incorporated into the timber sale contract and sale area map.
- The following are overall guiding principles that were used to formulate the more site-specific project design features:
    - Skidding equipment and tractor piling would be generally restricted to slopes <35 percent.

- Track mounted masticators/mowers can operate on slopes up to 35 percent.
- Existing landings and skid trails would be reused whenever practical.
- Tractor skidding would be restricted to designated skid trails.
- Temporary roads would be blocked and hydrologically restored after use, but prior to first winter after use. Hydrologically restored includes reshaping road prism to be self-maintaining (for example, leaving no structures that move water and could fail, outsloping, ripping of the roadbed, seeding, straw mulching, etc.). The amount of work to be done is site-specific and would be included in the roads contract package for this project.

BMP 1.2 – Timber Harvest Unit Design: Requires the ID team to consider methods of reducing water quality impacts, maintaining desirable stream channel characteristics and watershed conditions that are incorporated into the design of harvest units.

- Project soil scientist and hydrologist field inspected and verified existing conditions within the project area and adjacent areas as necessary per their resource. Unit design parameters were developed from these onsite field inspections.
- No new constructed (full bench) skid trails would be built.

BMP 1.3 – Determination of Surface Erosion Hazard for Timber Harvest Unit Design: Identify high erosion hazard areas in order to adjust resource protection measures to prevent downstream water quality degradation.

Surface soil erosion hazard is determined by evaluating four site factors: soil erodibility, runoff production, runoff energy, and percent soil cover. Based on field review, the Forest soil scientist determined the surface erosion hazard for each treatment unit and prescribed logging systems and soil cover recommendations based upon the soil's erosion hazard.

- Post-treatment soil cover to be met before the fall rainy season is prescribed by unit in the project soils report (Laurent 2006).

BMP 1.4 – Use of Sale Area Maps (SAM) and Project Maps for Designating Water Quality Protection: This ensures that areas with watershed concerns (streams, wetlands, unstable land) would be identified as part of the timber sale contract to assist the purchaser and timber sale administrator in applying protection methods. The following items are identified on the SAM.

- Harvest unit boundaries.
- All protected stream courses identified as stream management zones, would be illustrated on the sale area map (SAM). The width of the SMZ protection zone would be prescribed for each stream.
- Water drafting sites would be located on the SAM at Forest Service designated sites where water quality impacts can be controlled and minimized.
- Sources of rock for road aggregate riprap and borrow material.

The following items may be identified on a separate project map and/or harvest activity cards for use by the TSA:

- Specified temporary roads and landings.

BMP 1.5 – Limiting Operating Period of Timber Sale: To ensure that the purchasers conduct their operations, including erosion control work and road maintenance work, in a timely manner within the time specified in the timber sale contract. There is no specific limited operating

period specified for watershed protection, although there are several limiting operating periods for wildlife.

- When stormy weather is predicted, TSAs would be onsite to insure that winterization procedures are implemented in a timely fashion and to initiate shutdown or resume operations. Operations would not resume until suitable weather, soil, and forecast conditions exist.
- The timber sale contract would be used to guide operations, especially haul, during periods of wet weather. Earth scientists would be available upon request by the TSA to examine field conditions to determine when the soil and/or roads have dried out enough to enable operations to resume without risk of watershed impacts. The earth scientist would make recommendations to the TSA who would provide direction to the timber sale contractor as to when operations may resume.
- Landings and roads may be rocked and graded as necessary to prevent off-site erosion, and to disperse water.

BMP 1.8 – Streamside Management Zone (SMZ) Designation: Designates zones along riparian areas, streams, and wetlands that would minimize potential for adverse effects from adjacent management activities.

- This BMP only applies to the water drafting site along Antelope Creek located on private land outside of the project area.
- There are no SMZs within the project area.
- The SMZ as the drafting site includes the stream channel, stream banks (bank full flow), riparian vegetation and extends from 20 to 50 feet beyond the riparian vegetation and/or bank full flow zone.

BMP 1.9 – Determining Tractor Loggable Ground: To minimize erosion and sedimentation resulting from ground disturbance of tractor and ground-based logging systems.

- The erosion hazard rating, percent slope distribution, and soil displacement rating were all used to evaluate tractor units for their response to using ground-based mechanical logging systems. The Forest soil scientist field reviewed each tractor log unit in order to verify that they were reasonable to tractor log from a soil resource perspective. The erosion hazard rating was also a factor in determining the reasonableness of tractor use.
- Skidding equipment (track or rubber tired) and tractor piling would be generally restricted to slopes <35 percent.
- Track-mounted masticators or mowers can operate on slopes up to 45 percent.

BMP 1.10 – Tractor Skidding Design: Designs tractor skid patterns to best fit the terrain to better control potential runoff by avoiding over-steepened areas, designating tractor crossings, and minimizes skid patterns in sensitive areas to reduce erosion and sedimentation.

- The purchaser and timber sale administrator (TSA) would locate skid trails jointly or the purchaser would identify skid trails subject to the TSA's approval prior to use.
- The 35 percent slope limitation, the general topography within the unit, riparian areas, and presence of existing skid trails are all factors that are considered in laying out skid trails.
- Reuse existing skid trails when ever practicable.
- Refer to BMP 1.1 and 1.2 for skidding and skid trail practices.

- All skid trails would be water-barred to minimize soil erosion following the guidelines in the timber Sale Administration Handbook (61.42d – Exhibit 01, R5 Supplement 2409.15-94-3, p. 2).
- Skid trails that intersect Forest roads would be obliterated at the intersection by reshaping the slope, mulching with weed-free straw or slash the first 25 feet of the skid trail (from the intersection).

BMP 1.11 – Suspended Log Yarding in Timber Harvesting: Protects the soil mantle from excessive disturbance and maintains the integrity of the streamside management zone and other sensitive watershed areas.

- Ground-based skidding will use one-end suspension (suspend the lead end of logs) to minimize soil disturbance.

BMP1.12 – Log Landing Location: To locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.

- Existing landings would be reused whenever possible.
- New and old landings would be selected for use that involves the least amount of excavation, and the least erosion potential.

BMP 1.13 – Erosion Prevention and Control Measures during Timber Sale Operations: Ensures that the purchaser's operations shall be conducted reasonably to minimize soil erosion.

- Erosion control measures (BMPs) are discussed during the pre-operations meeting with the purchaser and the Forest Service. They are updated throughout the operations phase of the timber sale.
- Storms may temporarily suspend operations to insure BMP compliance and to avoid adverse impacts to beneficial uses (fisheries, wildlife habitat, and recreation, etc.).
- See BMP 1.5 for TSA responsibilities and measures when stormy weather is predicted.

BMP 1.16 – Log Landing Erosion Prevention and Control: The objective of this BMP is to reduce erosion and prevent subsequent sedimentation from log landings. The timber sale contract provides for erosion prevention and control measures on all landings.

- See BMP 1.1 and 1.12.
- Landings would be shaped to disperse drainage, eliminate ponding of water, and direct runoff away from watercourses/swales at the time of preparation for use. Rock armoring of fills, silt fences, straw bales, etc., may be used as necessary direct water to areas of suitable drainage and to capture sediment.
- Any landings used during wet weather that have the potential to deposit sediment in channels/swales will use any of the above mentioned erosion control measures to minimize erosion and control runoff.

BMP 1.17 – Erosion Control on Skid Trails: Employs preventative measures, during the operations phase of the project, such as water bars, mulching, spreading slash, or chipping to reduce water concentration and erosion.

Erosion control measures on skid trails are two-fold: (1) prevent road or landing runoff from concentrating onto skid trails and (2) control potential runoff on skid trails. Erosion control measures such as aggregate surfacing, scarifying, road and road-edge reshaping, and construction of drainage ditches would be used to divert water away from skid trails. On skid trails, waterbars are used to disperse runoff from concentrating to a volume that will cause

rilling/gullying. Portions of skid trails over 35 percent slope would have organic materials spread on that portion as needed.

- Waterbar spacing is based on the percent slope of the skid trail, soil texture, and erosion hazard rating for the unit. The spacing distances are located in the Sale Administrators Handbook.
- Place water bar outlets, whenever possible, where concentrations of slash or other organic materials occur to disperse runoff and trap sediment before it can reach a drainage channel.
- See BMP 1.1, 1.2 and 1.10 for skid trail measures.
- Portions of skid trails over 35 percent slope would have organic materials spread on that portion where needed as determined by the timber sale administrator as needed.
- Skid trails that may direct runoff onto roads or landings would have the first 25 feet covered with fine slash or weed-free straw (achieving 90 percent soil cover).
- Application of BMP "yardsticks" to ensure compliance with BMPs.
- Skid trails that intersect Forest roads would be obliterated at the intersection.
- Road runoff would be prevented from draining onto skid trails or landings by either reshaping the road prism, constructing cross drains or dips, or constructing water bars.
- Unless otherwise agreed, within the operating area, a minimum of 6 inches of machine compacted snow is required for over-the-snow logging or the soil should be frozen to a depth of 6 inches for logging operations to occur.
- Harvesting and skidding operations during wet conditions would follow the following guidelines:

  Cut-to-Length System—Processing of material on the designated skid trails by a harvester may occur when soils are dry to a depth of 4 inches. Limit harvester to one or two passes over the same piece of ground. The forwarder would stay on designated skid trails covered with a minimum of 6 inches of slash.

  Feller-Buncher System—Movement of material to the designated skid trails by a track laying feller-buncher may occur when the track does not create ruts >6 inches deep. A feller-buncher would be limited to one or two passes over the same piece of ground. Skidding equipment would stay on designated skid trails. Skidding would cease when >10 percent of a skid trail is rutted with ruts >6 inches deep.

  Traditional Tractor Logging—Skidding may occur by conventional high-ground-pressure equipment when soils are dry to a depth of 4 inches. Equipment is restricted to the designated skid trails. Endlining would be used to move material to the designated skid trails until soils are dry to a depth of 10 inches. Equipment may, by agreement, leave designated skid trails when soils are dry to a depth of 10 inches.

BMP 1.19 – Streamcourse and Aquatic Protection: Protects the natural flow of streams and reduces the delivery of sediment and other pollutants into streams. Conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values.

- Service landings would be located away from stream courses.
- Straw bales, rocking, and containment dikes would be used as needed at designated water drafting sites to capture any spilled water and prevent runoff and sedimentation into streams.

BMP 1.20 – Erosion Control Structure Maintenance: Requires periodic inspection of erosion control structures to assess maintenance needs and effectiveness. This is accomplished during the operations and post-operations phase of the project; this ensures the adequacy of erosion control measures.

- Same as BMP 1.5.
- Identified temporary roads would be decommissioned after use, and the road takeoffs blocked to prevent vehicle traffic. See BMPs 2.24 and 2.26.

BMP 1.21 – Acceptance of Erosion Control Measures before Timber Sale Closure: To ensure the adequacy of required erosion control work on timber sales. This is accomplished during the post-operations phase of the project during the contract final inspection.

- Landings would be shaped for drainage.
- At project completion, permanent water-bars would be installed as necessary on all skid and temporary roads.
- Identified temporary roads would be decommissioned after use, and the road takeoffs blocked to prevent vehicle traffic. See BMPs 2.24 and 2.26.

BMP 1.25 – Modification of the Timber Sale Contract (as needed): Allows contract language to be modified to add or increase protection of water quality not identified in the planning process.

- Modifications are not expected at this time, but this BMP is retained to illustrate that contract alteration would occur if needed to insure maintenance of water quality, especially if unforeseen circumstances and impacts occur.

BMP 2.1 – General Guidelines for the Location and Design of Roads: To locate and design roads with minimal resource damage.

- Temporary roads needing re-construction would be relocated on existing skid trails, skid roads, and existing openings to the greatest extent possible.

BMP 2.2 – Erosion Control Plan: The objective is to limit and control sedimentation through effective planning prior to the initiation of construction activities and through effective contract administration. An erosion control plan would be agreed to during the pre-operations meeting between the Forest Service and the purchaser. The plan is implemented during the operations phase of the project.

- Resource protection measures are incorporated into the proposed action by the ID team and these actions are then incorporated into the contract specifications and provisions. Examples of resource protection measures include such items as shaping landings, temporary and skid roads for drainage; and use of rock as necessary to obtain suitable haul bases on Forest Service roads.
- See BMPs 1.13 and 1.20 for erosion control measures during the project, maintenance of erosion control measures and operations control during periods of wet weather.

BMP 2.3 – Timing of Construction Activities: The objective is to minimize erosion by conducting operations during minimal runoff periods. This is accomplished during the operation phase of the project by the contract administrator, engineer, and earth scientist.

- See BMPs 1.13 and 1.20 for erosion control measures during the project, maintenance of erosion control measures and operations control during periods of wet weather.

- All landing and temporary road construction and development work would be conducted during appropriate periods of weather and soil moisture to ensure BMPs are met and adverse impacts to beneficial uses are avoided. Forecast periods would also be of a suitable length to allow completion or winterization of the task undertaken before precipitation events occur.

BMP 2.4 – Stabilization of Road Slope Surfaces and Spoil Disposal Areas (Preventative Practices): To improve road slope stabilization by applying mechanical and vegetative measures. This is accomplished during the operations phase of the project.

- See BMP 2.3 for measures pertaining to landing and road construction and development.
- Landings would be shaped for drainage at the time of construction. Rock armoring and silt fences with straw bales would be used as necessary to direct water to suitable areas of drainage and to capture sediment.
- Road construction, maintenance, and landing construction and enlargement generally is on gently sloping ground, so there would be no large cuts, fills, or spoil areas. Measures to control erosion from large fills and cuts during operations are not anticipated to be necessary.
- Roads would be rocked as necessary.
- See BMPs 1.13 and 1.20 for erosion control measures during the project, maintenance of erosion control measures and operations control during periods of wet weather.

BMP 2.7 – Control of Road Drainage (Preventative Practices): To minimize erosive effects of water concentrated by road drainage features; to disperse runoff from disturbances within the road clearing limits; to lessen the sediment yield from roaded areas; to minimize erosion of the road prism by runoff from road surfaces and from uphill areas. See BMPs 2.5 and 2.6 for measures that would be applied.

BMP 2.8 – Constraints Related to Pioneer Road Construction: To minimize sediment production.

- The roads to be opened and constructed in this project are temporary roads that do not require a pioneer road.

BMP 2.9 – Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects: To minimize erosion and sedimentation from disturbed ground on incomplete projects.

- The road and landing construction in this project is minor in scope. Individual temporary roads and landings would be completed in one season. If a temporary road includes a stream crossing, then the road would be used when the stream is dry. If a road or landing is needed for more than one season, then crossing, road and landing stabilization measures would occur before the nest rain season. See BMPs 1.13 and 1.20.

BMP 2.10 – Construction of Stable Embankments (Fills): To construct embankments with materials and methods which minimize the possibility of failure and subsequent water quality degradation. In general, problems arise due to improper compaction, incorporation of slash or organic matter, or use of inappropriate placement methods.

- Temporary road re-construction and landing construction and enlargement generally is on flat to gently sloping ground, so there would be no to minimal cuts, fills or spoil areas. Equipment compaction is anticipated to be adequate.

BMP 2.11 – Minimization of Sidecast Material: The objective is to minimize sediment production originating from material sidecast during road construction or maintenance. This is accomplished during the design phase of the project by the contract inspector.

- Minor blading would occur on temporary roads used by the project. Side-casting of soil during blading operations would be minimal due to the low gradient slopes on which the temporary roads are located.
- Sidecasting during road maintenance and clearing operations should not extend beyond the clearing limits of any road, or into any SMZ.
- During road blading, loose material should be incorporated back into the road prism and utilized in the road subgrade to the maximum extent possible, or deposited at designated disposal sites.
- Existing road berms should be removed and utilized in the road subgrade as part of outsloping, or placed at designated disposal sites.

BMP 2.12 – Servicing and Refueling of Equipment: The objective is to prevent pollutants, such as fuels and lubricants, from being discharged into or near rivers, streams, impoundments, or natural and man-made channels which lead into them. This is accomplished through the use of designed and designated refueling areas.

- Appropriate fuel containment systems would be in place at each service landing/site.
- Servicing and refueling areas would be outside of stream management zones.

BMP 2.21 – Water Source Development Consistent with Water Quality Protection: The objective is to limit and mitigate the effects of water source development through the planning of impoundments and withdrawals.

- One water drafting site has been specifically designated by the ID team. Water could be pumped directly from the sources, or a fold-a-tank could be set up outside of SMZ and water could be pumped by hose to the tank, and from the tank to the truck.
- Drafting sites are existing sites and rocking of approaches would be used as required; all boards and black plastic would be removed after use. Straw bales, rock surfacing, and containment dikes would be used at all locations where the possibility of water spill or overflow would result in sediment being moved toward the creek, ditch, or lake.

BMP 2.22 – Maintenance of Roads: The objective is to limit sedimentation and erosion by road drainage maintenance and road surface protection. This is accomplished during the operations phase of the project and the post-operations final inspection.

- Spot rocking would be used as necessary if small and isolated portions of the road system do not adequately dry to allow haul when most of the road is capable of haul, provided haul over the newly rocked areas would not create adverse impacts, such as sediment moving off-site towards channels.
- Timber sale administrators would periodically inspect the contractor's operations and condition of the roads.
- See BMP 1.5, 1.13, 1.20, for measures relating to operations during wet or potential stormy conditions and when to resume operations.
- Appropriate road watering would occur as roads dry to maintain road fines onsite; see BMP 2.23.

BMP 2.23 – Road Surface Treatment to Prevent Loss of Materials: The objective is to reduce road-related erosion through treatment of the road surface, usually through spot rocking and dust abatement. This is accomplished during the operations phase of the project.

- Appropriate road watering would occur as roads dry to maintain road fines onsite.
- Same as BMP 2.22. See also BMP 1.5, 1.13, 1.20, for measures relating to operations during wet or potential stormy conditions and when to resume operations.

BMP 2.24 – Traffic Control during Wet Periods: The objective is to reduce damage to road drainage and limit sedimentation from roads during wet periods. This is generally achieved by increased surfacing and/or road closures during the operations phase of the project.

- Spot rocking would used as necessary if small and isolated portions of the road system do not adequately dry to allow haul when most of the road is capable of haul, provided haul over the newly rocked areas would not create adverse impacts, such as sediment moving off-site towards channels.
- TSAs would periodically inspect the contractor's operations and condition of the roads.
- See BMP 1.5, 1.13, 1.20, for measures relating to operations during wet or potential stormy conditions and when to resume operations.

BMP 2.25 – Snow Removal Controls to Avoid Resource Damage: The objective is to minimize the impact of snowmelt runoff on road surfaces and embankments and to consequently reduce the probability of sediment production resulting from snow removal operations.

- Snow would be removed in a manner that protects roads and adjacent resources.
- Snow berms would be removed where they result in accumulation or concentration of snowmelt runoff on the road and on erosive fill slopes.
- Snow berms would be installed in locations that would preclude the concentration of snowmelt runoff and serve to rapidly dissipate melt water.
- Damage to the road surface from snow removal would be repaired by the purchaser, contractor, or other party responsible. This would include replacing lost surface material with similar quality material and repair of any damaged structures as soon as possible and as agreed to by the Forest Service.

BMP 2.26 – Obliteration or Decommissioning of Roads: The objective is to reduce sediment generated from temporary roads, unneeded system (classified) and non-system (unclassified) roads by obliterating or decommissioning them at the completion of the intended use. This is accomplished during the post-operations phase of the project. This BMP applies to all temporary roads, and other non-system (unclassified) roads proposed for decommissioning:

- Crossings are removed and the natural drainage restored.
- Roads are to be drained by measures such as re-contouring or outsloping to return the road prism to near natural hydrologic function.
- Roads and associated disturbed surfaces would be stabilized through appropriate treatment such as tillage, ripping, fertilization, and/or revegetation.
- Road take-offs would be obliterated or effectively blocked to vehicle access.

BMP 2.27 – Restoration of Borrow Pits and Quarries: The objective is to protect water quality by minimizing sediment production from borrow pits and quarry sites. This is accomplished during the operations and post-operations phase of the project.

- Excavated areas would be sloped and graded to ensure proper drainage, and general borrow source areas smoothed and stabilized.
- Seeding and/or mulching may be required as determined by an earth scientist.

BMP 5.2 – Slope Limitations Mechanical Equipment Operation: To minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems and tractor piling operations.

- Same as BMP 1.1 and 1.9 for slope limitations for ground-based logging, tractor piling, and fuel mastication.

BMP 5.4 – Revegetation of Surface Disturbed Areas: The objective is to protect water quality by minimizing soil erosion through the stabilizing influence of vegetation. This is accomplished during the operations and post-operations phase of the project.

- All harvest openings would be promptly replanted.

BMP 5.5 – Disposal of Organic Debris: The objective is to prevent surface erosion with associated reduction in sediment production and turbidity when conducting slash and excessive fuel removal operations.

- Project generated slash would be removed to landings as biomass chips.
- Hand pile and pile burning, machine mowing/mastication, and underburning would be used to reduce the fine fuel component. Specified soil cover recommendations would be used to maintain sufficient soil cover for erosion prevention.
- Machine mowing/mastication and machine piling are mechanical treatments that reduce slash. Slope limitations for mechanical equipment as well as specified soil cover recommendations would be used to maintain sufficient soil cover for erosion prevention. See BMPs 1.1 and 1.9 for slope limitations.

BMP 5.6 – Soil Moisture Limitations for Tractor Operations: The objective is to prevent soil compaction, rutting, and gulling that may result in increased sedimentation and turbidity.

- This is accomplished during the operations phase of the project by monitoring performed by the project earth scientist as requested by the TSA.
- See BMP 1.17 for harvesting and skidding operations during wet or over snow conditions.
- Same as BMPs 1.20 and 2.22 for measures to employ when wet weather is forecast, and following a period of stormy weather.

BMP 5.8 – Pesticide Application According to Label directions and Applicable Legal Requirements: The objective is to avoid water contamination by complying with all label instructions and restrictions for use.

- This BMP applies to the application of a borax fungicide (borax) on cut stumps (14 inches diameter or larger) within the project area.
- TSAs are responsible for ensuring timber sale contract specifications pertaining to treatment of stumps are met and would periodically inspect the contractor's operations to ensure that label directions and legal requirements are followed.

BMP 5.9 – Pesticide Application Monitoring and Evaluation: The objectives are to monitor whether pesticides have been applied safely, restricted to intended target areas, and have not resulted in unexpected non-target effects.

- This BMP applies to the application of a borax fungicide (borax) on cut stumps (14 inches diameter or larger) within the project area.
- TSAs are responsible for implementation monitoring of borax application, and would document and provide early warning of any accidental spills and potential water contamination.
- The purchaser is responsible for notification and reporting of releases of reportable quantities of hazardous substances caused by employees or contractors, directly or indirectly as a result of operations in the sale area.

BMP 5.10 – Pesticide Spill Contingency Planning: The objective is to reduce contamination of water by accidental pesticide spills.

- This BMP applies to the application of a borax fungicide (borax) on cut stumps (14 inches diameter or larger) within the project area.
- See BMP 5.9.

BMP 5.11 – Cleaning and Disposal of Pesticide Containers and Equipment: The objective is to prevent water contamination from the cleaning or disposal of pesticide containers.

- This BMP applies to the application of a borax fungicide (borax) on cut stumps (14 inches diameter or larger) within the project area.
- Cleanup and disposal of containers would follow directions on the manufacturer's label.

BMP 6.1 – Fire and Fuels Management Activities: The objective is to reduce the effects of wildfires on water quality by informing the public, and the development of access plans, fuel breaks, and fuel reduction programs.

- The district fuels and fire specialists have determined acceptable levels of slash to retain on the site following harvest activities and also have identified areas and methods to remove standing slash of a sub-merchantable size, that otherwise would create an unacceptable fire risk.
- On-going fire management work maintains fire access plans and restricts public activities, such as woodcutting, on days when fire weather predictions indicate significant risk from such activities in the Hi-Grouse Project Area.

BMP 6.2 – Consideration of Water Quality in Formulating Fire Prescriptions: The objective is to provide for water quality while achieving management objectives of prescribed fire. This is done during the planning phase of the project.

- Burn plans would incorporate appropriate burn parameters (such as fuel moisture, weather, etc.) into the burn prescriptions in order to meet the recommended cover amounts.

BMP 6.3 – Protection of Water Quality from Prescribed Burning Effects: Minimize soil erosion, ash, sediment, nutrients, and debris from entering water bodies.

- Hand and machine piles would burn under controlled settings to contain fire spread.
- Waterbars would be installed on hand and machine-created fire lines where needed.
- Recommended levels of post-burn soil cover are designed to minimize potential sediment.

Appendix E: Actions Considered for Cumulative Effects

Recent Past, Present, and Foreseeable Future Actions

This appendix lists recent past, present, and foreseeable future actions in the five 7th-field watersheds (Antelope Well, Dock Well, Grouse Hill, Hill 22, and Tamarack Flat) that intersect the Hi-Grouse Project boundary (see map A-7). Actions are listed by timeframe (past, present, future) from about 10 years ago to 5 years in the future. Whether these projects would be included for cumulative effects depends on the relationship of these projects to the specific resource. The effects of the project must overlap in time and space. Some resource areas may have considerations not included below, and they would be listed in the individual specialist report. Cumulative effects of these actions are discussed below. For the complete cumulative effects analyses please see appropriate specialist reports located in the project record at the district office.

Recent Past, Present, and Ongoing Actions for the Last 10 Years

Private—Fruit Growers Harvesting (Tennant and 5 Miles Northeast): The legal locations are sections 29, 35, and 36 in T44N, R1E; and section 31 in T44N, R2E, Mt. Diablo Meridian, Siskiyou County, California. The sale was harvested with alternative (combination shelterwood removal and sanitation/salvage) and clearcut methods. Similar effects include opening up forest canopies. The recent private harvest is not expected to change deer cover because private land is already very open due to historic logging. Due to intensive management, bitterbrush has been replaced with rabbitbrush (which is not good forage) in some areas. Fruit Growers Supply Company (South Garner THP) clear cut about 94 acres and commercial thin/light sanitation 135 acres west of the project area on the southeast flank of Garner Mountain.

Tamarack (Implementation Ongoing): The legal location of the project is all or portions of T44N, R1E, section 25 and 36; T44N, R2E, sections 19, 20, 28, 29, 30, 31, 32; and T43N, R1E, section 6, Mt. Diablo Meridian, Siskiyou County, California. Vegetation treatments have been approved on a total of 1,615 acres including: Commercial thinning on 1,050 acres (including thinning/chipping of small trees and/or underburning, and creation of openings from ¼ to ½ acre in size, up to a total of 10 acres); green tree retention (GTR) on 59 acres (including site preparation and tree planting on all acres, and gopher trapping on 34 acres); plantation thinning on 494 acres (including mechanical brush treatments on 41 acres and development of a fuelbreak along Tennant Road 77 of approximately 40 acres); and treatment of cut surfaces of stumps 14 inches and greater with a borax fungicide over 1,109 acres of commercial thinned and GTR areas.

Van Bremmer Project (Decision February 3, 2010): The legal location of the project is all or portions of T44N, R1E, sections 13, 14, 21−28, 33−36; T44N, R2E, sections 18−19, 30; and T43N, R1E, section 3, Mount Diablo Meridian. The Van Bremmer Project is a proposed hazardous fuels reduction and vegetation management project located within the Goosenest Ranger District of the Klamath National Forest. The project encompasses 5,970 acres of National Forest System lands northeast of Tennant, California, of which 4,970 acres are proposed for treatment. This EA considers the environmental consequences of one action (the proposed action, alternative 2) and one no action alternative (alternative 1). The intent of the proposed action is to reduce hazardous fuels, to increase the variety of age and size classes of desirable

browse and forage for big game, and to promote a diverse and resilient forest. The proposed action will include nine treatment types, including plantation thinning/mow, variable thinning from below, thin/chip, creation of a fuel management zone, jackpot burning, underburning, mowing and activities related to road access.

Small Spot Fires Within the Watersheds: Similar effects include canopy/tree density reduction. In the short term, small fires reduce brush and potential fawning habitat if burn occurs in thickets. Short term (3 to 5 years) to long term (until canopy closes in and shades forest floor) the loss of cover may increase foraging habitat due to more open canopies, and beginning of early succession of plants.

Motorized Travel Management (Decision Published on August 13, 2010): May be implemented beginning November 29, 2010. The EIS analyzed designation of a system of roads, trails, and areas for public motorized vehicle use, prohibition of cross-country motorized vehicle travel, and non-significant amendment of the Forest Plan. The Motorized Travel Management selected alternative identified 5.5 miles of closed non-system roads in the project area (USDA Forest Service 2010a). Of that, one existing non-system road is being administratively added to the Forest System Roads; it is 0.84-mile long and runs between 44N84 and 44N79. Road 44N03 (Badger Loop) is going from "Highway Legal Only," to "Open to All Vehicles." Map A-8, located in appendix A depicts the Hi-Grouse Project area and changes with the Motorized Travel Management decision.

Reasonably Foreseeable Future Federal, State or Private Actions

Sagebrush-steppe Restoration on BLM lands: This is not expected to have adverse impacts to wildlife (FEIS, August 2008).

Pumice Project: The legal location of the project is all or portions of T43N, R1E, sections 12−13 and 24; T43N, R2E, sections 2−11, 14−22, and 29−30; and T44N, R2E, Sections 31−33, MDM. The project is located within the Tamarack 7th-field watershed. The purpose of the project is to reduce fuel loads and improve forest health, while considering opportunities to maintain wildlife habitat and maintain and improve scenery values.

Highlands Roadside Safety Improvement Project: This project is located on the Doublehead Ranger District of the Modoc National Forest, east of the Hi-Grouse Project area. The project is proposed to improve public safety along major public travel routes by removal of hazard trees likely to fall onto the roadway, and includes removal of vegetation to increase sight distance around corners including thinning, mowing, pruning, hand pile and burning.

Hoffman Vegetation Management Project: The legal location of the project is T43N, R3E, MDB&M, near Little Glass Mountain, on the Shasta-Trinity National Forest; located southeast of the Hi-Grouse Project area. This project was proposed to reduce tree densities and fuels on approximately 2,600 acres to enhance forest resilience to natural disturbances. In heavily diseased areas, trees would be removed (leaving live, healthy trees where they exist) and healthy/resilient trees planted. This project is currently on hold as per the Shasta-Trinity National Forest web site.