United States
Department of
Agriculture

Forest
Service

Pacific Northwest
Region

March 2012

Draft Environmental Impact Statement

Eden Ridge Timber Sales

Powers Ranger District

Rogue River-Siskiyou National Forest

Coos County, Oregon



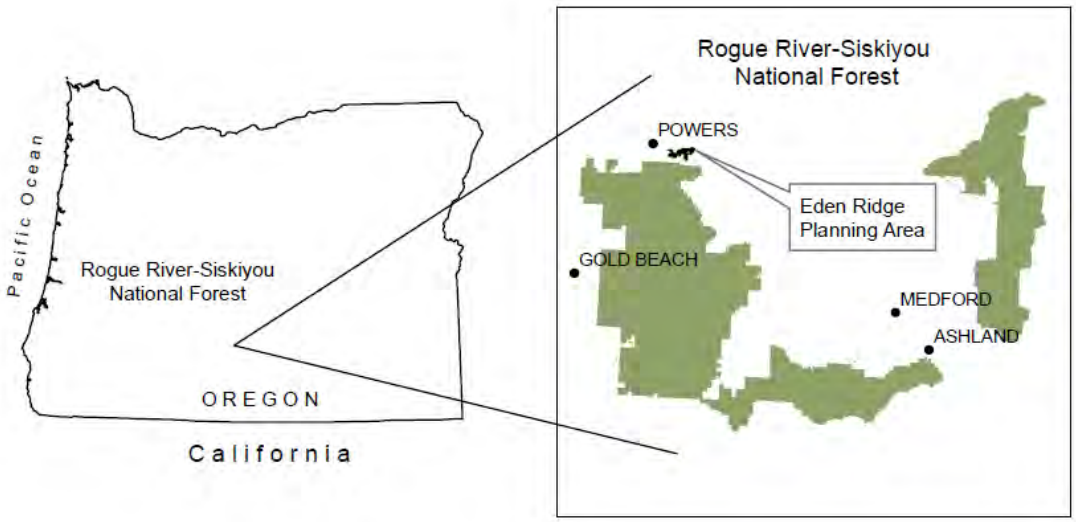


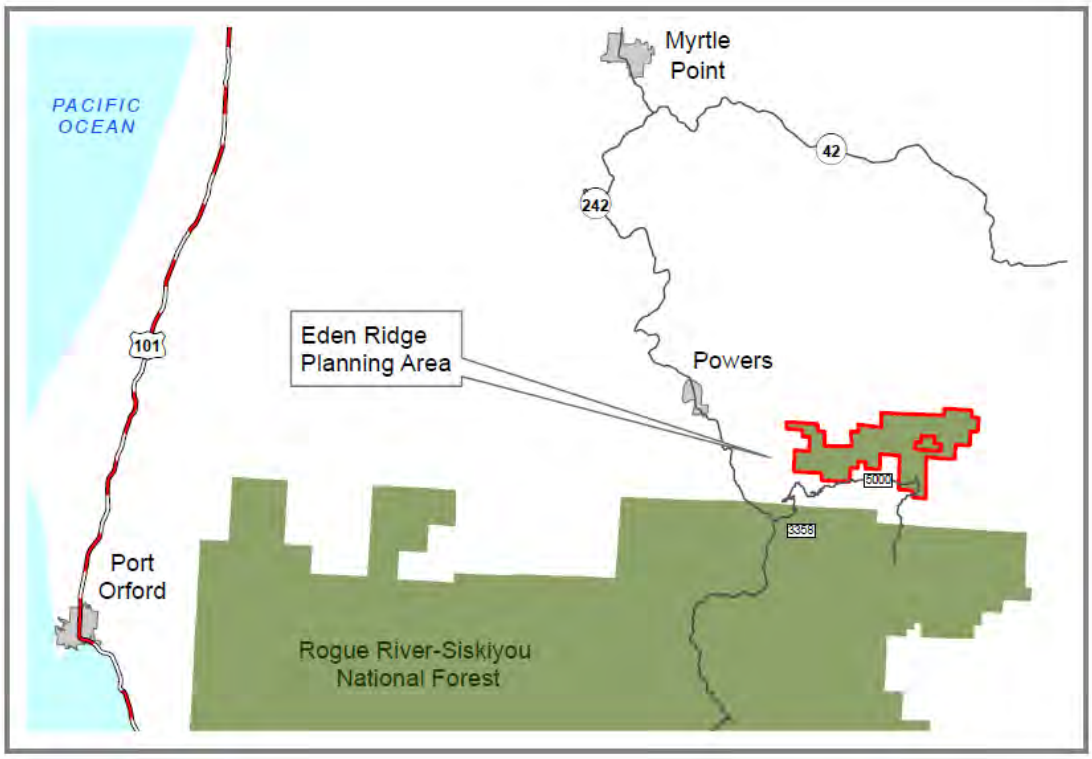


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DRAFT ENVIRONMENTAL IMPACT STATEMENT

EDEN RIDGE TIMBER SALES

Powers Ranger District
Rogue River-Siskiyou National Forest
Coos County, Oregon

March 2012

Lead Agency: USDA Forest Service
Rogue River-Siskiyou National Forest

Responsible Official: **Jennifer Eberlien**
Acting Forest Supervisor
Rogue River-Siskiyou National Forest

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Abstract:

The Powers Ranger District of the Rogue River-Siskiyou National Forest is proposing variable density thinning and other silvicultural treatments designed to control stocking and maintain or improve overall forest health and resiliency within the Eden Ridge Planning Area. Stand inventory records and walk-thru examinations have identified thousands of acres of regenerated conifer stands within the Eden Ridge Planning Area that were initiated by natural or artificial regeneration following clear-cut timber harvest in the 1930s through 1940s. The Eden Ridge Planning Area includes approximately 6,516 acres and is located approximately 4 air miles southeast of the city of Powers, Oregon at the closest point, with a legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon. Elevations range from 2,080 to 3,540 feet.

The Eden Ridge Planning Area has a unique history within Rogue River-Siskiyou National Forest lands. Originally included in the C.A. Smith Lumber and Manufacturing Company holdings, the Eden Ridge area played a role in the extensive logging history and economic development of Coos Bay and the surrounding county. This isolated piece was a part of the extensive logging history of the Coos Bay and southwest Oregon region which shipped lumber to San Francisco and beyond in the 1920s and 1930s. By the late 19th century, numerous small rail road lines, many with wooden rails, had been constructed to assist in transporting the timber and coal to the sea port at Coos Bay. Camps moved with the operations of logging and by 1936, a second camp at Doe Swamp (within the Planning Area) was in operation with a capacity of 400 men. This camp was run until 1941. As the logging operations drew to a close, much of the rail lines were removed and salvaged, but this Planning Area still shows the remains of the rail lines, camps and skid trails from this period of logging and aerial photographs taken in 1943 clearly show the effects of this logging activity.

During the Depression, many northwest timber owners would abandon cutover lands to reduce their tax burden. Instead of abandoning their lands to the county, in 1933 the Coos Bay Lumber Company proposed to convey their lands to the Forest Service. In return the Forest would extend their boundaries, and provide fire protection, to the lumber company lands. This agreement was made into Public Law 131 passed by Congress withdrawing the entirety of T31S R10 and 11W into the Siskiyou National Forest on June 10, 1935. The lands within the current Eden Ridge Planning Area were relinquished to the Siskiyou National Forest between 1938 and 1941.

The Powers Ranger District proposes timber harvest (variable density thinning) and other connected activities and actions on approximately 3,314 acres of second growth candidate stands within the Planning Area regenerated from timber harvest associated with historical railroad clear-cut logging. Currently, dense tree stocking conditions have developed in many stands as a result of stand growth leading to increased inter-tree competition for site resources essential for tree health, vigor, growth and development. Limited availability of site resources within these dense stands is resulting in environmentally stressed trees and vegetation. Additionally, there are two forest pathogens; Port-Orford-Cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*) affecting forest health in small portions of the Planning Area. Management records (that were found) show assessments of stocking/planting needs during WWII, or from 1939 to 1942. The stands that have been examined as well as the sampling of tree ages indicate that the trees are currently around 60 to 75 years old.

The overall ***Purpose*** of this project is to implement direction from the 1989 Land and Resource Management Plan for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan. The majority of the Eden Ridge Timber Sales proposal is on lands allocated to Matrix which emphasizes obtaining a full yield of timber within the capability of the land. Most scheduled timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands (NW Forest Plan, page C-39). Specifically for the Eden Ridge Timber Sales project, ***Needs*** include:

Improvement of Overall Forest Vigor and Resiliency – There is a need for tree stocking level control to reduce stand densities through intermediate harvest thinning treatments to sustain or increase tree growth and improve forest vigor and resiliency. Density management would release remaining trees from inter-tree competition for sunlight, water and soil nutrients when compared to untreated areas. Minor portions of the Planning Area infected with root diseases would be managed to harvest trees predisposed to pathogen infection and retain or plant resistant tree species to improve forest health. Older legacy (remnant) trees, minor conifer tree species (in portions of stands uninfected with root disease), hardwoods, existing snags and coarse woody debris would be retained where feasible to maintain or improve forest diversity. Post-treatment objectives are to develop a sustainable forest resilient to drought, wind, insects, disease, fire and other natural disturbances.

Contribution of Commercial Timber to the Probable Sale Quantity - Proposed candidate stands are primarily allocated to Matrix and contribute to the Rogue River-Siskiyou National Forest Probable Sale Quantity (PSQ). PSQ is the estimated output of commercial timber and other commodities assigned to the Forest under the 1994 Northwest Forest Plan. The ***Purpose*** of this action is to respond to the stated Needs.

The ***Significant Issues*** studied in the Draft EIS include: *Hydrologic Conditions; Water Quality; Cumulative Watershed Effects; Soils, Geology and Site Productivity; and Economics.* These Significant Issues serve as the basis for analyzing and comparing alternatives. While the Draft EIS focuses on the Significant Issues, all issues identified through scoping are considered and documented in the various resource analyses.

There are four ***alternatives considered in detail*** in the Eden Ridge Timber Sales EIS. These include Alternative 1 (No-Action), Alternative 2 (Proposed Action), Alternative 3, and Alternative 4. Alternative 1 is the No-Action alternative. It represents the current condition and is the basis for comparison of effects from implementation of the three Action Alternatives (Alternatives 2, 3 and 4). ***Alternative 2, the Proposed Action***, is designed to address and maximize attainment of the Purpose and Need. Alternative 2 also represents the maximum extent of proposed treatments and connected actions (e.g., harvest systems and roads). Connected actions include approximately 10.5 miles of new system road construction, approximately 12 miles of reconstruction and/or maintenance of existing system roads, and use of approximately 31 miles of existing system roads. Under the Proposed Action, harvest logging systems associated with commercial timber harvest would use a combination of ground-based or skyline operations depending on soil, slope and hydrological concerns. It is estimated the Proposed Action could produce approximately 50 million board feet of timber from the 3,314 acres being considered, from multiple timber sales over approximately five years.

Alternative 3 is similar to and is based on the Proposed Action, but differs from with modifications that include only "high-moderate benefit/low risk" new roads. In relation to Alternative 2, this modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative proposes helicopter logging systems, based on the change in access for conventional systems. Alternative 4 is also similar to and is based on the Proposed Action, but differs with modifications that include only the use (with some reconstruction and maintenance) of existing roads for treatment access (no new roads). This alternative also excludes some of the higher risk treatments within Riparian Reserves (primarily those associated with perennial streams). This alternative also proposes helicopter logging systems, based on the change in access for conventional systems.

Comments:

This DEIS is made available for a 45-day Comment Period, under the provisions of the National Environmental Policy Act (40 CFR 1506.10). The Forest Service will accept written, electronic and oral comments beginning on the day following date of publication of the notice of availability (NOA) in the Federal Register. This day is scheduled to be **March 30, 2012**. The Forest Service will respond to substantive comments received in an appendix to the Final EIS. Send responses to:

Jessie Berner, District Ranger
Powers Ranger District
42861 Highway 242
Powers, OR 97466-9700
Phone: (541) 439-6200
FAX: (541) 439-7704

Email responses to: **comments-pacificnorthwest-siskiyou-powers@fs.fed.us**

Important Notice:

Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record on this proposed action and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who only submit anonymous comments will not have standing to object to the subsequent decision under 36 CFR Part 215. Additionally, pursuant to 7 CFR 1.27 (d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under the FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets.

Reviewers should provide the Forest Service with their comments during the review period of the DEIS. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the Final EIS, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewer's position and contentions; Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the DEIS stage but that are not raised until after completion of the Final EIS may be waived or dismissed by the courts. City of Angoon v. Hodel, 803 F.2d 1016, 1022 (9th Cir. 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the DEIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

SUMMARY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

EDEN RIDGE TIMBER SALES

Powers Ranger District
Rogue River-Siskiyou National Forest
Coos County, Oregon

March 2012

This ***Summary*** is intended as a brief overview of the site-specific analysis documented in a Draft Environmental Impact Statement (DEIS). The purpose of the DEIS is to analyze and disclose the environmental effects associated with a Proposed Action and alternatives that would enact variable density thinning and other silvicultural treatments designed to control stocking and maintain or improve overall forest health and resiliency within the Eden Ridge Planning Area. This Summary does not present the depth of analysis contained within the complete text of the DEIS; please consult the complete text for further detailed information[1].

INTRODUCTION

The Powers Ranger District of the Rogue River-Siskiyou National Forest is proposing variable density thinning and other silvicultural treatments designed to control stocking and maintain or improve overall forest health and resiliency within the Eden Ridge Planning Area. Stand inventory records and walk-thru examinations have identified thousands of acres of regenerated conifer stands within the Eden Ridge Planning Area that were initiated by natural or artificial regeneration following clear-cut timber harvest in the 1930s through 1940s. The Eden Ridge Planning Area includes approximately 6,516 acres and is located approximately 4 air miles southeast of the city of Powers, Oregon at the closest point, with a legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon. Elevations range from 2,080 to 3,540 feet.

The Eden Ridge area has a unique history within the Rogue River-Siskiyou National Forest lands. This isolated piece was a part of the extensive logging history of the Coos Bay and southwest Oregon region which shipped lumber to San Francisco and beyond in the 1920s and 1930s. The tie to San Francisco drove the economic development of Coos Bay and the surrounding country by providing a market for the coal and timber of the area, as well as money to invest in developing the infrastructure to extract those resources. Isolated by the steep rugged coastal range, by the late 19th century, numerous small rail road lines, many with wooden rails, had been constructed to assist in transporting the timber and coal to the sea port at Coos Bay. The camps moved with the operations of logging and by 1936, a second camp at Doe Swamp (within the Planning Area) was in operation with a capacity of 400 men. This camp was run until 1941. As the logging operations drew to a close, much of the rail lines were removed and salvaged, but this Planning Area still shows the remains of the rail lines, camps and skid trails from this period of logging and aerial photographs taken in 1943 clearly show the effects of this logging activity.

During the Depression, many northwest timber owners would abandon cutover lands to reduce their tax burden. Instead of abandoning their lands to the county, in 1933 the Coos Bay Lumber Company proposed to convey their lands to the Forest Service. In return the Forest would extend their boundaries, and provide fire protection, to the lumber company lands. This agreement was made into Public Law 131 passed by Congress withdrawing the entirety of T31S R10 and 11W into the Siskiyou National Forest on June 10, 1935. The lands within the current Eden Ridge Planning Area were relinquished to the Siskiyou National Forest between 1938 and 1941.

[1] The format for this Summary is adapted from "Eight NEPA Questions" (8 questions any EA or EIS should readily answer), developed by Owen L. Schmidt, Attorney, formerly with USDA, OGC Portland OR.

WHY IS THE ACTION BEING PROPOSED?

The overall ***Purpose*** of this project is to implement direction from the 1989 Land and Resource Management Plan for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan. The majority of the Eden Ridge Timber Sales proposal is on lands allocated to Matrix which emphasizes obtaining a full yield of timber within the capability of the land. Most scheduled timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands (NW Forest Plan, page C-39). Specifically for the Eden Ridge Timber Sales project, ***Needs*** include:

Improvement of Overall Forest Vigor and Resiliency – There is a need for tree stocking level control to reduce stand densities through intermediate harvest thinning treatments to sustain or increase tree growth and improve forest vigor and resiliency. Density management would release remaining trees from inter-tree competition for sunlight, water and soil nutrients when compared to untreated areas. Minor portions of the Planning Area infected with root diseases would be managed to harvest trees predisposed to pathogen infection and retain or plant resistant tree species to improve forest health. Older legacy (remnant) trees, minor conifer tree species (in portions of stands uninfected with root disease), hardwoods, existing snags and coarse woody debris would be retained where feasible to maintain or improve forest diversity. Post-treatment objectives are to develop a sustainable forest resilient to drought, wind, insects, disease, fire and other natural disturbances.

Contribution of Commercial Timber to the Probable Sale Quantity - Proposed candidate stands are primarily allocated to Matrix and contribute to the Rogue River-Siskiyou National Forest Probable Sale Quantity (PSQ). PSQ is the estimated output of commercial timber and other commodities assigned to the Forest under the 1994 Northwest Forest Plan. The ***Purpose*** of this action is to respond to the stated Needs.

WHAT WOULD IT MEAN TO NOT MEET THE NEED?

To not meet the need is defined by the No Action Alternative. Under this alternative the agency would take no affirmative action (no change from current management or direction). The No-Action Alternative is required by Council of Environmental Quality regulations (4O CFR 1502.14(d)). The No-Action Alternative forms the basis for a comparison between meeting the project needs and not meeting the project needs. This alternative provides benchmark information for understanding changes associated with the Proposed Action and expected environmental responses as a result of past management actions. For Eden Ridge Timber Sales, this alternative constitutes that:

- Dense stands would rely on natural succession to control stocking and develop mature forests;
- Candidate stands would not be thinned to sustain or improve tree growth and contribute commercial timber commodities to the Forest's assigned PSQ;
- Areas infected with forest pathogens would continue to infect susceptible host trees and expand in size decreasing forest health from current conditions; and
- Existing Forest system roads would be retained with minimal changes to current conditions (e.g., road maintenance).

Under the No-Action alternative, candidate stands would continue to grow over time though inter-tree competition would increase for limited resources, especially light. Trees would grow taller as they strive to obtain sufficient sunlight, but diameter growth would slow in response to loss of crown and growing space. Trees would become less stable as they become more dependent on neighboring trees for support, increasing tree height to diameter ratios. Small diameter down wood would increase from stand self-thinning.

Untreated forest stands infected with laminated root rot, (*Phellinus weirii*) would become more susceptible to root disease infection due to the high percentage of host trees in candidate stands. This root disease extensively decays roots of susceptible host trees and either causes windthrow or mortality by destroying the tree's ability to take up water and nutrients (Hadfield et al., 1986). Windthrow is more common with laminated root rot than other root pathogens. Laminated root rot spreads by root contact between uninfected trees when living roots penetrate infected roots.

Landscape-level Port-Orford-cedar (POC) distribution is expected to decline as surrounding private timber company land is being managed for Douglas-fir regeneration. Dead and dying POC seedlings and saplings are present in roadside ditches and drainages. Infection by the exotic pathogen, *Phytophthora lateralis*, which causes POC root disease, is present on Eden Ridge. Restoring Port-Orford-cedar within its natural range by planting disease resistant POC seedlings in low risk areas for POC root disease and treated laminated root rot pockets would not occur.

WHAT ACTION IS PROPOSED?

The Forest Service has a Proposed Action when the agency agrees to move forward with the proposal to authorize, recommend, or implement an action (CFR 1508.23). The following is a summary of the Proposed Action.

The Proposed Action (Alternative 2) is discussed in detail in DEIS Chapter II. The Proposed Action would allow variable density thinning treatments designed to control stocking and maintain or improve overall forest vigor and resiliency via timber harvest and other connected activities on approximately 3,314 acres in stands that were initiated by natural or artificial regeneration following clear-cut timber harvest in the 1930s through 1940s via historical railroad logging. Candidate stands located on suitable forest land within the Planning Area are proposed for treatment that are designated as Matrix, with some amount of Riparian Reserve under the Land and Resource Management Plan as amended by the Northwest Forest Plan. Approximately seventy-five (75) treatment units would be designed for timber harvest with associated harvest systems that would use a combination of ground-based and skyline operations depending on soil, slope and hydrological concerns. Connected actions include approximately 10.5 miles of new system road construction, approximately 12 miles of reconstruction and/or maintenance of existing system roads, and use of approximately 31 miles of existing system roads. It is estimated the project could produce approximately 50 million board feet from the 3,614 acres being considered, from multiple timber sales over a 5-year period.

Other functions of the Proposed Action are to establish a framework that the Forest used to initiate the NEPA process, facilitate meaningful public comment, and serve as a basis for identification of the issues.

ARE THERE OTHER ALTERNATIVES THAT WOULD MEET THE NEED?

There are four *alternatives considered in detail* in the Eden Ridge Timber Sales DEIS. These include Alternative 1 (No-Action), Alternative 2 (Proposed Action), Alternative 3 and Alternative 4. Alternative 1 is the No-Action alternative. It represents the current condition and is the basis for comparison of effects from implementation of the three Action Alternatives (Alternatives 2, 3 and 4). *Alternative 2, the Proposed Action*, is designed to address and maximize attainment of the Purpose and Need. Alternative 2 also represents the maximum extent of proposed treatments and connected actions (e.g., harvest systems and roads).

The following table provides a comparison and summary of the actions associated with the *alternatives considered in detail:*

Table S-1. Alternative Comparison

	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Commercial Treatments				
Number of Units	0	75	65	53
Total Acres	0	3,314	3,240	3,058
Matrix Acres	0	2,217	2,187	2,093
Riparian Reserve Acres	0	1,097	1,053	965
Total Est. Volume MMBF	0	53	52	49
Activity Fuels Treatment Acres	0	1,600	1,145	1,300
Predicted Harvest Method				
Ground based Acres	0	2,119	1,786	1,441
Skyline Acres	0	1,195	941	457
Helicopter Acres	0	0	513	1,160
Non-Commercial Treatments	0	363 Acres	363 Acres	363 Acres
Roads				
New Classified (system) Road Construction Miles	0	10.81	4.45	0.25
Temporary Road Construction & Decommissioning Miles	0	0.29	0.03	0
Classified Road Use Miles	0	31.03	31.03	32.03
Classified Road Use & Maintenance Miles	0	5.50	5.50	5.50
Classified Road Use w/ Reconstruction Miles	0	6.07	4.09	1.74
Other Actions				
	None	All Action Alternatives include: snag creation, native grass/forb seeding, meadow restoration, stream enhancement, nest boxes		

WHAT ARE THE EFFECTS OF THE ALTERNATIVES?

This section summarizes environmental effects and consequences linked with implementing the Action Alternatives, or the No-Action Alternative, considered and analyzed in detail. The following discussion and tables portray outcomes for each alternative in regard to the attainment of Purpose and Need, Significant Issues, and Other Issues (see DEIS Chapter I).

Attainment of Purpose and Need
Candidate stands within Eden Ridge Timber Sales Project have been altered by railroad logging, tree planting and fire suppression. Proposed silvicultural treatments under the Action Alternatives would focus on stands with the greatest potential for treatment response and sustainable growth while avoiding lower site class and unsuitable areas, hardwood patches, and harvested sites functioning as late-successional habitat.

The Action Alternatives (Alternatives 2, 3 and 4), all would have similar attainment of the Purpose and Need; the difference between these alternatives is the amount of area treated. Alternative 2 (the Proposed Action) would treat the most acres (3,314). Alternative 3 would treat slightly less acres (3,240), and Alternative 4 would treat the least acres (3,058).

Accelerating the growth and sustainability of candidate stands through density management and forest health treatments to meet LRMP goals for lands allocated to Matrix is the primary objective for Eden Ridge Timber Sales. By accomplishing this objective, opportunities to meet other resource objectives may also be met (e.g., developing shade cover in riparian areas, providing habitat diversity for wildlife, etc.).

Expected Results of Treatments
Although these previously managed candidate stands are the result of regeneration harvest in the 1930s and 1940s, there is still a range of ages and conditions between stands. In general, these stands are overstocked and predisposed to tree mortality from inter-tree competition, disease and insects. Integrated silvicultural treatments are designed to facilitate sustainable tree growth, live crown development, resilience to disease and disturbance, enhance stand variability and species diversity. The following treatment strategies would provide a range of vegetative conditions across the Project Areas associated with candidate stands:

- Thinning prescriptions would emphasize variable density thinning to achieve stand growth and stocking objectives. Clumping trees, leaving untreated areas (skips), wide spacing around desirable trees (wide thin gaps), and creating openings to treat root disease (gaps) would be used in combination to develop site-specific silvicultural prescriptions. Retention of minor conifer species, hardwood species, unique trees having desirable characteristics (e.g., large branches, etc.) existing snags and down wood would also be incorporated.

- Portions of almost every candidate stand would not be thinned and harvested. Areas within the stands that would not be thinned and harvested would be identified on the ground during the layout process. The majority of the areas not treated would be stream buffers in accordance with Riparian Reserve design criteria, areas of geologic instability, inaccessible stands, and those portions of stands where the current health, vigor, and variable spacing of the conifer and hardwood vegetation is on a suitable trajectory toward attaining overall forest vigor and resiliency without the need for treatment.

- Post-harvest stand variability may be enhanced through the creation of snags and coarse woody material, and Port-Orford-cedar tree planting. Tree planting in created openings and underneath tree canopies of candidate stands would restore healthy, disease-resistant Port-Orford-cedar into the landscape and enhance structural and species diversity over the long term.

- Stand variability would also be enhanced by natural regeneration of conifers, hardwoods and brush species within and adjacent to treated stands.

Reducing the crown densities is a subordinate objective for this project. Given the proper degree of crown bulk density reduction, this chain can effectively be broken, causing the fire to drop back to the surface. Activity-generated fuels would be treated to result in at least pre-pretreatment levels. All treatments would retain the largest of the specimens in the stands. Larger trees are more fire resistant in nature because of their thicker bark and higher crown base height. The Action Alternatives would effectively reduce the potential for high severity, stand replacement wildfire.

Significant Issues as used in this environmental analysis are those that are used to evaluate alternatives, affect the design of component proposals, prescribe mitigation measures, and/or describe important and variable environmental effects. They are significant because of the extent of their geographic consequence, the duration of the effects, or the intensity of interest or resource conflict. Other Issues, as used in this analysis, differ from Significant Issues in that they often describe minor and/or non-variable consequences. The following tables briefly describe the consequences for each of the alternatives, in terms of Significant and Other Issues.

Table S-2. Comparison of Alternatives - Significant Issues

Significant Issues	Indicator	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)		Alternative 3		Alternative 4	
1 Hydrologic Conditions	**Thinning Acres by Subwatershed and Percent of Subwatershed Affected**							
	Coal Creek (9,952 acres)	0 / 0	1,760	(18%)	1,615	(16%)	1,427	(14%)
	Headwaters SF Coquille (40,233 acres)	0 / 0	585	(1.5%)	637	(1.6%)	642	(1.6%)
	Mill Creek (13,935)	0 / 0	33	(<1%)	33	(<1%)	33	(<1%)
	Myrtle Creek (20,028 acres)	0 / 0	172	(1%)	172	(1%)	172	(1%)
	Lower Rock Creek (25,544 acres)	0 / 0	765	(3%)	783	(3%)	783	(3%)
	Road Construction Miles by Subwatershed: Permanent System/Temporary							
	Coal Creek	0 / 0	6.61	0.29	1.87	0.03	0.25	0.0
	Headwaters SF Coquille	0 / 0	2.27	0.0	1.31	0.0	0.0	0.0
	Mill Creek	0 / 0	0	0.0	0.0	0.0	0.0	0.0
	Myrtle Creek	0 / 0	0.78	0.0	0.54	0.0	0.0	0.0
	Lower Rock Creek	0 / 0	1.15	0.0	0.68	0.0	0.0	0.0
	Road Density Increase by Subwatershed: (mi/sq mi)	***Existing***						
	Coal Creek	4.19	0.43		0.12		0.00	
	Headwaters SF Coquille	4.25	0.04		0.02		0.00	
	Mill Creek	3.94	0.00		0.00		0.00	
	Myrtle Creek	4.12	0.02		0.02		0.00	
	Lower Rock Creek	4.68	0.03		0.02		0.00	
	Permanent System Roads Crossing Riparian Reserve (Miles)	0.00	1.58		1.5		0.25	
	Temporary Roads Crossing Riparian Reserve (Miles)	0.00	0.17		0.03		0.00	
	Percent of Subwatershed Affected by Ground Based Yarding							
	Coal Creek	N/A	12 %		9.5 %		6.5 %	
	Headwaters SF Coquille	N/A	0.5 %		0.5 %		0.4 %	
	Mill Creek	N/A	<0.1 %		<0.1 %		<0.1 %	
	Myrtle Creek	N/A	0.3 %		0.2 %		0.2 %	
	Lower Rock Creek	N/A	2.5 %		2.3 %		2.3 %	
	Units (and roads) of Concern	N/A	214 acres within Coal Creek; Units 301, 302, 303, 304, 306, 307, 308, 309, 312, 315, 321, 338		149 acres within Coal Creek; Units 301, 302, 303, 306, 309, 312, 315, 321, 329		0 acres; Units 312 & 315 are helicopter	

Significant Issues	Indicator	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
2 Water Quality	**Water Temperature Increase**	No Change	• All of the road crossings are located on first and second order streams. These channels are only a few feet wide and have small discharges. • Sun exposure would be 100% blocked as water flows through the culvert. Exposure upstream and downstream of the culvert would occur over a few linear feet and would be reduced by adjacent forest canopy; this limited exposure is not enough to cause a measureable change in water temperature. • The largest watershed area above these crossings totals approximately 60 acres. Others are 30 acres or less. This presents very little drainage area to collect surface water to these crossings. Stream discharge from such small drainage basins is low, especially during the summer when ground water levels are lowest. • Skyline corridors would remove minor amounts of canopy in the primary shade zone where the corridor crosses perennial streams. Skyline corridors that cross Riparian Reserves are required to be 12 feet or less in width, and no less than 150' apart, and be utilized with full log suspension. Surrounding trees and understory would make shade loss resulting from these gaps in the canopy negligible.		
	Sediment Production/Increase in Turbidity	No Change	• Thinning would leave sufficient forest canopy to prevent large increases in storm runoff or snowmelt. • Minimally disturbed soils and understory vegetations would recover and anchor surface soils. • Thinning activities would occur in areas where streams and runoff amounts are both small. Units located along Coal Creek that are exceptions to these conditions have site specific mitigating measures designed to prevent or capture activity generated sediment. • No cut buffers in the stream bank protection zone and primary shade zone would act as capture and retention areas between stream courses and activity-generated, localized sediment sources. • Wet weather conditions would preclude hauling as per design criteria; road-generated sediment during wet conditions is the primary source of logging activity-generated sediment. • Less than 12% of the total harvest area is within Riparian Reserve. 7% of the Proposed Action harvest area is located in sensitive areas of the Coal Creek subwatershed; 5% of Alternative 3. All sensitive areas are excluded or harvested by helicopter under Alternative 4.		
3 Cumulative Watershed Effects	**Overall Risk of Adverse Cumulative Effects**	***Current Risk Rating (USDA 1993)***			
	Headwaters SF Coquille	Low	The Proposed Action would present no measureable increase in risk for adverse cumulative watershed effects in the Headwaters SF Coquille, Mill Creek, Myrtle Creek or Lower Rock Creek subwatersheds. This is due to: • The minor involvement of these subwatersheds in the Action Alternatives. • The location of units/roads at or near ridges and watershed divides where effects would be minimal.		
	Mill Creek	Moderate			
	Myrtle Creek	High			
	Lower Rock Creek	High			

Significant Issues	Indicator	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
3 Cumulative Watershed Effects	**Coal Creek**	Risk of adverse cumulative watershed effects in the Coal Creek subwatershed is currently High since the main channel is already in a degraded condition.	The addition of the proposed harvest acreage and road construction within this degraded subwatershed may contribute to additional risk of adverse effects; however, limited stand management could be conducted without increasing risk because the impacts would be limited to the site scale. The following conditions would allow containment of impacts to the local or unit level (site scale): • NFS lands contain hydrologically mature stands with large in-stream and upland wood present; this provides vegetative buffers that would counter increased runoff or sediment transport. • NFS lands are located mainly in the uplands where streams are small and discharges are low; risk of hydrologic impact from this portion of watershed is low. • The majority of the proposed units are located thousands of feet away from the main channel. • Proposed thinning is designed to enhance the growth and vigor of the stand by removing intermediate and suppressed trees. • Stream buffers and equipment limitations are designed to eliminate off-site impacts. Some proposed units are located in areas that have a greater potential for hydrologic impacts (see above). Their combined acreage is relatively small; however these units would present more risk of measurable impact than the rest of the project.		
4 Soils, Geology & Site Productivity	**Risk of Slope Failure**				
	Miles of New Classified and Temporary Road that Crosses Concern Areas	N/A	4.74	0.32	0.0
	Soil Productivity				
	Acres Taken Out of Productivity (Range Based on Est. Road Widths)	N/A	78 - 104	63 - 84	60 - 80
	Long-Term Opportunity For Erosion: Miles of System Road (New Construct/Reconstruct)	N/A	53.4	43.1	40.5
	Detrimental Disturbance (Acres)				
	Ground-based harvest system (est. 15%)	N/A	318	268	216
	Skyline harvest system (est. 5%)	N/A	60	47	23
	Aerial harvest system (est. 2%)	N/A	0	10	23
	Pile & Burn (est. 2%)	N/A	21	16	12
	Totals	N/A	399	341	274
5 Economics	**Volume by Logging System (MBF)**				
	Ground Based	0	33,933	28,718	23,170
	Skyline	0	19,197	15,102	7,350
	Helicopter	0	0	8,208	18,655
	Total Yarding Costs (Dollars)	0	$11,925,200	$13,622,788	$15,377,775
	Total Roading Costs (Dollars)	$62,000	$4,268,291	$3,508,096	$1,616,479
	Present Net Value (Dollars)	$-62,000	$322,501	$-957,615	$-1,707,714
	Benefit Cost Ratio	N/A	1.02	0.94	0.90

Table S-3. Comparison of Alternatives - Other Issues

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
1 Aquatic Conservation Strategy	**Response to NWFP S&Gs for Riparian Reserves (TM-1)**	N/A	The Purpose and Need is based on employment of silvicultural practices that are designed to control stocking, and acquire desired vegetation characteristics	Alternative 3 would treat Riparian Reserves in a similar manner as Alternative 2, on slightly less acres.	Alternative 4 would treat the fewest acres of Riparian Reserves. Stocking control would occur and desired vegetation characteristics would improve but not within untreated areas.
	Response to NWFP S&Gs for Riparian Reserves (RF 2-7)	N/A	Alternative 2 includes some new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may also be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has the most new road construction and has the greatest risk, based on the amount and location of certain roads.	Alternative 3 includes some new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may also be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has less new road construction and has minimal risk, based on the amount and location of proposed roads.	Alternative 4 does not include new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has the least risk, based on its design.
	Consistency with Aquatic Conservation Strategy Objectives	N/A	All Action Alternatives would be consistent with the 9 Aquatic Conservation Strategy Objectives and would not prevent attainment of Aquatic Conservation Strategy at the site, watershed or landscape scales.		
	Response to Key Watershed S&G (NWFP B-19) South Fork Coquille 5th Field	No Change	Alternative 2 would result no net increase in miles of roads within Key Watershed in compliance with this NWFP Standard and Guideline, due to the "road bank" of decommissioned road miles.	Alternative 3 has less new roads and would result no net increase in the miles of roads within Key Watershed due to the "road bank" of decommissioned road miles.	Alternative 4 has no new roads and would result no change in the miles of roads within Key Watershed.
2 Fire/Fuels	**Change in Fuel Loading and Fire Hazard**	No Change	All Action Alternatives would generate a short-term increase in fuels loading and the associated fire hazard within the units as created from activity-generated slash for approximately 5 years from date of harvest. Fuels treatment methods would include hand piling fuels concentrations, yarding of tops, and piling and burning landing slash. The long-term effect would be a return to natural conditions and improvement of defensible space along system roads.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
3 Air Quality	**Smoke Production**	N/A	The Action Alternatives could generate as much as 7.3 tons of PM, 5.4 tons of PM10, and 4.6 tons of PM2.5 per year, well below the thresholds defined in the National Ambient Air Quality Standards.		
	Impact on Coos Bay Area or Kalmiopsis Wilderness (Class 1 Airshed)	N/A	Burning would not take place within 38 miles of the Coos Bay area or within 30 miles of the Kalmiopsis Wilderness (Class I Area). Burning would not take place during the visibility protection period of July 1 to September 15. Therefore there are no expected adverse effects to air quality in either the Coos Bay area or Class I Area.		
4 Botanical Resources	**Effects to Threatened or Endangered Species**	N/A	There are no populations, nor is there any habitat for any federally listed Threatened or Endangered plant or fungi species within the Project Area. (No Effect)		
	Effects on FS Sensitive Species: Oregon Bensonia	No Change	For all Action Alternatives, avoidance of the bensonia populations is proposed so that direct and indirect effects are minimized to insignificant. (May impact individuals or habitat, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species)		
	Effects on FS Sensitive Fungi	No Change	Based on existing data and the regional Interagency Special Status and Sensitive Species Program (ISSSSP), Sensitive fungi may be present within the Project Areas but according to protocol, surveys were deemed impractical. (May impact individuals or habitat of Sensitive fungi, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to any population or species within its range)		
5 Invasive Plants	**Potential for Spread**	No Change	Project Design Criteria and Mitigation Measures are developed to avoid or mitigate the introduction and/or spread of invasive species; effects would be minimized to insignificant for all Action Alternatives.		
6 Port-Orford-cedar Root Disease	**Potential for Spread of *Phytophthora lateralis***	No Change	In areas proposed for timber harvest and road building, management practices and mitigation measures would be required for all Action Alternatives as described in the POC Risk Key assessment (EIS Appendix B, Port-Orford-cedar Report), consistent with the 2004 SEIS analysis and Forest Plan Amendment.		
7 Threatened Terrestrial Wildlife Species and Critical Habitat	**Effects to Late-successional or Old-Growth Forest or Spotted Owl Nesting, Roosting, Foraging Habitat (NRF)**	No change	There is an estimated 3,300 acres of proposed treatment acres that are best represented by the mature (21-32" dbh) forest habitat type, however these "mature" stands do not contain large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees, and are not considered late-successional forest. Further, based on historical records and stand examination, these stands are currently less than 80 years old. Any stand with a potential suitable habitat (remnant late-successional tree) component would be further assessed and if a late successional component is confirmed, that portion of the stand (or the entire stand) would be excluded from treatments. All Action Alternatives would not affect (or reduce) the current condition regarding late-successional or old-growth forest, in conformance with Standard and Guideline at Northwest Forest Plan C-44. A primary spotted owl recovery goal of the Revised Recovery Plan (USFWS 2011) is to conserve older stands that are either occupied or contain high-value spotted owl habitat. Stands meeting the definition for Recovery Action 32, as well as suitable Nesting, Roosting, Foraging (NRF) habitat within the Planning Area have been excluded from treatments.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
7 Threatened Terrestrial Wildlife Species and Critical Habitat	**Effects to Spotted Owl or Marbled Murrelet Critical Habitat Unit**	N/A	Critical habitat for the northern spotted owl was designated on 1 January 1992 (USDI FWS 1992). A revised designation of critical habitat was published in the Federal Register in August 2008 (USDI FWS 2008). Critical habitat for the northern spotted owl corresponds closely with those areas designated as Late-Successional Reserve in the Northwest Forest Plan. There is no Northern Spotted Owl Critical Habitat within the Eden Ridge Planning or Analysis Areas. (No Effect) Critical habitat for the marbled murrelet was designated in May 1996 (61 FR 102:26256-26320). The Eden Ridge Planning Area is within the known range (Area A) of the marbled murrelet; however, there is no designated marbled murrelet critical habitat within the Planning or Analysis Areas. (No Effect)		
	Effects to Spotted Owl Dispersal Habitat	No Change	The Action Alternatives would commercially treat and maintain up to 3,314 acres of spotted owl dispersal habitat and non-commercially treat up to 363 acres The resultant canopy closure (40-50%) and residual tree structure (the larger tree component) is likely to maintain the dispersal function of the treated stands. Because of the potential for disturbance to spotted owls, the Eden Ridge Timber Sales Project is considered "may affect, not likely to adversely affect" for the northern spotted owl (NLAA).		
	Effects to Marbled Murrelet	No Change	Marbled murrelet habitat would not be removed or degraded by the proposed activities under all Action Alternatives. Project Design Criteria would assure that no habitat would be removed. Because of the potential for disturbance to nesting marbled murrelets from implementation activities to unknown sites, a "may affect, not likely to adversely affect" determination is made for the marbled murrelet (NLAA).		
8 Forest Service Sensitive Terrestrial Wildlife Species & Habitats	**Effects to Sensitive Species within Range of Analysis Area**	No Change	All Action Alternatives would have "No Impact" for bald eagle, harlequin duck, Lewis' woodpecker, Townsend's big-eared bat, northwestern pond turtle, foothill yellow-legged frog, mardon skipper, and coronis fritillary because although within the species range, suitable habitat does not exist or species would not be affected by proposed actions.		
	Effects to Sensitive Species from Project Actions	No Change	All Action Alternatives "may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide" for the American peregrine falcon due to the potential for disturbance to individuals and potential limited adverse effects to prey species from treatments; for Pacific fisher because it could result in a reduction of denning, resting and foraging habitat; for fringed myotis because there may be some impacts to existing snags or trees with cavities; and for Johnson's hairstreak due to the removal of trees with mistletoe.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
9 Management Indicator Species	**Effect to MIS Species & Habitats: 1989 Forest Plan (pages IV-10 and 11)**	No Change	MIS and habitats include bald eagle (habitat along major rivers), osprey (habitat along large rivers), spotted owl (late-successional forest), pileated woodpecker and American marten (mature/interior forest), black-tailed deer and Roosevelt elk (early successional forest stages, and woodpeckers/cavity nesters (wildlife trees [snags]). Bald eagle and spotted owl are analyzed as Sensitive species. For the Action Alternatives, it is unlikely that potential nest trees would be removed or impacted. Therefore, a "No Impact" determination for osprey is made. This project is expected to have M - minimal impacts to pileated woodpecker but there is the potential that an occasional existing snag or tree with cavities may be impacted. The woodpecker group includes acorn, black-backed, downy, hairy, Lewis', and white-headed woodpeckers, as well as northern flickers and red-breasted sapsuckers. These species are generally associated with oak woodland, mixed forest, and/or grassland habitat types. Woodpeckers excavate nests in snags and trees. This project is expected to have M - minimal impacts to these species, but there is the potential that an occasional existing snag or tree with cavities may be impacted. Remnant trees, snags and down wood suitable for denning & resting would be retained, however some may be felled and retained. The project is considered M –"may affect some individuals or some habitat but effect is minimal" for American marten The Action Alternatives are considered M – "may affect some individuals or some habitat but effect is minimal" for blacktail deer and Roosevelt elk because of loss of thermal cover and adverse effects due to potential increased harassment from new and temporary roads. The increase in available forage would provide a beneficial effect.		
10 Rare and Uncommon Wildlife Species	**Survey and Manage**	No Change	The Eden Ridge Timber Sales Project meets 2006 Pechman Exemption a. because it entails no regeneration harvest and entails thinning only in stands less than 80 years old (USDI and USDA 2011) and do not require Survey and Manage surveys. The Eden Ridge Timber Sales Project applies the Survey and Manage species list in the 2001 ROD. There are 46 known Del Norte Salamander locations within the proposed units and one within a proposed non-commercial unit. All historical locations would be identified and given a protection buffer. All Action Alternatives are considered M –may affect some individuals or some habitat but effect is minimal. All Action Alternatives are considered M –may affect some individuals or some habitat but effect is minimal for Oregon red tree vole due to effects to potential red tree vole habitat. This project will have NI – No Impact to great gray owl because suitable nesting/foraging habitat does not occur within or near the Project or Planning Areas.		
	Protection Buffer Species	No Change	Species potentially in the Project Area include bats that use caves, mines, and abandoned wooden bridges and buildings. The project does not affect caves, mines, wooden bridges, or buildings, however a few large snags may be felled with this project (i.e., hazard trees). All Action Alternatives are M –may affect some individuals or some habitat but effect is minimal.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
11 Neo-tropical Migratory birds	**Effects to neo-tropical migratory birds/land bird focal species identified by Partners in Flight (PIF): Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington**	No Change	Effects to these species from the Action Alternatives are variable depending on the habitat associations of the individual species. Impacts to habitat for some species may occur from commercial thinning of mature and younger forests, hazard tree felling, landing clearing/temporary road construction. However, due to the limited amount of area affected by these projects, relative to the availability of habitats within the watersheds and forest, effects to neo-tropical migratory birds is expected to be (M) minimal.		
12 Aquatic Species & Habitats	**Effects to OC Coho and/or Critical Habitat (Essential Fish Habitat)**	No Change	The indirect and cumulative effects from the Action Alternatives would result in an overall non-measureable adverse sediment effect to Oregon Coast (OC) coho salmon and its critical habitat and OC steelhead on the Powers Ranger District. Thus, a "May Affect, Not Likely to Adversely Affect" determination is rendered for OC coho salmon, "No Effect" determination to OC coho salmon critical habitat, "Will Not Adversely Affect Essential Fish Habitat" for coho salmon or Chinook salmon and "May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for OC steelhead trout due to the non-measureable sediment delivery of the hauling and road maintenance activities.		
	Effects to Other Sensitive Aquatic Species	No Change	Action Alternatives would have "No Impact" to other Sensitive species including Pacific Coast chum salmon, inland redband trout, pit sculpin, western ridged mussel, Klamath rim pebblesnail, highcap lanx, scale lanx, robust walker, pacific walker, or the pristine springsnail because these species are not known to occur or have suitable habitat within proximity to any of the proposed activities.		
13 Thinning Shock & Windthrow	**Thinning Shock & Windthrow Potential**	N/A	Under all Action Alternatives, treatments include an overriding objective of leaving the larger residual stems within the entire stand; these trees would most likely be the healthiest and wind-firm. Thinning shock and windthrow are not expected to be a substantial concern due to consideration for feathering and special treatments along the edges of stands, leaving all hardwoods where possible, and thinning to a higher relative density as necessary to allow residual trees to become more wind firm.		
14 Other Undeveloped Areas	**Effects to Other Undeveloped Areas**	N/A	Analysis determined that there are no "unroaded areas" that contain roadless characteristics similar to inventoried roadless areas. Since there are no undeveloped areas, there is no cause/effect relationship that can occur regarding this issue.		
15 Heritage	**Effects to Historic Properties**	No Change	The three Action Alternatives all propose to convert some of the railroad grades to classified roads. Alternative 2 proposes to convert the most railroad grade to road with four miles reconstructed as road. Alternative 3 proposes three miles of railroad grade to be reconstructed as road. Alternative 4 proposes one mile of railroad grade to be reconstructed as road. Project area inventories and consultation under *Section 106 of the NHPA* will be completed prior to project implementation. Under all Action Alternatives, where avoidance of a significant cultural resource site is not possible, measures are developed to mitigate or limit the effects of the project. Where the loss of the site, or a portion of the site will occur, the loss can mitigated by data recovery or interpretation of the history of the site.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
16 Recreation/Human Safety	**Effects to Human Safety**	No Change	All Action Alternatives may affect recreationists during the short-term implementation phase from temporary road closures (for safety reasons), noise (chain saws, heavy equipment, and/or helicopters), smoke, and increased vehicle traffic. These effects would be mitigated and managed, and would not result in any long-term adverse effects.		
	Effects From Increased OHV Use	No change	OHV use has been limited to specific areas due to the nature of favorable conditions. New roads would not have the potential to develop a "loop system" as the roads would be constructed to access landing locations. These roads would be closed and rehabilitated after use (Maintenance Level 1 status); this status would not allow for OHV access. Mitigation measures would include: construction of water bars, scarification, scattering of slash and debris within disturbed areas, seeding and permanently barricading/closing the road entrance with native materials.		
	Attainment of Visual Quality Objectives	No change	All Action Alternatives would create a slight change in the visual character along many roads. Currently dense tree stands would be opened up through cutting and removal of generally small diameter trees resulting in a more open forest. All treatments and connected actions would be in compliance with Forest Plan Visual Quality Objectives for the allocations affected.		
17 Climate Change	**Effect on Climate Change from Project**	N/A	All Action alternatives were identified to have minor cause-effect relationships to greenhouse gas emissions or the carbon cycle, and were determined to be of such a minor scale at the global or even regional scale, that the effects would be meaningless to a reasoned choice among alternatives.		
	Effect on Project from Climate Change		No specific forest management recommendations have been published regarding global climate change and the impacts climate change may have on the desired outcomes of, and the potential impacts from, this project.		

CAN ADVERSE EFFECTS BE MITIGATED?

Specific mitigation measures and Project Design Criteria have been developed for the Action Alternatives analyzed in detail. These include appropriate measures a defined by NEPA Regulations at 40 CFR 1502.14(f) and 1508.20. Additional measures incorporated into the Action Alternatives emphasize applicable Best Management Practices (BMPs) and Forest-wide Standards and Guidelines. These mitigation measures would reduce, rectify, avoid, eliminate, and/or compensate the potential resource impacts as required by 40 CFR 1508.20. Mitigation measures common to all of the Action Alternatives are described in DEIS Chapter II.

WHAT FACTORS WILL BE USED IN MAKING THE DECISION BETWEEEN ALTERNATIVES?

In addition to and concurrent with attainment of Purpose and Need, the response of the alternatives in relation to the identified Significant and Other Issues will be used as important decision factors (see above). No one element of Purpose and Need or Issues will be used to make the decision, rather, they will be reviewed together with an assessment of tradeoffs to make the final decision, documented in a forthcoming Record of Decision, following the Notice, Comment, and Appeal Procedures for National Forest System Projects and Activities (36 CFR 215).

WHAT MONITORING IS NECESSARY?

Monitoring is a required element of all Action Alternatives and would be carried out according to a detailed Monitoring Plan for authorized use and/or development activities. This Monitoring Plan would be developed specifically to the activities contained in the final decisions, and be specific to the action(s) and area(s) where authorized actions would occur.

Project activities should be monitored during and after implementation of management actions to ensure that Project Design Criteria and mitigation measures are implemented as specified. Monitoring is also proposed to evaluate the effectiveness of planned activities, including standard practices and mitigation measures, in achieving desired outcomes.

WHICH ALTERNATIVE IS THE PREFERRED?

NEPA requires that the EIS identify the agency's Preferred Alternative or alternatives, if more than one exists. The "agency's preferred alternative" is the alternative (or alternatives) which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. The concept of the "agency's preferred alternative" is different from the "environmentally preferable alternative," (an element documented in a Record of Decision); although in some cases they may be both. A Preferred Alternative is identified so that agencies and the public can understand the agency's orientation.

The Forest Supervisor of the Rogue River-Siskiyou National Forest has not identified a specific alternative as the Preferred Alternative. Some form of action to obtain desired conditions with a high attainment of the stated Purpose and Need is desired; it is likely than some combination or "blend" of elements and connected actions contained within the Action Alternatives will become the preferred and final decision.

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LIST OF FREQUENTLY USED ACRONYMS AND ABBREVIATIONS

AC	Acre
ACS	Aquatic Conservation Strategy
APE	Area of Potential Effect
ATV	All Terrain Vehicle
BA	Basal Area
BA	Biological Assessment
BA	Basal Area
BE	Biological Evaluation
BLM	Bureau of Land Management
BMP	Best Management Practice
BO	Biological Opinion
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFPA	Coos Forest Protection Association
CHFT	Coastal Healthy Forest Treatments
CHU	Critical Habitat Unit
CWE	Cumulative Watershed Effects
dbh	diameter at breast height
DF	Douglas-fir
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ER	Eden Ridge
EFH	Essential Fish Habitat
FEIS	Final Environmental Impact Statement
FEMAT	Forest Ecosystem Management Assessment Team
FR	Federal Register
FS	Forest Service
FSEIS	Final Supplemental Environmental Impact Statement
FSH	Forest Service Handbook
FSM	Forest Service Manual
FVS	Forest Vegetation Simulator
FWS	Fish and Wildlife Service
GHG	Greenhouse Gas
GIS	Geographic Information System
IDT	Interdisciplinary Team
IMAP	Interagency Mapping and Assessment Project
IRA	Inventoried Roadless Area
ISSSSP	Interagency Special Status and Sensitive Species Program
KV	Knutson-Vandenberg Act
LOC	Letter of Concurrence
LRMP	Land and Resource Management Plan
LW	Large Wood
LWM	Large Woody Material
MA	Management Area
mbf	Thousand Board Feet
MBTA	Migratory Bird Treaty Act
MIS	Management Indicator Species
ML	Maintenance Level
MOU	Memorandum of Understanding
N	Nitrogen
NF	National Forest
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act

NFSL	National Forest System Lands
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRF	Nesting/Roosting/Foraging Habitat
NRHP	National Register of Historic Places
NRIS	Natural Resource Information System
NTMB	Neo-tropical Migratory Birds
NWFP	Northwest Forest Plan
OAR	Oregon Administrative Rule
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OR-OSHA	Oregon Occupational Safety and Health
OHV	Off-highway Vehicle
PAG	Plant Association Group
PCE	Primary Constituent Element
PDC	Project Design Criteria
PDCRR	Project Design Criteria-Riparian Reserves
PETS	Proposed, Endangered, Threatened & Sensitive
PIF	Partners in Flight
PL	*Phytophthora lateralis*
PM	Particulate Matter
POC	Port-Orford-cedar
PSQ	Probable Sale Quantity
PVT	Private
QMD	Quadratic Mean Diameter
R6	Region 6 (Pacific Northwest)
RARE II	Roadless Area Review and Evaluation II
RD	Relative Density
RM	River Mile
RMO	Road Management Objectives
RO	Regional Office
ROD	Record of Decision
RRSNF	Rogue River-Siskiyou National Forest
S&G	Standards and Guidelines
SAI	Sale Area Improvement Plan
SCS	Soil Conservation Service
SDI	Stand Density Index
SF	South Fork
SHPO	State Historic Preservation Office
SNF	Siskiyou National Forest
SO	Southern Oregon
SRI	Soil Resource Inventory
SSRA	Smoke Sensitive Receptor Area
SVS	Stand Visualization System
TES	Threatened, Endangered and Sensitive species
TMDL	Total Maximum Daily Load
tpa	trees per acre
TSZ	Transient Snow Zone
USDA	United States Department of Agriculture
USDI	United Stated Department of Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VDT	Variable Density Thinning
WA	Watershed Analysis
WQMP	Water Quality Management Plan
WTG	Wide-thin Gaps
YTA	Yard Tops Attached

EDEN RIDGE TIMBER SALES
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Powers Ranger District
Rogue River-Siskiyou National Forest

I. PURPOSE AND NEED

A. INTRODUCTION AND DOCUMENT STRUCTURE

The Forest Service has prepared a Draft Environmental Impact Statement (DEIS) for the Eden Ridge Timber Sales Project in accordance with the National Environmental Policy Act (NEPA) and the regulations for implementing the procedural provisions of NEPA (40 CFR parts 1500-1508; 36 CFR 220) as well as those requirements established by allied Federal environmental laws and regulations This DEIS discloses the direct, indirect, and cumulative environmental impacts that would result from implementation of the Proposed Action and other alternatives considered in detail. The document is organized into five parts (Chapters) and Appendices:

- ***Purpose and Need:*** Chapter I includes information on the background of the Planning Area and project proposal, the purpose of and need for the project, and a summary of the agency's proposal for achieving that Purpose and Need. This Section also discusses applicable land management direction and the framework for the responsible official's decision. This Section identifies how the Forest Service informed the public of the proposal and how the public responded. Issues are introduced and an explanation as to how they are used in this environmental analysis is provided.

- ***Alternatives:*** Chapter II provides a more detailed description of the agency's Proposed Action as well as alternatives for achieving the stated Purpose and Need (including a No-Action Alternative). These alternatives were developed based on Issues raised by the public and other agencies. This discussion also includes Project Design Criteria and Mitigation Measures applicable to the alternatives that propose action. Finally, this Section provides a summary and comparison table for each alternative considered in detail.

- ***Affected Environment and Environmental Consequences:*** Chapter III describes the environmental effects of implementing the Proposed Action and alternatives. This analysis is organized by the Significant and Other Issues, as identified in Chapter I. Within each Section, the affected environment background, current conditions, and effects mechanisms are described first, followed by the consequences of the No-Action Alternative that provides a baseline for evaluation and comparison of the other alternatives. Also included is a discussion of the attainment of Purposed and Need, and discussions on Other Effects, Laws, Regulations and Executive Orders.

- ***Consultation and Coordination:*** Chapter IV provides a list of preparers and agencies consulted during the development of the DEIS. It provides a summary of the responsibilities for project leadership, and resource specialists with input into the preparation of this document and other agency personnel who provided data, review, and/or information. The names of the agencies, organizations, and individuals who were provided copies of the DEIS is also identified.

- ***References:*** Chapter V of this document provides a list of sources of information, literature and data used to prepare this DEIS.

- ***Appendices:*** Information in support of design elements and analyses presented in the DEIS, as well as detailed specialist reports and interdisciplinary team input. The Appendices include a copy of the **Corrected Notice of Intent** (NOI for DEIS: to be replaced with Response to Comments in Final EIS), **Preliminary Silvicultural Diagnosis and Port-Orford-cedar Reports,** a **Hydrology Report**, a **Geology and Soils Report, a Fire/Fuels and Air Quality Report,** a **Botanical Resources Report,** a **Wildlife Report and Biological Evaluation**, an **Aquatic Biota Report and Fisheries Biological Evaluation**, a **Transportation and Logging Systems Report**, and a **Heritage** (Cultural Resource) **Report**. These reports are incorporated by reference to the body of this DEIS document.

B. BACKGROUND

The Eden Ridge Planning Area (MAP I-1) includes approximately 6,516 acres and is located approximately 4 air miles southeast of the city of Powers, Oregon at the closest point, with a legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon. Elevations range from 2,080 to 3,540 feet. The term **Planning Area** is used to describe the overall area of consideration that was reviewed for the development of treatment opportunities.

The Powers Ranger District of the Rogue River-Siskiyou National Forest is proposing variable density thinning and other silvicultural treatments designed to control stocking and maintain or improve overall forest health and resiliency within this Planning Area. Stand inventory records and walk-thru examinations have identified thousands of acres of regenerated conifer stands within the Eden Ridge Planning Area that were initiated by natural or artificial regeneration following clear-cut timber harvest in the 1930s through 1940s[1].

Eden Ridge Planning Area falls within the **South Fork Coquille River** and the **Middle Fork Coquille River 5th-Field watersheds**, and the (Lower) Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River (Wooden Rock Creek), Coal Creek, and Mill Creek 6th field watersheds (see MAP I-2).

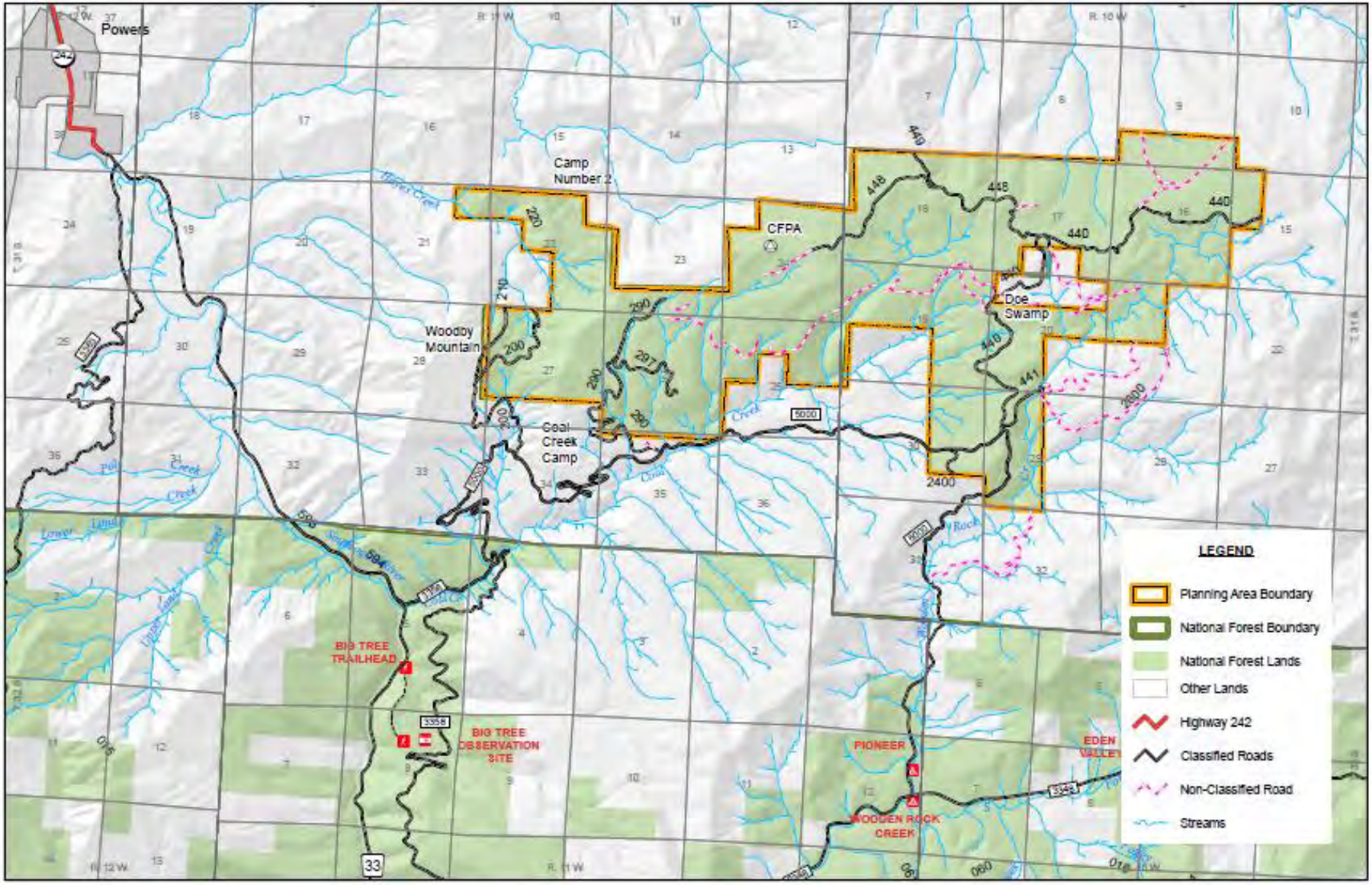
Watershed Analyses have been conducted within these drainages and contain a synthesis of scientific knowledge about watershed trends and conditions at 5th field watershed scales as well as by smaller 6th field subwatersheds.

Historical Background

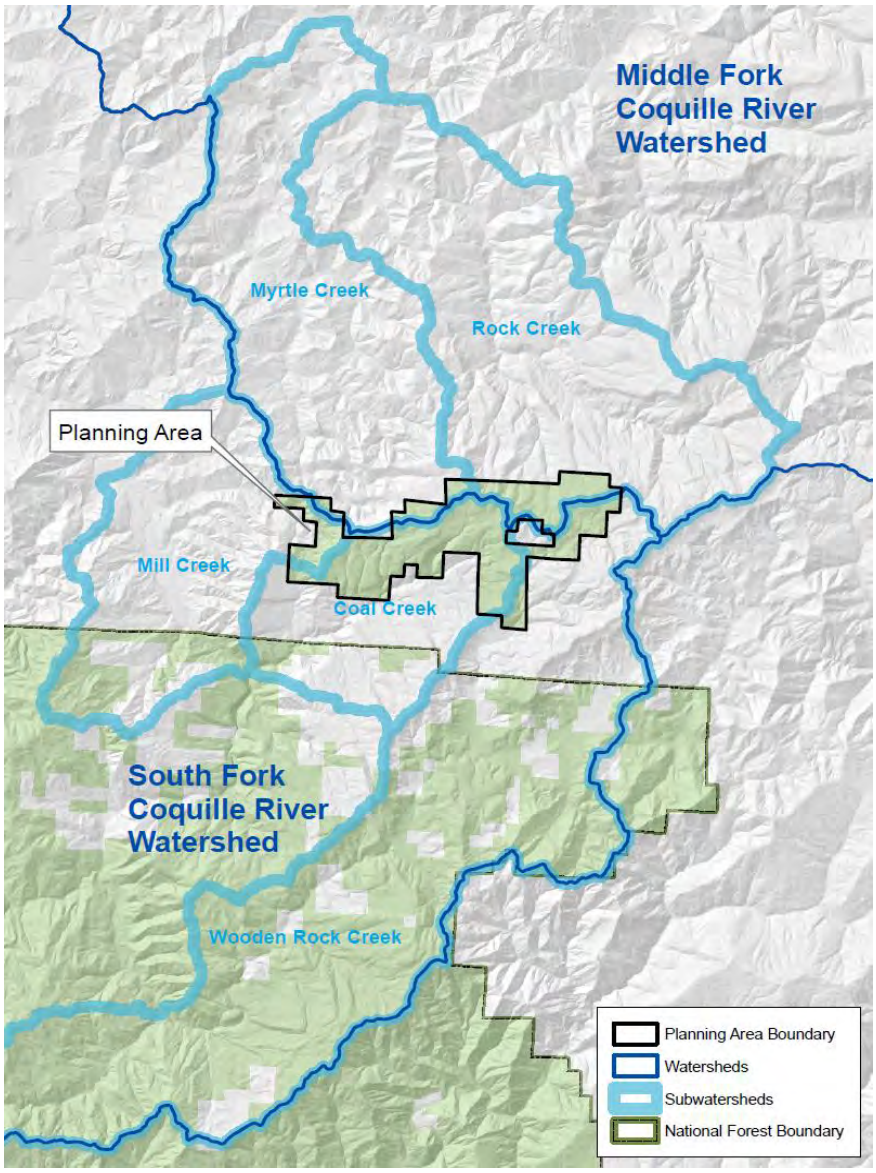
The Eden Ridge Planning Area has a unique history within Rogue River-Siskiyou National Forest lands. Originally included in the C.A. Smith Lumber and Manufacturing Company holdings, the Eden Ridge area played a role in the extensive logging history and economic development of Coos Bay and the surrounding county. From the early days of Coos County, the area has been relatively isolated from the rest of Oregon by the steep range of coastal mountains. Coos Bay, a natual harbor, provided access to the rapidly expanding markets in California through the ports of the San Francisco Bay.

[1] The original Notice of Intent (April 26, 2010) stated that regeneration occurred between the 1920s and 1930s. Further research and review of stand examinations and field inventories have identified that all stands being considered for treatment with this project are currently 80 years old or less, having been regenerated during the 1930s through 1940s, after historical railroad logging.

MAP I-1. Eden Ridge Planning Area



MAP I-2. Planning Area; Watersheds, and Subwatersheds



By the late 19th century, numerous small rail road lines, many with wooden rails, had been constructed to assist in transporting the timber and coal to the sea port at Coos Bay. The longest and best known of these short rail lines was the Coos Bay, Roseburg and Eastern Railroad and Navigation Company line which ran from Marshfield to Myrtle Point by 1893. This 28 mile long stretch of railroad accessed the Beaver Hill coal mines, as well as the virgin stands of Douglas-fir and Port-Orford-cedar. While most of the smaller lines were eventually abandoned, the Coos Bay, Roseburg and Eastern Railroad and Navigation Company line was purchased by Southern Pacific in 1906. Early plans to connect the line to the Willamette Valley were finally realized 10 years later when the Willamette Pacific Railroad was completed from Eugene to Coos Bay, introducing Coos Bay to the world. While coal was no longer so important, the rails still provided a means to move the timber to sawmills and markets outside the area.

While there were numerous small sawmills around Coos Bay from the mid 19th Century, a new era of logging came about when Charles Axel Smith, a Minnesotan logging entrepreneur, began to move his operations to Coos Bay. Drawing many experienced lumber men from Minnesota with him to Oregon, Smith partnered with Albert Powers, an experienced lumberman and railroad logger he had worked with in Minnesota.

Powers generally operated the woods side of the business, while Smith ran the seafaring and marketing operations. By 1908, Smith had built the largest electric mill in the world and began to acquire the logs to process there and ship out to San Francisco and beyond. By 1912, they needed to move farther afield from Coos Bay to gain access to new timberlands requiring the extension of the Coos Bay, Roseburg and Eastern Railroad and Navigation Company south past Myrtle Point to the Waggoner Ranch, which would eventually become the company town of Powers, named after Albert Powers. Powers would be the site of extensive logging for several years once the railroad had been completed in 1915. By 1916, they began to extend the rail lines beyond Powers into Salmon Creek, the South Fork of the Coquille River, and the Eden Ridge area. These areas would provide the timber for one of the largest railroad logging operations of its time.

Constructed between 1916–1924, much of this rail line was characterized by log trestles which could provide a relatively straight and level rail way without the expense of excavating the railroad grades. The line to Eden Ridge included a long incline up the steep slopes to access the ridge above and by 1919, Camp 2 was in operation just within the current Eden Ridge Planning Area.

Earlier, during the Great War, the loggers were aided by military units in order to access the timber needed for building the airplanes and ships used in the war. After the war, the prices and demand for timber fell causing the failure of Smith's overextended businesses and in 1922 the company was reorganized. Logging operations continued although in 1928 the Coos Bay Lumber Company sold the Salmon Creek railroad along with timber lands in the Sixes River to the Port Orford Cedar Products Company of Coos Bay.

The camps moved with the operations of logging and by 1936, a second camp at Doe Swamp (within the Planning Area) was in operation with a capacity of 400 men. This camp was run until 1941 and the Coal Creek Camp took over near the switchbacks and operated until the mid 1950s when it was relinquished to the Forest Service by Georgia Pacific. As the logging operations drew to a close, much of the rail lines were removed and salvaged, but this Planning Area still shows the remains of the rail lines, camps and skid trails from this period of logging. Aerial photographs taken in 1943 clearly show the effects of this logging activity.

The Siskiyou National Forest was established on October 5th in 1906 by proclamation and acquired all of the Coquille National Forest (established by Public Proclamation in 1907) in 1908. At that time it did not include the lands known as the Eden Ridge Tract that comprise this Planning Area. During the Depression, many northwest timber owners would abandon cutover lands to reduce their tax burden. Instead of abandoning their lands to the county, in 1933 the Coos Bay Lumber Company proposed to convey their lands to the Forest Service. In return the Forest would extend their boundaries, and thereby provide fire protection to the adjacent lumber company lands.

This agreement was made into Public Law 131 passed by Congress withdrawing the entirety of T31S R10 and 11W into the Siskiyou National Forest on June 10, 1935. The lands within the current Eden Ridge Planning Area were relinquished to the Siskiyou National Forest between 1938 and 1941, but no other lands were conveyed to the forest under this agreement. In 1958, Public Land Order 1610 revoked the earlier law and the northern Siskiyou National Forest boundary was returned to its earlier location, with the exception of the Eden Ridge area. (compiled by K. Hauge, 2011)

At the time the Eden Ridge area was extensively clear-cut railroad logged; future forest management may not have been not a concern, so stands were left to regenerate naturally. The area, probably covered in slash, burned as the fire hazard was likely very high. Brush could have been a major component for 15 to 20 years after logging. Eventually, conifer and hardwoods overtopped the brush and the shrubs died back.

Current Conditions
Today the stands are still in transition to fewer hardwoods and the dominant conifers are out-competing other conifers. Management records (that were found) show assessments of stocking/planting needs during WWII, or from 1939 to 1942. The stands that have been examined as well as the sampling of tree ages indicate that the trees are currently around 60 to 75 years old (Crum, pers. com.)

Currently, dense tree stocking conditions have developed in many stands as a result of stand growth leading to increased inter-tree competition for site resources essential for tree health, vigor, growth and development. Limited availability of site resources within these dense stands is resulting in environmentally stressed trees and vegetation. Additionally, there are two forest pathogens; Port-Orford-Cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*) affecting forest health in small portions of the Planning Area.

C. PURPOSE AND NEED FOR ACTION

The overall *Purpose* of this project is to implement direction from the 1989 Land and Resource Management Plan for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan. The majority of the Eden Ridge Timber Sales proposal is on lands allocated to Matrix which emphasizes obtaining a full yield of timber within the capability of the land. Most scheduled timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands (NW Forest Plan, page C-39). Specifically for the Eden Ridge Timber Sales project, ***Needs*** include:

Improvement of Overall Forest Vigor and Resiliency – There is a need for tree stocking level control to reduce stand densities through intermediate harvest thinning treatments to sustain or increase tree growth and improve forest vigor and resiliency. Density management would release remaining trees from inter-tree competition for sunlight, water and soil nutrients when compared to untreated areas. Minor portions of the Planning Area infected with root diseases would be managed to harvest trees predisposed to pathogen infection and retain or plant resistant tree species to improve forest health.

Older legacy (remnant) trees, minor conifer tree species (in portions of stands uninfected with root disease), hardwoods, existing snags and coarse woody debris would be retained where feasible to maintain or improve forest diversity. Post-treatment objectives are to develop a sustainable forest resilient to drought, wind, insects, disease, fire and other natural disturbances.

Contribution of Commercial Timber to the Probable Sale Quantity **-** Proposed candidate stands are primarily allocated to Matrix and contribute to the Rogue River-Siskiyou National Forest Probable Sale Quantity (PSQ). PSQ is the estimated output of commercial timber and other commodities assigned to the Forest under the 1994 Northwest Forest Plan.

The ***Purpose*** of this action is to respond to the stated Needs. Specific stand management objectives associated with the Purpose and Need for this proposal include:

- Maintenance or improvement of forest health and diversity within Matrix and Riparian Reserve land allocations through density management treatments; This typically means individual tree and overall stand diameter growth, crown development, vigor and overall stand health, improved root strength on residual trees;
- Improve habitat conditions for wildlife and fish. This means increasing vegetative and structural diversity and species; maintained or improved shading capability of streams; improved large wood retention and large wood recruitment, and providing suitable amounts of snags and/or replacement habitat for dependent species;

- Reduce the risk of effects from insect and disease infestations;
- Minimize or reduce the potential for high severity, stand replacement wildfires;
- Increase riparian vegetation quality, health and vigor; and
- Contribute to a predictable and sustainable level of timber commodities with human and economic dimensions.

In enacting treatments in stands to attain these objectives, the project and/or its activities would be designed to:

- Minimize soil impacts (erosion, compaction and/or displacement);
- Minimize damage to residual trees during treatment;
- Maintain aquatic conditions in terms of attainment of Aquatic Conservation Strategy Objectives;
- Minimize adverse effects, including cumulative effects, on all other resources;
- Provide wood products for local and regional markets (including firewood); and
- Be an operational and economically sustainable project.

D. PROPOSED ACTION

The action proposed by the Forest Service to meet the Purpose and Need is variable density thinning and other silvicultural treatments designed to control stocking and maintain or improve overall forest vigor and resiliency from within portions of the 6,516-acre Eden Ridge Planning Area. Commercial timber harvested from stand treatments would contribute to the Forest's Probable Sale Quantity.

Candidate stands located on suitable forest land within the Planning Area are proposed for treatment that are designated as Matrix and Riparian Reserve under the Land and Resource Management Plan as amended by the Northwest Forest Plan. Additionally, treatments would include management of two forest pathogens; Port Orford cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*) affecting forest health in small portions of the Planning Area. Within candidate stands, the more abundant species are Douglas-fir and western hemlock.

The Powers Ranger District specifically proposes timber harvest and other connected activities and actions on approximately 3,314 acres of second growth candidate stands within the Planning Area from timber harvested in the 1920s through 1930s, and regenerated in the 1930s through 1940s. The original Notice of Intent (April 26, 2010) stated that approximately 3,650 acres would be treated under the Proposed Action. This estimate (as disclosed in the corrected Notice of Intent [January 18, 2012]) has been refined downward and now includes 3,314 acres of commercial treatments. Likewise, the number of commercial units has been refined to now include 75 units. An additional 363 acres are proposed for non-commercial density management.

The original Notice of Intent stated that approximately 8 miles of new system road construction, and/or construction of new temporary roads to facilitate treatments would be considered. Based on field reconnaissance, this estimate has been refined and now includes (corrected Notice of Intent) approximately 10.5 miles of new system road construction, approximately 12 miles of reconstruction and/or maintenance of existing system roads, and use of approximately 31 miles of existing system roads.

Under the Proposed Action, harvest logging systems associated with commercial timber harvest would use a combination of ground-based or skyline operations depending on soil, slope and hydrological concerns.

It is estimated the Proposed Action could produce approximately 50 million board feet from the 3,314 acres being considered, from multiple timber sales over approximately five years. This project (and its analysis under the National Environmental Policy Act) is **not** being authorized as a project under the Healthy Forest Restoration Act (HFRA) of 2003.

Chapter II of this EIS contains more detail on the proposed treatments, connected actions including roads, logging systems, and other actions that are associated with the Proposed Action.

E. DECISION FRAMEWORK

This EIS is not a decision document. Its main purpose is to disclose and allow public comment on the consequences that could result from implementation of the Proposed Action or alternatives to that action. Should an action alternative be selected, certain decisions will be documented in a forthcoming Record of Decision. Accordingly, the EIS focuses on providing analysis sufficient to make the following Federal decisions:

- Which, if any, of the proposed ecosystem management proposals will the Forest Service implement and under what conditions?
- What design elements, mitigation and monitoring measures will be required if an action alternative is selected?

The Responsible Official (the Decision Maker) for this analysis and forthcoming decision is the Forest Supervisor, Rogue River-Siskiyou National Forest[2]. The District Ranger(s) for Powers have led the analysis, guided the interdisciplinary team, and coordinated the public involvement process.

In addition to consideration of attainment of Purpose and Need, the response of the alternatives in relation to the identified Significant and Other Issues will be used as important decision factors. No one element of Purpose and Need or Issues will be used to make a decision; rather, they will be reviewed together with an assessment of tradeoffs to make the final decision.

F. MANAGEMENT DIRECTION

For this portion of the Rogue River-Siskiyou National Forest (RRSNF), Land management direction is contained in the Siskiyou National Forest (SNF) Land and Resource Management Plan (USDA Forest Service 1989) as amended by the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management, 1994).

The Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, is now commonly known as the **Northwest Forest Plan** (NWFP). This ROD, jointly signed by the Secretaries of Agriculture and Interior, amended the Siskiyou National Forest Land and Resource Management Plan (**LRMP or Forest Plan**) and other existing plans within the range of the northern spotted owl. This amendment, which became effective on May 20, 1994, provided additional goals, objectives, standards, and guidelines for resource management. It added several new land allocations, each with its own set of Standards and Guidelines. These land allocations overlay and merge with the allocations from the 1989 SNF LRMP.

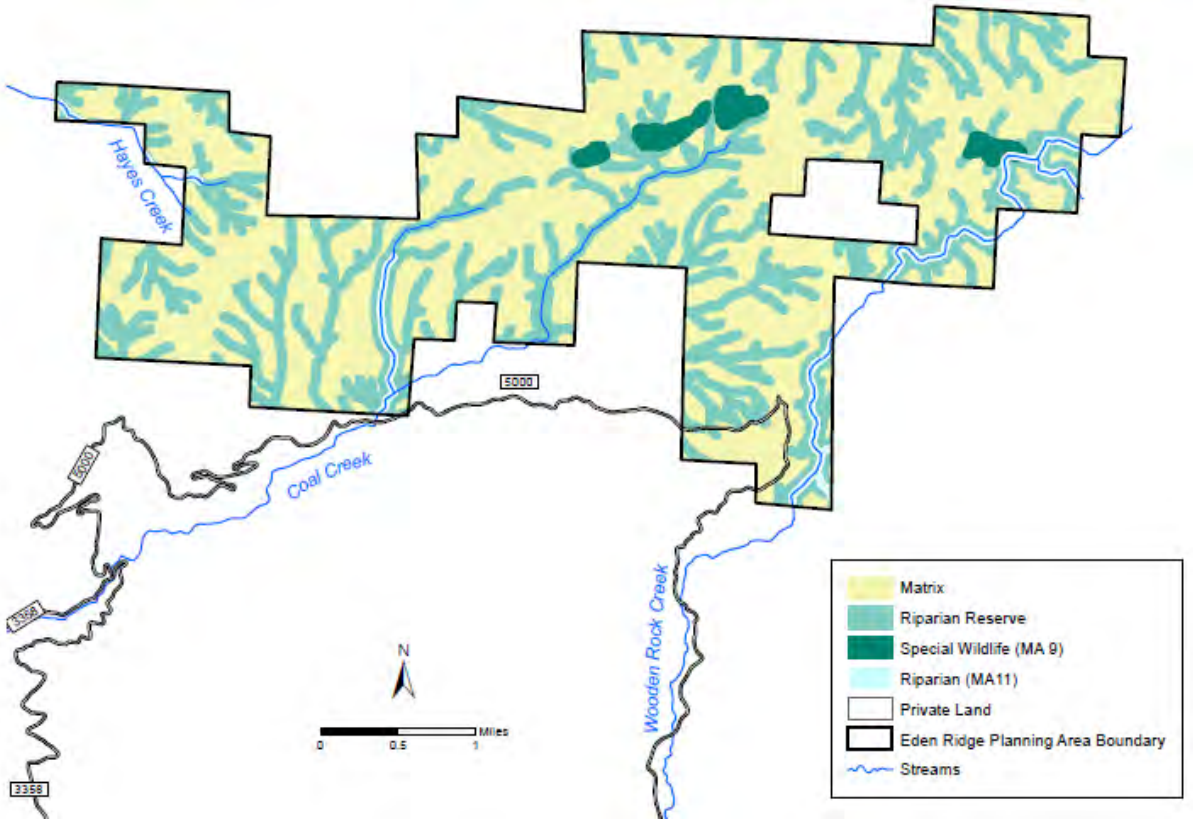
[2] This was changed in the January 18, 2012 corrected Notice of Intent, to the Forest Supervisor from the District Ranger, as published in the original (April 26, 2010) Notice of Intent.

Pursuant to CEQ 1502.20, this EIS is tiered to the Final Environmental Impact Statement and Record of Decision (ROD) for the Siskiyou National Forest Land and Resource Management Plan as amended by the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl*. The direction in the Northwest Forest Plan supersedes the SNF LRMP allocations where it is more restrictive or provides greater benefits to late-successional ecosystems. Direction from the SNF Forest Plan is retained where it is more restrictive or is unaffected by the Northwest Forest Plan.

This document is also tiered to the FEIS and Record of Decision and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon, Siskiyou National Forest (March 2004).

The Eden Ridge Planning Area contains four Management Allocations/Prescriptions (see MAP I-3). A brief description of applicable Management Allocations/Prescriptions is provided below. More detailed descriptions can be found in the Northwest Forest Plan, and the Siskiyou National Forest Land and Resource Management Plan, as amended by the Northwest Forest Plan.

MAP I-3. Eden Ridge Planning Area Land Allocations/Prescriptions



1. MATRIX

This allocation emphasizes obtaining a full yield of timber within the capability of the land. Most scheduled timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands (NWFP, page C-39). Matrix lands allocated under the NWFP that include all areas not otherwise designated to a more protective status under the LRMP. The Eden Ridge Planning area primarily includes lands allocated to Matrix, as carried forward from the 1989 LRMP as General Forest Prescription (Management Area 14).

2. RIPARIAN RESERVE

An estimated 2,600 acres of the Eden Ridge Timber Sales Planning Area are managed as Riparian Reserves. As allocated under the NWFP, Riparian Reserve includes lands along all streams, lakes, ponds, wetlands, unstable areas, and potentially unstable areas that are subject to special Standards and Guidelines designed to conserve aquatic and riparian-dependent species. The NWFP establishes a minimum protection buffer equal to the height of one site-potential tree, along each side of the riparian feature, which in the case of the Eden Ridge Timber Sales Project, is 175 feet. For perennial fish-bearing streams this distance is two site-potential trees (or 350 feet).

Standards and Guidelines emphasize prohibiting or regulating activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives (NWFP, page C-31). Under the Aquatic Conservation Strategy (ACS), Riparian Reserves are used to maintain and restore riparian structures and functions of perennial and intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of watersheds (NWFP page B-9).

Vegetation management within Riparian Reserves shall apply silvicultural practices to control stocking, reestablish and manage stands, improve vegetative health, and acquire vegetation characteristics needed to attain ACS objectives. Thinning within Riparian Reserves and within some candidate stands is proposed, based on field reconnaissance. Further investigation during implementation may identify Riparian Reserves that are currently fully functioning and not in need of thinning treatments. There are likely to be intermittent or perennial streams not yet identified. These areas would need to be identified through additional field reconnaissance and mapped in GIS. Some, all or none of these Riparian Reserves may need vegetative treatment to maintain or improve their function in accordance with the ACS.

Standards and Guidelines apply to activities in Riparian Reserves that may otherwise retard or prevent attainment of ACS Objectives, as defined in the 1994 Northwest Forest Plan. Standards and Guidelines for Key Watersheds and Riparian Reserves are found in Attachment A to the ROD for the Northwest Forest Plan. **The South Fork Coquille River is designated as a Tier 1 Key Watershed.**

Management Prescription MA-11 - Riparian
The SNF Forest Plan allocation of "Riparian" (Prescription MA-11) is now included within the Northwest Forest Plan Riparian Reserves allocation; it was generally less restrictive and included less area than does Riparian Reserve as now designated. As stated in the SNF LRMP page IV-125:

> "This prescription applied to the riparian ecosystem along all perennial streams (Class I, II, and Ill). The minimum area of consideration is 100 feet measured horizontally from each side of the stream. The actual width of the riparian zone is determined on the ground and varies based on site-specific conditions. The expected average distance of consideration for Class I and II streams is 150 feet. Within this Management Area there are three prescription themes that are assigned to individual Planning Basins. Two include multiple uses with the emphasis on watershed and fisheries values and limited timber production. Prescription B is designed to manage vegetation to maintain water temperature. Prescription C manages vegetation to reduce water temperature and improve watershed conditions over time. The third prescription is Minimum Level (M) which programs no timber harvest that would remove stream shade producing vegetation."

The Eden Ridge Timber Sales Project is contained within the "South Fork Coquille Planning Basin" (SNF LRMP page IV-124), and is assigned Prescription B (SNF LRMP page IV-125). Timber Standard and Guideline MA 11-5 (SNF LRMP page IV-127) states:

"Timber management is programmed at a level that will provide for maintaining the stream temperatures without significant increase in critical summer temperatures. Management activities may include the following: commercial harvest, site preparation, planting, release, and precommercial thinning.

To provide canopy cover for stream shading and large conifers for wildlife and stream habitats; the basal area of conifers should be maintained at or above 70 percent of natural conditions along Class I and II streams, and 30 percent along Class Ill streams. Harvest shall be done in such a way that damage to remaining streamside vegetation is minimized. Priority should be given to planting vegetation along shade-deficient stream channels. Directional falling and full suspension should be required within the streamside area.

The project level environmental analysis shall examine the cumulative effects of both past and future treatments. No more than 11 percent of the Riparian Area acreage within each planning basin shall be entered on a first entry basis per decade. Harvest units shall be distributed within each basin, and subsequent reentries per site should not occur within 20 years."

The Eden Ridge Timber Sales Project would only have harvest activities that are designed to improve conditions within areas designated as MA-11, in accordance with this Standard and Guideline.

3. SPECIAL WILDLIFE SITE (MA 9)

This Prescription is derived from the 1989 LRMP. It is applicable to special wildlife sites and botanical sites which are important components for overall wildlife habitat diversity. Included are sites of general and special multiple values including water, meadows, and hardwoods. While included within the Eden Ridge Planning Area, **the Eden Ridge Timber Sales Project is not proposed and would not occur within Special Wildlife Site MA-9**.

4. OTHER LAND USE CONSIDERATIONS

Inventoried Roadless Areas
The Eden Ridge Timber Sales Project is not within or adjacent to any area previously inventoried as roadless, resulting from the RARE II process and identified in Appendix C of the 1989 SNF FEIS for the LRMP.

Other Unroaded Areas
Commonly associated with roadless area interests is the interest by some in lands spoken of as being unroaded. There are no large areas within the Eden Ridge Planning Area that were not identified in the RARE II inventory but currently have few or no classified roads, or lack evidence of past management. There are very small areas within portions of the Planning Area that were not intensively regenerated via historical railroad logging. The largest of these, however, is only about 200 acres, and none are contiguous with any designated Wilderness or Inventoried Roadless Areas. A 1,000-acre size minimum for consideration of such areas is consistent with parameters used for the national roadless policy and was applied here. As a result, **there are no "unroaded areas" that contain roadless characteristics similar to inventoried roadless areas**. This topic is further explored as an "Other" issue and is documented in Chapter III (Section D, 14).

Congressionally Designated Areas
The Planning Area does not contain nor are any activities proposed under the Eden Ridge Timber Sales Project that are within or adjacent to any Wilderness, Recreation Area, Wild and Scenic River, or any other congressionally designated area.

5. WATERSHED ANALYSES

Watershed Analysis is a procedure used to characterize conditions, processes and functions related to human, aquatic, riparian and terrestrial features within a watershed. Watershed Analysis is issue driven. Analysis teams of resource specialists identify and describe ecological processes of greatest concern in a particular "fifth field" watershed, and recommend restoration activities and conditions under which other management activities should occur.

Watershed Analysis is not a decision making process. Rather, Watershed Analyses provides information and non-binding recommendations for agencies to establish the context for subsequent planning, project development, regulatory compliance and agency decisions (See Federal Guide for Watershed Analysis 1995, p. 1).

For example, in the "Social Discussion" (South Fork Coquille Watershed Analysis, Page S-1), there is a discussion under "Timber Commodity" and "Future trends" (WA page S-4) that predicts forested seral stages and future trends for harvest volume. These trends were based on the conditions prevalent in the early 1990s, when regeneration harvest was the predominant harvest type.

At this time (approx. 15 years later), minimal amounts of volume have been regeneration harvested within the watershed on federally managed lands; the predominant harvest system has been thinning. The harvest volume predictions discussed at Page S-5 of the Watershed Analysis have not come to fruition and it is likely that the estimate for thinning from the early seral stages was understated (more than half of the early seral states are likely to be commercially thinned). While stated as a prediction for the next 50 years, it is not likely to be exceeded under current trends. This annual harvest volume prediction is not considered an annual threshold for this project.

The Watershed Analysis focused on the use of existing information available at the time the analysis was conducted, and provides baseline information. Additional information, determined to be necessary for completing an analysis of the Eden Ridge Timber Sales Project, has been collected and is considered along with existing information provided by Watershed Analyses. Management Objectives and Recommendations provided by the Watershed Analysis were considered and addressed as they applied to this project.

The Planning Area falls within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds (see MAP I-2). Two watershed analyses have been completed that cover the Planning Area and contain a synthesis of scientific knowledge about watershed trends and conditions at watershed scales as well as by smaller sub-watersheds. They are listed below along with the subwatersheds that contain the Eden Ridge Planning Area:

- Myrtlewood Resource Area, Coos Bay District, Bureau of Land Management, 1994
  Middle Fork Coquille Analytical Watershed
  (Lower) Rock Creek and Myrtle Creek subwatersheds

- Powers Ranger District, Siskiyou National Forest, USDA Forest Service, 1995
  South Fork Coquille Watershed Analysis
  Coal Creek, Headwaters South Fork Coquille (Wooden Rock Creek), and Mill Creek subwatersheds

These documents are incorporated by reference to this statement. The majority of the proposed candidate stands are within the South Fork Coquille Key Watershed; proposed areas in the Middle Fork Coquille are limited to areas along the divide between these two fifth-field watersheds. More information summarized from watershed analyses is contained in the Hydrology Report, Appendix C (attached to this EIS and incorporated by reference).

G. SCOPING AND ISSUES

Scoping is the name for the process used to determine the extent of the environmental analysis to be conducted. It is used early in the NEPA process to identify (1) the issues to be addressed, (2) the depth of analysis required, (3) alternatives to the Proposed Action, and (4) potential environmental effects of the Proposed Action. This DEIS has been developed with extensive public participation. The public involvement requirements of NEPA (40 CFR 1501.7) have been employed in order to develop and publish a DEIS for release to an informed public.

1. SCOPING PROCESS

In April of 2010, the formal process under NEPA was initiated. Scoping letters were mailed on 4/13/10 to all known interested publics having been involved in the initial sensing process, describing the Proposed Action and Purpose and Need for the Project. A Legal Notice for Scoping was published in the Coos Bay World, Newspaper of Record, on 4/16/10.

In addition, Scoping Letters were sent to other agencies such as Oregon Department of Fish and Wildlife, Oregon Department of Forestry, NOAA Fisheries, Bureau of Land Management, and various city and county government entities in coastal southwest Oregon. Government-to-Government consultation letters were mailed to the Coquille Tribal Council; no response was received.

The Scoping process for this project officially began with the issuance of a Notice of Intent (NOI) to prepare an Environmental Impact Statement published in the Federal Register on April 26, 2010 (FR page 21577-21579). Written and electronic responses to the Scoping Letter were received through June 10, 2010. Eight sources of substantial input were received from interested individuals, environmental interest groups, industry representatives, the Environmental Protection Agency (EPA), and the Oregon Department of Fish and Wildlife.

Due to the length of time that has passed since the original NOI was published, refinement of the Proposed Action, and a change in the Responsible Official, a second (corrected) Notice of Intent was sent to the Federal Register and was published on January 18, 2012 (FR Vol. 77, No. 11, page 2508-250). Notification was provided to the initial scoping respondents to notify them of the corrected NOI.

The text of the corrected Notice of Intent (NOI) as it appeared in the Federal Register, is contained in DEIS Appendix A (Process Record).

2. SIGNIFICANT ISSUES

NEPA requires Federal agencies to focus analysis and documentation on the significant issues related to a proposed action. The interdisciplinary team with involvement and approval from District Rangers and Responsible Official has identified the following as Significant Issues associated with the Proposed Action presented in this analysis.

Issues are defined herein as points of discussion, debate, or dispute about the environmental effects of a Proposed Action. Significant Issues as used in this environmental analysis are those that are used to formulate alternatives or drive alternative themes, affect the design of component proposals, prescribe Mitigation Measures or Project Design Criteria, or describe important and variable environmental effects. They are significant because of the extent of their geographic distribution, the duration of the effects, or the intensity of interest or resource conflict.

The following Significant Issues are organized by broad resource or area categories, with subsequent issue statements and discussion. Issue statements identify elements, mechanisms and indicators that are used to describe the effects or consequences of implementing the various alternatives considered in detail. **The issue statements also contain a reference (Chapter and Section, in parenthesis) for where in this EIS document a description or discussion of the effects of each alternative considered in detail is located, including further description of indicators, relevant to these issues**. A summary of responses to Significant Issues is contained within alternative comparison Table II-26, at the end of Chapter II.

Significant Issues are presented in a statement format that intends to identify the actions may have an effect on certain resources, resource elements or values These Significant Issues serve primarily as the basis for developing and comparing alternatives, represent variable consequences between alternatives, and may serve as decision factors. While the EIS focuses on the Significant Issues, all relevant issues identified through scoping are considered and documented in the various resource analyses (see next section: Other Issues).

Hydrologic Conditions

Effects of variable density management (thinning) treatments and other connected actions on hydrologic conditions, including channel morphology, large woody material, sediment delivery, or peak flows. ***(Chapter III, Section C, 1)***

Water Quality

Effects of variable density management (thinning) treatments and other connected actions on water quality; stream temperature, turbidity, or water quality (303(d) listed waterbodies). ***(Chapter III, Section C, 2)***

Cumulative Watershed Effects

Effects of variable density management (thinning) treatments and other connected actions on the risk for adverse cumulative watershed impacts. ***(Chapter III, Section C, 3)***

Soils, Geology, and Site Productivity

Effects of variable density management (thinning) treatments and other connected actions on soils, geologic stability, or site productivity through detrimental soil disturbance, erosion, or effects on woody material. ***(Chapter III, Section C, 4)***

Economics

Commercial variable density management (thinning) treatments and other connected actions may generate various economic benefits/costs depending on design. Effects of economic factors on the feasibility to implement treatment activities as well as economic return to the local economy. ***(Chapter III, Section C, 5)***

3. OTHER ISSUES

Other Issues as used in this environmental analysis are those that have been determined to be relevant, are used to disclose consequences, may affect design of component actions, may prescribe mitigation measures, or whose disclosure of environmental effects are required by law or policy. Other Issues differ from Significant Issues in that they often describe minor and/or non-variable consequences.

Other Issues are also presented in a statement format that intends to identify the actions may have an effect on certain resources, resource elements or values. Each Other Issue statement also contains a reference (Chapter and Section of this document, in parenthesis) for where in the document a description or discussion of the effects of each alternative considered in detail is located, relevant to the stated issue. The consequences of each alternative considered in detail, in relation to these issues are also summarized at the end of Chapter II, Table II-27.

Aquatic Conservation Strategy

Effects of variable density management (thinning) treatments and other connected actions on attainment of the Aquatic Conservation Strategy Objectives associated with the Northwest Forest Plan and/or Standards and Guidelines associated with Riparian Reserves and Key Watersheds. ***(Chapter III, Section D, 1)***

Fire/Fuels

Effects of density management (thinning) treatments and other connected actions on fuel loading and fire hazard conditions. ***(Chapter III, Section D, 2)***

Air Quality

Effects of variable density management (thinning) treatments and activity fuels treatments on air quality. ***(Chapter III, Section D, 3)***

Botanical Resources

Effects of variable density management (thinning) treatments and other connected actions on rare, special status, Forest Service Sensitive or Federally listed botanical species. ***(Chapter III, Section D, 4)***

Invasive Plants

Effects of variable density management (thinning) treatments and other connected actions on the spread of invasive plant species. ***(Chapter III, Section D, 5)***

Port-Orford-cedar Root Disease

Effects of variable density management (thinning) treatments and other connected actions on the spread of *Phytophthora lateralis*, a non-native pathogen that causes disease, affecting Port-Orford-cedar. ***(Chapter III, Section D, 6)***

Threatened Terrestrial Wildlife Species and Critical Habitat

Effects of variable density management (thinning) treatments and other connected actions on Threatened terrestrial wildlife species and/or Critical Habitat. ***(Chapter III, Section D, 7)***

Forest Service Sensitive Terrestrial Wildlife Species and Habitats

Effects of variable density management (thinning) treatments and other connected actions on terrestrial wildlife species and habitats, identified as Forest Service Sensitive species. ***(Chapter III, Section D, 8)***

Terrestrial Wildlife Management Indicator Species

Effects of variable density management (thinning) treatments and other connected actions on Forest Plan Management Indicator Species. ***(Chapter III, Section D, 9)***

Rare and Uncommon Terrestrial Wildlife Species
Effects of variable density management (thinning) treatments and other connected actions on other Rare or Uncommon terrestrial wildlife species and habitats. ***(Chapter III, Section D, 10)***

Neo-tropical Migratory Birds
Effects of variable density management (thinning) treatments and other connected actions on other neo-tropical migratory bird species or habitats. ***(Chapter III, Section D, 11)***

Aquatic Species and Habitats
Effects of variable density management (thinning) treatments and other connected actions on aquatic species and habitats, including Threatened or Sensitive species and/or Critical Habitat/Essential Fish Habitat. ***(Chapter III, Section D, 12)***

Thinning Shock and Windthrow Potential
Effects of variable density management (thinning) treatments and other connected actions on changed environmental conditions for residual trees causing shock (change in light conditions), and/or leading to increased wind throw (trees broken off or uprooted by wind). ***(Chapter III, Section D, 13)***

Other Undeveloped Areas
Effects of variable density management (thinning) treatments and other connected actions on changed environmental conditions within non-inventoried "roadless" areas generally free of developments such as forest roads, or timber harvest units that may have undeveloped character. ***(Chapter III, Section D, 14)***

Heritage Resources
Effects of variable density management (thinning) treatments and other connected actions on Heritage (cultural) resources. ***(Chapter III, Section D, 15)***

Recreation/Human Safety
Effects of variable density management (thinning) treatments and other connected actions on recreation opportunities, and/or human safety conditions. ***(Chapter III, Section D, 16)***

Climate Change
Effects of variable density management (thinning) treatments and other connected actions on climate change (greenhouse gas emissions and carbon cycling) and effects from global climate change on this proposal. ***(Chapter III, Section D, 17)***

4. OUT OF SCOPE ISSUES

There were several issues identified during Scoping as being non-significant and "out of the scope" of this environmental analysis. These issues include those that are not or cannot be addressed or solved in this project-level analysis, issues already decided by law, regulation, or other higher level decisions, issues irrelevant to the decision to be made, and/or issues that are conjectural or not supported by scientific evidence. These issues are listed along with a rationale for their being determined "out of scope", as follows:

Use of Port Orford Cedar Risk Key
Several commenters suggested non reliance on the Port-Orford Cedar Risk Key to dismiss or minimize the impacts of road construction and timber haul on the spread of *p. lateralis*. They assert continuing loss of mature Port Orford cedar (POC) populations is severely affecting riparian forest conditions. Additional road construction and unregulated timber haul is likely to exacerbate this condition. They felt that POC management should be a project driver, rather than an afterthought or mitigation measure. Seasonal haul restrictions should be meaningful, tied to weather conditions, and mandatory. High-risk routes and roads should be closed.

The Forest and this project are required to follow direction provided in USDA-FS 2004: Record of Decision and Land and Resource Management Plan Amendment for Management of Port-Orford-Cedar in Southwest Oregon, which requires use of the Risk Key, as applicable. Port-Orford-cedar (POC) program objectives are to maintain POC as an ecologically and economically significant species on National Forest lands. Port-Orford-cedar management provides cost-effective mitigation for controllable activities creating appreciable additional risk to important uninfected POC, not to reduce all risk to all trees at all cost (USDA-FS 2004). Port-Orford-cedar management slows the spread of the non-native pathogen, *Phytophthora lateralis*, enough to maintain POC's significant ecological and economic functions, without the cost of the management strategy exceeding its effect on the value of these functions.

Do not rely on the Matrix land allocation merely for commodity extraction
Commenters suggested that several elements of new information undermine the commodity expectations from the Matrix land allocation. They suggested that:

- Global climate change is a compelling issue that requires that we manage the global carbon cycle in a way that reduces emissions from logging and increases storage in growing forests like these.
- Barred owl encroachment was barely mentioned in the 1994 FEIS that supports the Matrix land allocation. The barred owl now occupies large areas of suitable habitat that were set aside for the spotted owl but are now occupied and defended by barred owls. This means we need to set aside more of the Matrix for spotted owl habitat development. By providing more suitable habitat for both owls we would be increasing the chances that the two owls can co-exist, while decreasing the risk that the barred owl will competitively exclude the spotted owl to the point of extirpation.

The suggestion to reconsider the Matrix allocation is outside the scope of this project and its analysis. The Forest and this project are required to follow direction provided in the Forest Plan, as amended by the Northwest Forest Plan (see Management Direction above). The consequences of climate change, and the effects on northern spotted owl, its habitat and the effects of competition from barred owls, as applicable to this project, are considered within this project level document.

Preponderance of seasonal restrictions makes sales difficult to complete within contract timelines
Many seasonal restrictions associated with timber sales are required by laws, rules, and/or regulations. These restrictions are known to encumber activities during implementation and can create a burden on operations and affect prospective purchasers. Wherever and whenever possible, the Agency conducts required surveys to identify only the appropriate seasonal restrictions. For this project, seasonal restrictions are reviewed for all Action Alternatives regarding implementation and their impact on the project feasibility.

H. RELATED PERMITS, PLANS AND ACTIONS

A decision from this analysis may result in one or more commercial timber sale contracts and/or service contracts, depending on which actions are selected, the amount (acres) selected, various implementation types (logging systems, road access needs, etc.).

Compliance with all Forest Service contracts would be monitored by the Rogue River-Siskiyou National Forest and Powers Ranger District and staff, and Forest Service resource specialists.

Roads used for access may involve Cost Share Agreements with neighboring land owners. Several Cost Share Agreements are already in place for existing Forest Service and private roads. These may be used for commercial product hauling. In other cases, there may be a need for new road construction and new Cost Share Agreements. Obtaining new and utilizing existing Cost Share agreements may reduce the amount of new road construction needed for access to proposed treatments.

Excavation and/or fill permits issued by the Army Corps of Engineers and Oregon Division of State Lands would not be necessary. The Oregon Department of Environmental Quality (ODEQ) has the responsibility for regulating sections 401 and 402 of the Clean Water Act. No special permit authorization for these actions has been determined necessary by ODEQ since actions would not potentially discharge pollutants into any navigable waters.

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II. ALTERNATIVES

A. INTRODUCTION

This chapter describes the process used to develop the Proposed Action and consider alternatives. It also describes alternatives considered in detail (including No-Action) and the treatment elements, assumptions associated with implementation, Project Design Criteria and Mitigation Measures to minimize environmental effects, as well as monitoring applicable to the Action Alternatives. Alternatives and action elements considered but not analyzed in detail are also discussed.

Forest Service policy requires that all projects undertaken on National Forest System land must comply with their respective land and resource management plan as amended. For the Rogue River-Siskiyou National Forest, this includes the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan ROD) and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (S&Gs)*.

B. DEVELOPMENT OF PROPOSED ACTION AND ALTERNATIVES

The Purpose and Need and the Significant and Other Issues identified during Scoping were used to develop the Proposed Action and alternatives considered in this EIS. This was done to: a) provide a focus for the decision-maker, b) respond to the Scoping comments, c) respond to management direction, including amended Forest Plan direction associated with the Northwest Forest Plan, and d) respond to the Purpose and Need for action. The No-Action Alternative (Alternative 1) is designed to address all the above except factor d), and provides a benchmark against which to evaluate the other alternatives.

The process for development of the Proposed Action and development of final candidate stands included in the Proposed Action utilized Geographic Information System (GIS) systems, and orthographic photos linked to analytical spreadsheets and other information such as historical records and stand examination data. The process began with all forested stands within the Eden Ridge Planning Area being considered for treatment.

The next steps in the process included removal of certain stands or areas because of their obvious current conditions, land allocation designation, and other conditions (e.g., currently late-successional habitat or non-forest) that would exclude them from the stated objectives and Purpose and Need for this project.

Through a preliminary field examination process, candidate stands were identified. The majority of proposed candidate stands are currently overstocked. Vegetative competition has increased over time since stand initiation in the 1930s and 1940s due to the lack of early stand management. Proposed treatments are designed to reduce stand densities through stocking level control to allow residual trees to increase in both vigor and growth. Candidate stands are expected to respond well to thinning since stands are under 80 years old.

Within candidate stands, the more abundant species are Douglas-fir and western hemlock. Vegetative competition has increased over time resulting in minor populations of other tree species such as Port-Orford-cedar, red alder, chinquapin, and tanoak.. Other species are a mixture primarily of vine maple, Pacific rhododendron, tanoak, evergreen huckleberry, dwarf Oregongrape and salal in the understory.

C. ALTERNATIVES CONSIDERED IN DETAIL

Four alternatives (including a no-action alternative) are analyzed in detail in this EIS. **Alternative 1, the No-Action Alternative**, provides a basic description of conditions (both current and ongoing) for which the other alternatives were analyzed and compared.

In addition to No-Action, this Section discusses alternatives that were considered in detail as alternatives that propose "action" in the form of site-specific project proposals to commercially harvest timber; construct, reconstruct, and use roads; implement variable density management activities; and implement other enhancement projects. These are termed "**Action Alternatives**." Three Action Alternatives are analyzed in detail in this Draft EIS.

For purposes of this documentation under NEPA, the Proposed Action being analyzed is contained and described as Alternative 2. Two additional Action Alternatives (Alternatives 3 and 4) were developed and designed to address one or more of the Significant Issues identified during Scoping as being associated with Alternative 2.

Alternative 2, the Proposed Action is designed to address and maximize attainment of the Purpose and Need outlined in Chapter I. Alternative 2 also represents the maximum extent of proposed treatments and connected actions (e.g., harvest systems and roads).

Alternative 3 is similar to and is based on the Proposed Action, but differs from the candidate stands, opportunities and connected actions associated with the Proposed Action, with modifications that include only "high-moderate benefit/low risk" new roads. In relation to Alternative 2, this modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative proposes helicopter logging systems, based on the change in access for more conventional systems.

Alternative 4 is also similar to and is based on the Proposed Action, but differs from the candidate stands, opportunities and connected actions associated with the Proposed Action, with modifications that include only the use (with some reconstruction and maintenance) of existing roads for treatment access. This alternative also excludes some of the higher risk treatments within Riparian Reserves (primarily those associated with perennial streams). In relation to Alternative 2 and Alternative 3, these modifications would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative also proposes helicopter logging systems, based on the change in access for more conventional systems.

Further detail on these alternatives and their function follows in this Section:

1. ALTERNATIVE 1 (No-Action)

Alternative 1 identifies and describes the current conditions of the physical, biological, social and economic environments associated with the candidate stands and various analysis areas. As suggested by NEPA, a no-action alternative is included and analyzed as a benchmark against which the Proposed Action and other Action Alternatives can be compared. Under this scenario, Alternative 1 - No-Action would not authorize variable density management and other connected actions to obtain the Purpose and Need for the Eden Ridge Timber Sales Project. MAP I-1, DEIS Chapter I shows the Eden Ridge Planning Area without proposed activities. This map also serves as a current condition base-map for comparison with the Action Alternatives.

Under this scenario, no project activities would take place, and the resulting environmental effects of no-action would be compared to the environmental effects of permitting the Proposed Action, or another alternative to go forward. Since no activity is planned, no additional design criteria, mitigation measures, or management requirements or constraints are necessary. This alternative would not preclude future vegetation and restoration treatments within the Eden Ridge Planning Area for actions considered with this analysis.

The No-Action alternative should not be confused with a baseline. Whereas a baseline is essentially a description of the affected environment at a fixed point in time, the No-Action alternative for this analysis assumes that other things would happen to the affected environment, particularly in a dynamic, changing forest ecosystem over time. How this ecosystem could change over time without the proposed management actions is discussed more fully in those Sections of this EIS that describe potential consequences for No-Action.

2. TREATMENT ELEMENTS APPLICABLE TO ACTION ALTERNATIVES

This section introduces the activity proposals, treatment objectives, methodologies and elements associated with the Proposed Action and other alternatives that propose action (i. e., "Action Alternatives"). The location reference, land allocation, watershed, and extent of variable components are presented and disclosed under each Action Alternative description.

a. Silviculture

Background
Eden Ridge Timber Sales (ER) is located on Eden Ridge approximately four (4) air miles southeast of Powers, Oregon. The legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon.

The Planning Area is approximately 6,516 acres of Forest Service land within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Headwaters of South Fork Coquille River, Coal Creek, Mill Creek, Lower Rock Creek and Myrtle Creek 6th field watersheds. Adjacent private timber company lands owned by Plum Creek surround the Planning Area.

Forested stands in the Eden Ridge Planning Area were extensively railroad logged (clear-cut) in the 1920s and 1930s with steam donkeys as railroad lines were constructed through the area. Harvested areas were likely covered in slash or burned with abundant quantities of residual down wood still present today in many proposed units. Some areas in the northern section of the Planning Area appear to have incurred a forest fire during the logging operation[1]. Large contiguous areas of post-harvest early seral vegetation are visible on 1943 air photos taken of Eden Ridge (see MAP III-6, EIS Chapter III).

[1] Silver Doe Timber Sale, Silvicultural prescription, Stand Area Description.

Approximately 10% of the Planning Area has documentation of post-harvest reforestation treatments (Table II-1). Historical records for ten (10) plantations documented 648 acres of tree planting between 1939 and 1943. Conifer species planted were Douglas-fir and Port Orford cedar. Approximately 232 acres of understocked areas from poor seedling survival within plantations were naturally regenerated and later determined stocked between 1954 and 1963.

Table II-1. Plantation Data in Eden Ridge Planning Area

Unit	Year Logged	Year Planted/ Acres	Tree Species Planted	Year Site Preparation or Release	Year Natural Regeneration/ Acres
P-1	Early 1900s	1939/44 ac	30,000 POC	1947	1954/11 ac
P-2	Early 1900s	1940/36 ac	13,500 POC	Unknown	1954/14 ac
P-3	Early 1900	1940/37 ac	25,300 POC	Unknown	1954/15 ac
P-4	Early 1900'	1941/144 ac	98,100 POC	1937	1954/68 ac
P-5	Early 1900s	1942/57 ac	28,000 POC	1937	1954/27 ac
P-6	Early 1900s	1942/100 ac	74,000 DF	Unknown	1954/23 ac
P-7	Early 1900s	1942/40 ac	28,000 DF	Unknown	1954/18 ac
P-8	Early 1900	1946/48 ac	33,000 POC	1937	1963/24 ac
P-9	Early 1900	1946/127 ac	70,000 DF	1937	1954/26 ac
P-10	Early 1900s	1946/15 ac	10,000 DF	1937	1954/5 ac; 1963/1 ac
	Total Acres	648 ac			232 ac

There are no records indicating stocking level control occurred on these plantations or adjacent naturally regenerated stands during the early stages of stand development. Tree growth and associated vegetative competition between trees has steadily increased since the stands were regenerated in the 1930s-1940s.

Field reconnaissance noted many areas that appear planted or pre-commercially thinned due to the spatial arrangement of overstory trees, particularly in the northeast section of the Planning Area. Long-time residents of Powers stated that aerial seeding was a post-harvest treatment implemented on Eden Ridge[2] though no records currently exist to validate these statements.

Current Stand Condition

Candidate stands are mostly single-storied in stem exclusion (Oliver, 1996) with scattered openings from root disease infection in the northern portion of the Planning Area that have more multi-layered structure from natural regeneration of conifers and hardwoods. Live crowns are receding from dense stand conditions with crown ratio ranging 15-20% on suppressed and intermediate crown class trees to 30-40% for dominant and codominant trees. Hardwood thickets of chinquapin are present and interspersed within stands and are associated with rocky, shallow soils (Atzet, Wheeler, 1989) and rock outcrops. Candidate stands are generally 60-75 years old.

Relative Density

Relative Density (RD) index is used on ER for determining thinning treatment thresholds for candidate stands. RD is calculated using quadratic mean diameter and stand basal area (Curtis 1982) or by dividing a stand‟s existing Stand Density Index (SDI) (Reineke 1933) by a maximum SDI characteristic of the stand‟s species composition (Woodall 2009). The SDI maximum for Douglas-fir in Oregon (Larsen, 2001) was used for ER. Calculated RD numbers describe stand competition as follows (Ellen 1984):

[2] Pers. conv. with Eric Martz, Powers Ranger District Silviculturist (retired).

Table II-2. Stand Competition from Calculated Relative Density (Curtis 1982)

70%+	Grossly overstocked (unmanaged mature stands)
60%	Approximate "normal" stocking
50-70%	Stand density sufficient to cause competition-related mortality
35-50%	Stand vigor and growth are maximized
<35%	Individual tree growth maximized

Previous environmental analysis of similar stands on Powers and Gold Beach Ranger Districts identified a RD of 50% as a threshold of undesirable competition-related tree mortality (USDA 2007). This RD threshold is used for treatments on ER.

Previous Timber Stand Exams

Timber stand examinations were conducted in portions of ER proposed units in 1986, 1999 and 2009. Table II-3 displays abbreviated stand summary information indicating dense stocking conditions exceeding treatment thresholds at the time of stand exam data collection. More stand exam information is contained in Appendix B, Preliminary Silvicultural Diagnosis (incorporated by reference).

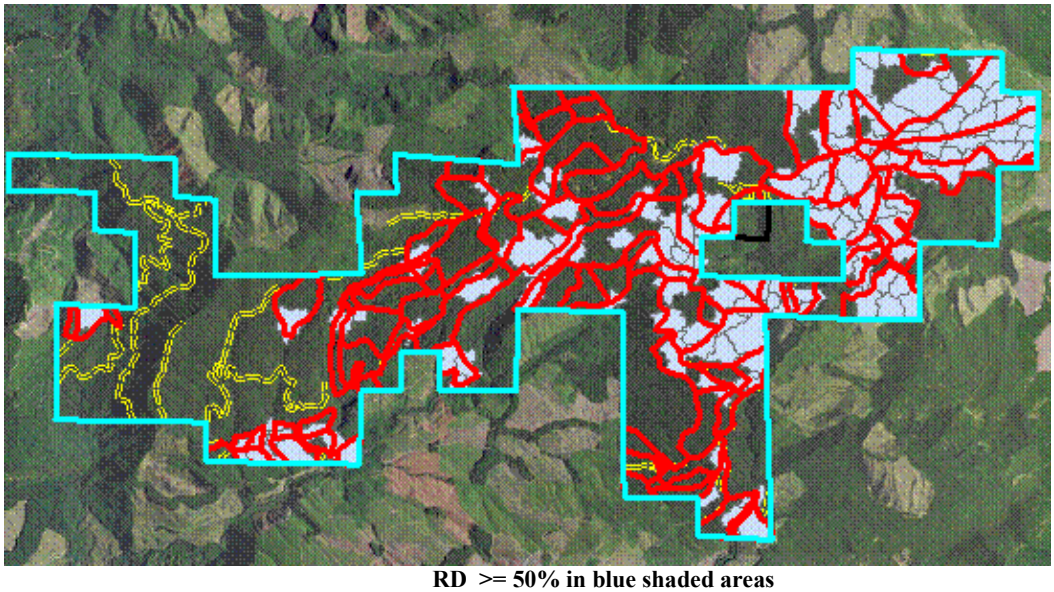
Table II-3. Eden Ridge Stand Examination Summary

1986 Stand Exams - Eden Ridge					
ER Unit Reference #	**Stand Age**	**2011 Stand Age**	**BA/ Ac**	**SDI**	**RD**
3	40	65	207	472	0.79
332, 333	43	68	253	463	0.78
333	38	63	171	309	0.52
340, 341	40	65	176	389	0.65
1999 Stand Exams - Eden Ridge					
5, 6, 7	53	65	283	505	0.85
5, 6, 7	54	66	203	377	0.63
210, 332	51	63	240	469	0.79
332, 333	54	66	253	463	0.78
332, 333	51	63	280	498	0.84
340, 341, 342	57	69	250	428	0.72
340, 341, 342	58	70	262	504	0.85
216, 343, 344	53	65	222	412	0.69
Not in proposed unit	49	61	242	425	0.71
401, 402	50	62	230	476	0.80
2009 Stand Exams - Eden Ridge					
2, 201	51	53	333	510	0.86
320, 324	57	59	253	340	0.57
307	71	73	376	602	1.01
905, 906 (non-commercial)	63	65	165	264	0.44

RD = Relative Density (expressed as decimal); SDI = Stand Density Index; BA/Ac = Basal area per acre

A data query of the Forest"s existing vegetation GIS layer displays 1,996 acres exceeding 50% RD in candidate stands for Eden Ridge Timber Sales (MAP II-1). Queried polygons are concentrated in the eastern portion of the Planning Area and are associated with the more productive Preacher-Bohannon soils. These areas are higher priority for treatment though computer-generated existing vegetation data will need ground verification at the stand-level for determining data accuracy and developing site-specific silvicultural prescriptions (see RRS Existing Vegetation section description).

MAP II-1. Existing Vegetation Polygons Exceeding 50% RD within Candidate Stands

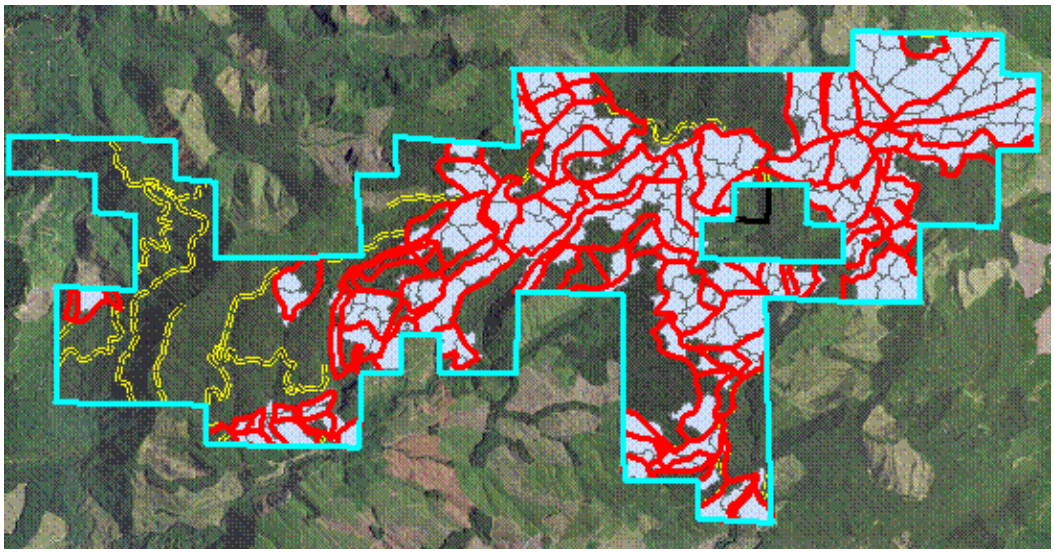


RD >= 50% in blue shaded areas

Canopy Cover

A data query of the Forest‟s existing vegetation GIS layer displays most candidate stands exceeding 70% canopy cover for Eden Ridge Timber Sales (MAP II-2).

MAP II-2. Existing Vegetation Polygons >= 70% Canopy Cover within Candidate Stands



b. Silvicultural Treatments

The primary silvicultural objective for ER is to control existing dense stocking conditions and to treat subordinate amounts of root disease infection within candidate stands to improve forest health and to sustain or increase tree growth and vigor. Intermediate commercial harvest treatments using variable density thinning (VDT) techniques are proposed. Riparian Reserve treatments would be designed to protect or improve riparian stand conditions to meet Aquatic Conservation Strategy Objectives as stated in the NW Forest Plan.

Variable Density Thinning
VDT uses a combination of low and crown thinning to release larger dominant and co-dominant trees. Spacing between trees is variable depending on tree diameter distribution on the ground and thinning intensity. Individual stand characteristics would be heterogeneous and post-harvest tree spacing would not have a rigid, grid-like appearance.

Intensity of density management treatments ranges light (150-225 trees per acre [tpa]), medium (90-150 tpa) or heavy (50-90 tpa) thinning with a target RD of approximately 35-50%. Tree species composition is maintained or enhanced by favoring a diverse mixture of conifers and hardwoods (see Figure II-1).

Stocking level control to reduce stand density to a RD of 35-50% would allow stand vigor and growth to be maximized (Ellen 1984) by creating more growing space for retained trees and controlling inter-tree competition for site resources. Retained trees would ideally have 40% live crown ratios following treatment to respond to increased availability of site resources. A live crown ratio of 40% represents a generally acceptable level of individual tree vigor (Daniel et al. 1979).

Although maximum gross production in coastal Douglas-fir is obtained when RD exceed 40%, thinning to relative densities below this optimum may produce less growth per unit area but this would be offset by greater growth per tree (Drew and Flewelling,1979). Reducing treated stands to this target 35-50% RD range would achieve desired conditions of sustainable, cost-efficient timber production while treating candidate stands to improve forest health and resiliency.

Future thinning treatments could occur when stand density grows back to 50% RD or when dominant and codominant trees have about 40% live crown ratios. For Douglas-fir, a live crown ratio of 40% appears to correspond with a SDI of about 50% of the maximum SDI (i. e., 50% RD) (Long, 1985).

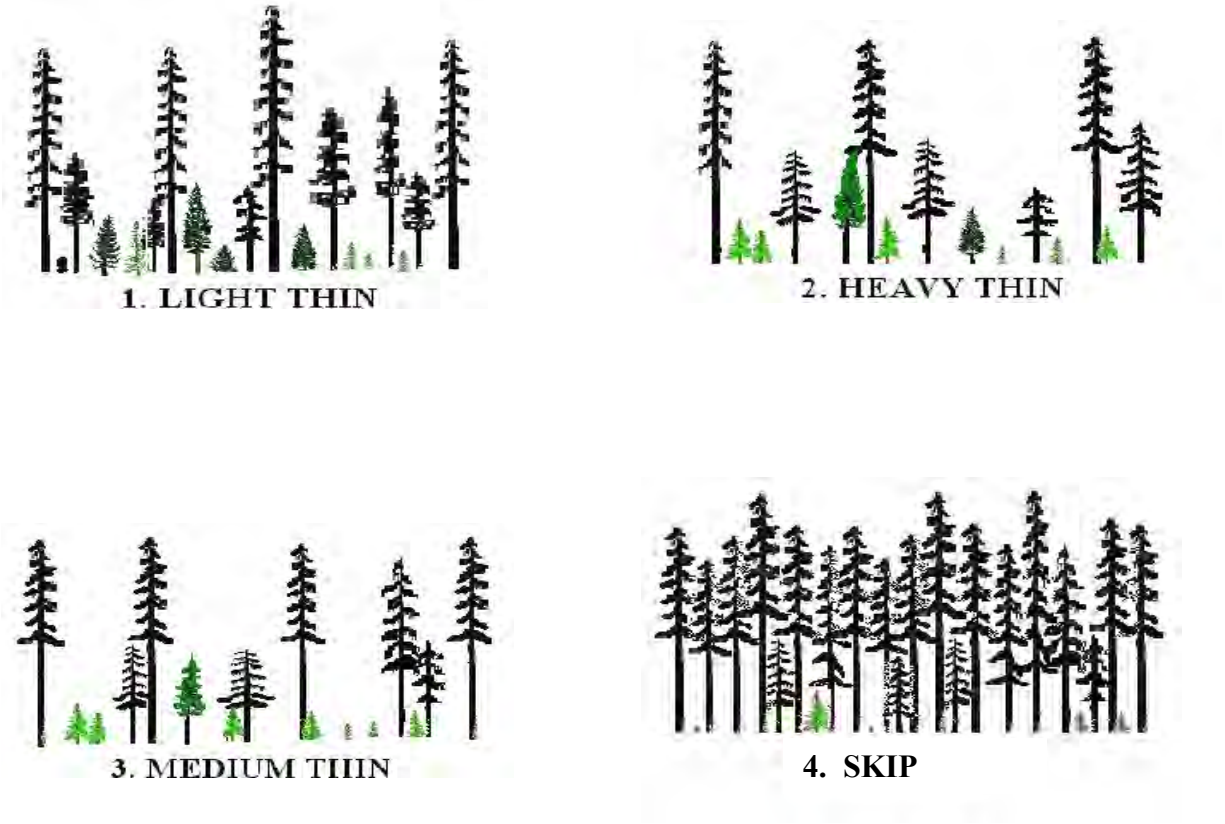
VDT may include creation of irregular shaped openings (i.e., gaps) interspersed within some thinning units to primarily treat laminated root rot infection centers. Forest heath treatments would harvest all susceptible tree species (Douglas-fir, white fir, western hemlock) within and along the perimeter of infection pockets and 50-100‟ out from the last symptomatic tree while favoring resistant or immune species for leave trees. Gaps may be site prepared and planted afterwards with Port-Orford-cedar seedlings (see planting) for improving stand health and stocking conditions to meet sustainable timber harvest objectives while enhancing structural and species diversity. Gap size is estimated to be ¼ to 2 acres depending on extent of infection centers and proximity to existing openings on adjacent private timber company lands. Larger gap sizes are estimated to occur in the northeastern corner to treat smaller connected root rot infection pockets (see Map B-13 in Silvicultural Diagnosis Report).

Additionally, portions of dense stands where live tree crowns are <15-20% and not likely to respond to thinning may also receive gap treatments.

Skips
VDT may include no-thin areas (i.e., skips). Skips can be strategically placed to protect hardwood thickets, minor tree species, pockets of large down wood, other unique stand attributes and inaccessible areas (see Figure II-1.).

Figure 1. Illustration of Stand Treatments

Figure II-1. Examples of Stand Treatments; Eden Ridge Timber Sales



Wide-Thin Gaps

Wide-thin gaps (WTG) may occur around genetic trees selected for cone collection, Port-Orford-cedar root disease pockets favoring resistant trees, or dominant tree release of desirable trees from competing vegetation. Generally, one (1) to four (4) trees would be retained in WTG (Figure II-1.). The size of WTG would be approximately ¼ - ½ acre.

Thinning treatments are designed to enhance development of late seral conditions as recommended in the South Fork Coquille Watershed Analysis (1995) by moving stand structure forward by increasing tree growth through density management, creating structural diversity through skip and gap treatments and to improve forest health and resistance to forest pathogens.

VDT treatments would harvest conifers with diameters ranging approximately 7-24 inches and larger. Extracted commercial timber volume is estimated to range 8-20 thousand board feet (mbf) per acre and could potentially yield up to 53million board feet for the entire project.

Site-specific silvicultural prescriptions would be developed for each individual stand identified for treatment and address each land allocation classification (Matrix, Riparian Reserve) during implementation. Silvicultural prescriptions would describe desired conditions; specify tree spacing, target RD, preferred species, canopy retention, post-harvest treatments and other key stand components. Final silvicultural prescriptions would be approved by a Region 6 certified silviculturist.

c. Large Woody Material and Snags

Observations based on an informal walk through candidate stands prior to 2009 by the previous district silviculturist noted large woody material (LWM), 20 inch plus diameter at breast height (dbh), limited on the forest floor. Where observed, LWM was in the decomposition class 4 and 5 range (soft). Standing snags over 16 inch diameter are also limited with most snags being within the 8 to 11 inch diameter range.

Current Condition – Down Wood
Down woody material (large and small) fulfills a number of important ecological functions such as stabilizing surface soils, increasing organic content in soils over the long-term, providing habitat for the many organisms that depend on snags and down logs in various stages of decay, and ensuring adequate woody material recruitment to meet the ecological needs of aquatic systems over time.

Stand self-thinning is evident in many stands proposed for treatment. High RDs exceeding stated density thresholds has caused tree mortality to occur in the suppressed and intermediate crown class trees. Correlations between living tree biomass and deadwood biomass emerge when stands exceed 75% RD (Woodall 2009). Down wood boles from self-thinning are smaller in diameter than historical logging slash, present around old railroad grades and in riparian areas.

Figure II-2. Examples of Down Wood Conditions from Historical Railroad Logging



ER Unit 326



ER Unit 1

Root rot infection caused by laminated root (*Phellinus weirii*) contributes more localized pockets of down wood, particularly in the northern half of the ER Planning Area. Infected areas resemble between 1-DF-3 and 2-DF-3 in the Pacific Northwest photo series (Maxwell 1980) which estimates 59 to 111 tons per acre of forest residue respectively. Laminated root rot centers are more susceptible to windthrow (Hadfield et al. 1986) and may supply important concentrations of down woody material as infected dead trees do not remain standing for very long.

In addition to laminated root rot centers, windthrown trees are evident along the perimeter of the Planning Area adjacent to large openings created by timber harvest on private timber company lands. Down wood from windthrow is also present on landforms with shallow soils (e.g. Umpcoos/Rock outcrop).

Down woody material information using Brown‟s transect protocol was recorded during 2009 stand exam data collection (see silvicultural diagnosis, attachment A, for vegetation polygon locations). Table II-4 displays quantitative downed woody data for stands sampled. Down woody material present on stand exam plots is mostly associated with laminated root rot pockets and old railroad logging slash.

Table II-4. Eden Ridge 2009 Stand Exams - Down Woody Data (FSVEG Report 19)

Location#	Stand#	ER Unit # (approx.)	Tons/ac (0-0.24")	Tons/ac (0.25-0.99")	Tons/ac (1-2.99")	Sound Tons/ac (3+")	Rotten Tons/ac (3+")	Tons / ac (ALL)	Ave. Diam. 3+ Rotten	Pieces/ acre (ALL)	Photo Series (1980)
6032030	199	2/201	0.64	1.98	3.87	0.00	43.87	50.36	19.60	168	1DF3 4DF4
6048010	604	320/324	0.37	0.46	1.94	0.00	4.98	7.74	7.60	45	2DF4 3DF4
6048030	802	307	0.59	1.80	2.90	1.41	8.05	14.75	6.00	533	2DF4 3DF4 4DF4
6048010	747	906/905	0.30	1.91	5.58	0.41	60.49	68.70	16.70	312	4DF4 3MC3 1MC4 1DFHD4 4DFHD4

In riparian areas of the South Fork of the Coquille watershed, large wood is delivered to stream channels by debris flows, streamside landslides, recruitment from adjacent riparian forests, and transport from upstream sites. Federal and private activities removed massive amounts of wood for salvage following the 1964 flood. Standing large wood has been lost from riparian areas primarily by harvest, scouring debris flows and salvage following windthrow (USDA Forest Service 1995).

Current Condition – Snags

Currently there are scattered snags in ER due to stand density, past fires and forest disease conditions causing tree mortality. Table II-5 lists standing dead (snags) present on the 2009 stand exam plots.

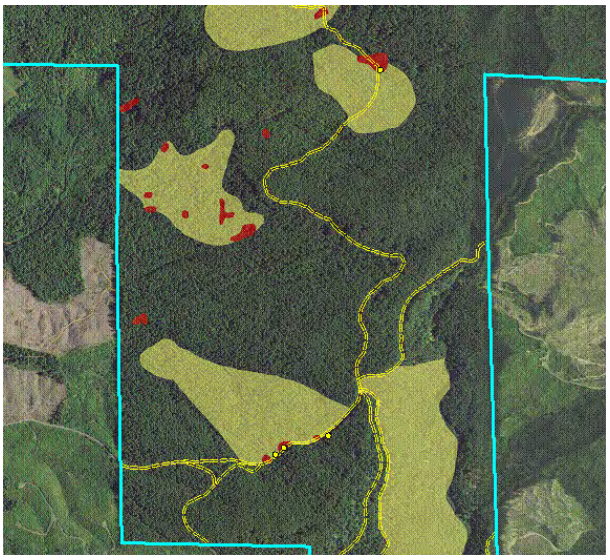
Table II-5. 2009 Stand Exams Standing Dead (Snags) from Plot Data (FSVEG Report 19)

Location#	Stand#	ER Unit # (approx.)	Total Standing Dead	Species	DBH	Height	TPA
6032030	199	2/201	0				
6048010	604	320/324	0				
6048030	802	307	5	Douglas-Fir	7"	15'	37.4
				Douglas-Fir	11"	64'	15.2
				Douglas-Fir	13"	97'	10.8
				Douglas-Fir	16"	78'	7.2
				Douglas-Fir	15"	89'	8.1
6048010	747	906/905	2	Douglas-Fir	28"	86'	0.8
				Douglas-Fir	42"	38'	0.4

Snags are deficient in two of the vegetation polygons inventoried in the eastern portion of the Planning Area, small 7 to16 inch snags are present in an older stand in the western portion near Coal Creek and scattered larger 20+inch snags are present in the non-commercial units west of the 5000 Road.

Field reconnaissance in combination with GPS location waypoints during summer 2011 noted clumps of five (5) to twelve (12), four (4) inch to thirty (30) inch diameter standing snags occurring in Port-Orford-cedar root disease pockets (*Phytophthora lateralis)* in the southern portion of the Planning Area adjacent to the 5000 Road (Map II-3).

MAP II-3. Standing Snags Occurring in *Phytophthora lateralis* Pockets



Most of the snags are < 12 inch diameter. Larger 24 inch to 32+inch diameter snags were observed interspersed in the overstory north of this road and below the southernmost waypoint. This area is currently outside candidate units proposed for commercial treatments and would be assessed for POC treatment needs and possible funding in the Sale Area Improvement (KV) plan. POC is not considered a desirable tree species for wildlife use as snag habitat[3].

Land And Resource Management Plan (LRMP)

The Siskiyou National Forest LRMP (1989) is the existing policy direction for snags and coarse down wood objectives. However, scientific studies on wildlife habitat (Johnson, O'Neil, 2001) have determined that snag retention based on biological potential is a flawed technique. This technique was used for determining snag requirement standards and guidelines in the LRMP.

The Southwestern Oregon Provincial Interagency Executive Committee requested a province-wide process be developed for determining levels of snags and down woody material in forests in the late 1990s. As a result, landscape stratification based on Plant Association Groups (PAGs), was developed across the Forest.

A key element of desired conditions for PAGs is down dead woody material. Existing large woody material varies depending on past logging operations and PAG in southwest Oregon. Desired levels of dead wood were modeled by PAG, based on Ecology Plot data, adjusted by past conditions with consideration of the DecAID[4] advisory system. These models were intended to be used as a baseline for managers to develop prescriptions for landscape management. Treatment units proposed for ER are within the maritime western hemlock PAG model derived from this process (Siskiyou NF, 2000).

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[3] Pers conv. David Clayton, Rogue River-Siskiyou National Forest Wildlife Biologist, January 18, 2012

[4] DecAID is a wood advisory tool for Washington and Oregon forests and is based on *Habitat Model for Wildlife Tree Retention*. USDA Forest Service, Region 6, Portland Oregon: Kim Mellen (editor) 2003. The title can be read as decayed wood advisor and management aid "decay-aid" or "decision-aid".

Ecological processes within PAGs vary due to changes in climate, topography and soil. Each PAG has a mean and range for snags and down wood derived from ecological plot data. Recommended means and ranges (standard deviations) are broken into diameter classes: 6 to 9 inches, 10 to 19 inches and 20 inches and greater and into decay classes: 1 through 5 (Siskiyou NF, 2000; White et al., unpubl.).

Because the Forest"s PAG data is at a finer scale, the Forest is currently using plant series data from new PAG classifications, delineated by geographical regions (Cascades, Siskiyous, Coast), for determining snag and down wood objectives on the Rogue River-Siskiyou National Forest[1].

Snag Recommendations
The LRMP specifies a desired snag quantity of 185 to 235 snags per 100 acres delineated into hard and soft 11+, 15+, 17+ and 25+ snag diameter classes to maintain habitat capability of woodpeckers (indicators of cavity nesting species) at not less than 60% of potential population levels (LRMP, IV-33 to 36). Snag quantities are dependent on woodpecker species present in the treatment area.

As previously discussed, the Forest is choosing to use plant series data derived from new PAG classifications to determine snag and down wood objectives

Table II-6 displays snag data (trees per acre) recently derived for the western hemlock plant series in the coast geographic region.[5] This data reflects snag quantities present in older stands derived from numerous PAG inventory plots and represents desired snag quantities (trees per acre) to develop in candidate units post-treatment.

Table II-6. Snag Data for Western Hemlock Plant Series

COAST - Snags		
SERIES	**Diameter**	**Average TPA**
Western Hemlock	0-10"	28.64
Western Hemlock	11-19"	7.93
Western Hemlock	20"+	6.27

Large snags over 20 inch diameter are particularly essential for forest function. In addition, at least 96 wildlife species in Oregon and Washington are associated with snags in forests, using snags for shelter, roosting and hunting. Most species use snags greater than 14 inch diameter (Rose et al. 2001). Ridges, upper thirds of slopes, and riparian areas or lower third of slopes are especially important for late-successional dependent species. Snags in various size classes also are important to the recruitment pathways of the down, coarse materials important to soils.

In areas where past management has resulted in a lack of large snags needed for cavity nesting species, snags would be created from live trees left in stands. Whenever possible, creation of a minimum of 2 or more snags per acre over 20 inch dbh within all commercially treated units should be part of each silvicultural prescription. Creation can be through girdling, topping the trees with chain saws, blasting, inoculation with heart rot fungi, or deliberate injury. These methods would open the trunk to development of a hollow core used by woodpeckers and a variety of other birds, mammals, and other wildlife.

[5] Hochhalter (et al.) Ecology Group, Southwest Oregon Province, plant series data from PAG plots.

Large Wood Recommendations

As with snags, down logs are important for wildlife and aquatic ecosystem function. In addition, large coarse woody material is particularly important to maintaining and holding soils in place. The following table displays down wood data (pieces per acre, tons and size) for the western hemlock plant series in the coast geographic region[6] and represents desired down wood quantity and size objectives.

Table II-7. Down Wood Data for Western Hemlock Plant Series

COAST – Down Wood				
SERIES	**DIAMETER**	**Average PIECES PER ACRE**	**Average TONS**	**Average LENGTH (feet)**
Western Hemlock	0-10"	110	3	63
Western Hemlock	11-19"	52	11	64
Western Hemlock	20"+	35	38	111

Under the Action Alternatives, snags and down wood would be retained to support ecosystem function (see Wildlife Report). Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem (SIS LRMP 1989). LWM already on the ground would be protected from disturbance to the greatest extent possible during logging and other land management activities that might destroy the integrity of the substrate.

Evaluations would occur after density management treatments to assess potential needs for snag/down wood creation. In areas lacking adequate amounts of down woody material (include snags in calculations), green trees may be felled. Any leave trees damaged during harvest operations would be left standing or felled for safety, but left on site. The intent is to provide future snags or trees with cavities or deformities utilized by wildlife.

d. Other Silvicultural Treatments

Other silvicultural treatments include management of two forest pathogens, laminated root rot (*Phellinus weirii*) and Port Orford cedar root disease (*Phytophthora lateralis*). Proposed non-commercial treatments are discussed in Section 2, i, of this Chapter.

Laminated Root Rot

Laminated root rot is affecting forest health on portions of Eden Ridge Planning Area, particularly in the northern half in forest stands adjacent to FS Roads 5000440, 5000440003, and 5000448.

Figure II-3. Examples of Laminated Root Rot in Northern Portion of Planning Area



Unit 2 **Unit 201**

[6] Hochhalter (et al.) Ecology Group, Southwest Oregon Province, plant series data from PAG plots.

This disease infection extensively decays roots of susceptible host trees and either causes windthrow or mortality by destroying the tree"s ability to take up water and nutrients (Hadfield et al. 1986). Windthrow is more common with laminated root rot than other root pathogens. Laminated root rot spreads by root contact between uninfected trees when living roots penetrate infected roots. In pole-sized and larger trees, the root disease can spread outwards an average rate of one (1) foot per year. This pathogen can live saprophytically in infected dead roots for fifty (50) years or more. Tree species present in proposed treatment units are listed as follows in decreasing order of susceptibility:

Douglas-fir and white fir> western hemlock > Port-Orford-cedar. All hardwoods are immune

Overstory tree species composition is dominantly composed of Douglas-fir in proposed treatment units. Stand-level susceptibility to infection is expected to increase as root rot pockets continue to expand in size. Root rot pockets are currently estimated to be 1/8 to 1/4 acre for areas field visited, though larger infection centers are anticipated based on numerous potential root rot pockets visible on aerial photos that are within proximity to each other.

Although timber volume losses caused by laminated root rot are most conspicuous as mortality or windthrow, tree growth may also be reduced for several years before tree death (Bloomberg and Reynolds 1985, Thies 1983). For commercial forest land in Oregon, reduction in wood volume is estimated to be 40-70% on areas affected (Goheen and Hansen, 1993).

Gap Development Treatment
Irregular shaped openings ¼ to 2 acres for tree yield (Matrix) reasons centered on root rot pockets may be created to treat portions of stands infected with laminated root rot. Treatments would harvest all susceptible tree species within and along the perimeter of infection pockets while favoring resistant or immune species for leave trees. Gaps may be site prepared and planted afterwards with Port-Orford-cedar seedlings for stand health and enhance structural and species diversity within a stand.

Port-Orford-cedar

On most of the Rogue River-Siskiyou National Forest, Port-Orford-cedar (POC) is concentrated in Riparian Reserves except on the Powers Ranger District where POC is well distributed across the landscape. The Powers Ranger District has the greatest concentration of Port-Orford-cedar (POC) occurring in the world, from the South Fork of the Coquille River to Iron Mountain. This district is also unique in having stands with POC stand components of up to 70 to 80 percent.

Included within the district are the Port-Orford-cedar Research Natural Area, Big Tree Viewing Area, which includes the largest POC in the world at nearly 12 feet in diameter, and the Coquille River Falls Research Natural Area. The research natural areas are infested with POC root disease, *Phytophthora lateralis* (PL). The 2008 inventory showed 47,902 acres of POC present on the district, of which 2,349 acres (4.9%) are infested with PL.

Phytophthora lateralis
PL is a virulent, non-native pathogen that was introduced into the native range of POC in the early 1950s and its place of origin is unknown. PL readily kills POC of all ages that are growing on sites favorable for infection. Once an area becomes infested, it is difficult to eradicate PL.

PL can cause mortality within weeks of infection in the case of small trees and in one to four years when large trees are infected (Roth et al., 1987). Trees usually lose all foliage two to three years after death. In areas where the disease has been active for several years, dead and dying trees with all degrees of foliage symptoms are visible (Hadfield et al. 1986).

PL is spread in the following ways (Hansen et al. 2000; Zobel et al. 1985):

-Human vectors over long distances via resting spore transported in infested plant material or soil;
-Locally via waterborne spores moving in ditches, streams, or overland flow; or
-Via mycelia growing across root contacts and grafts between infected and uninfected POC.

PL is favored in areas of slow-moving or standing water and on poorly drained microsites, especially when such sites occur below roads. Susceptible areas are segregated by the following risk categories (USDA Forest Service, 2004: Record of Decision and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon, Siskiyou National Forest).

High-risk Sites

Low-lying wet areas (infested or not) that are located downslope from already infested areas or below likely sites for future introductions, especially roads. They include streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low lying areas where water collects during rainy weather (USDA-FS 2004). High risk sites are defined as streamside POC within 100 feet of a road and non-streamside POC within 50 feet below a road or 25 feet above a road.

For the purposes of this analysis, probability (USDA-FS 2004, section 3&4, page 37) below 6.1% for spread and establishment of PL in previously uninfested areas is considered low risk. This probability corresponds to Low-risk sites defined as follows:

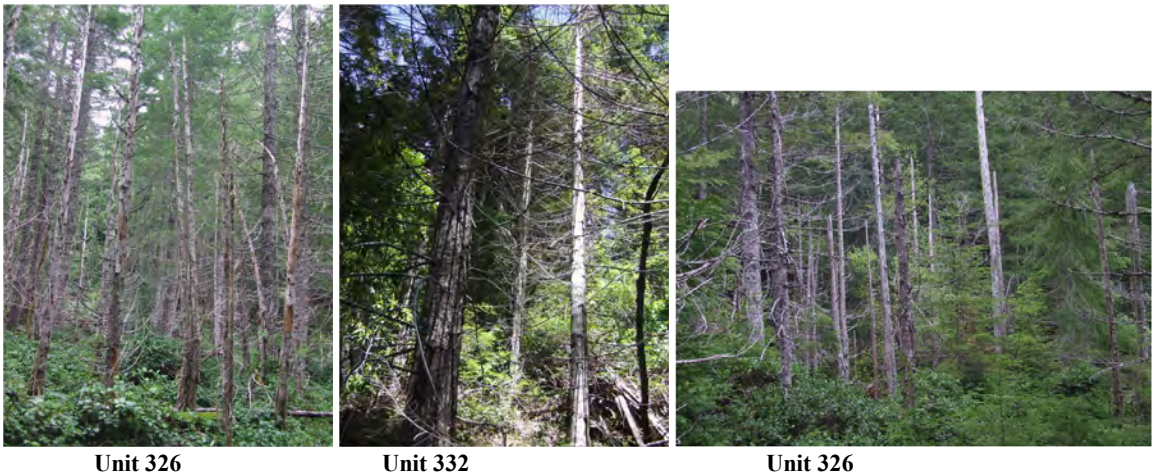
Low-risk Sites

These are sites with characteristics unfavorable for spread and infection by PL. Low risk sites are defined as streamside POC greater than 100 feet from a road and non-streamside POC greater than 50 feet from a road. Probabilities of spread are based on literature and professional judgment of forest pathologists with substantial amounts of experience evaluating PL in the laboratory and in the field.

Current Condition

Field observations noted variable amounts of standing small to medium diameter snags in PL pockets associated with profuse natural regeneration of POC seedlings and saplings. Infected and healthy POC seedlings usually occur intermingled.

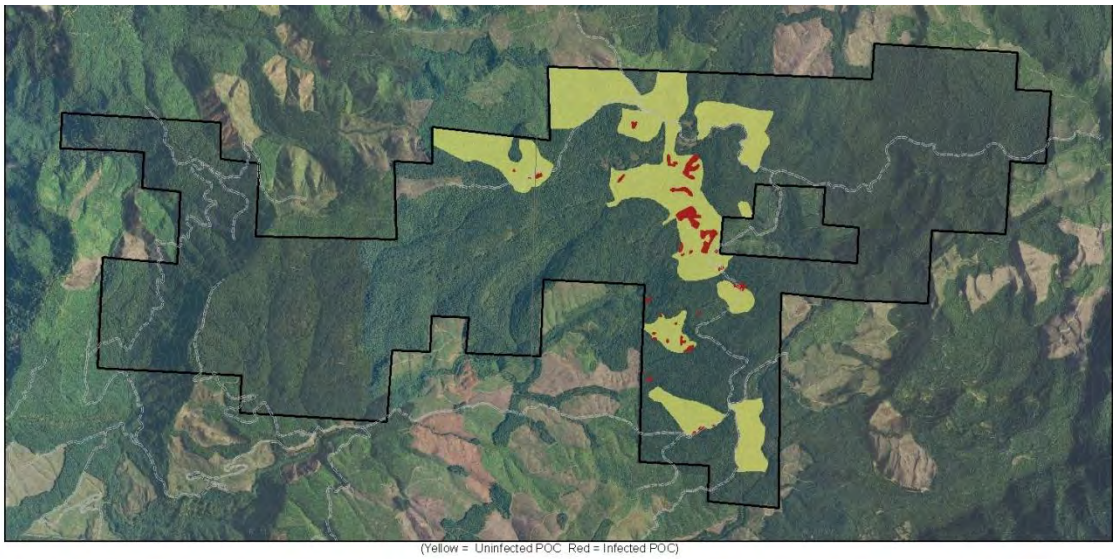
Figure II-4. Examples of PL Pockets - Eden Ridge Planning Area



Unit 326 **Unit 332** **Unit 326**

An updated Port-Orford-cedar (POC) inventory based on field verification was finalized in 2008 on the Powers Ranger District of the Rogue River-Siskiyou National Forest. POC root disease is mapped in small portions of the ER Planning Area (MAP II-4).

MAP II-4. Port-Orford-cedar Distribution in Eden Ridge Planning Area



Most of ER Planning Area is mapped as canopy cover 1 in the updated inventory. This attribute is defined as 2-5% canopy cover of POC present in mapped polygons. Canopy cover is estimated during air photo interpretation and field verification in some cases (Polygon Attribute Table-Data Dictionary).

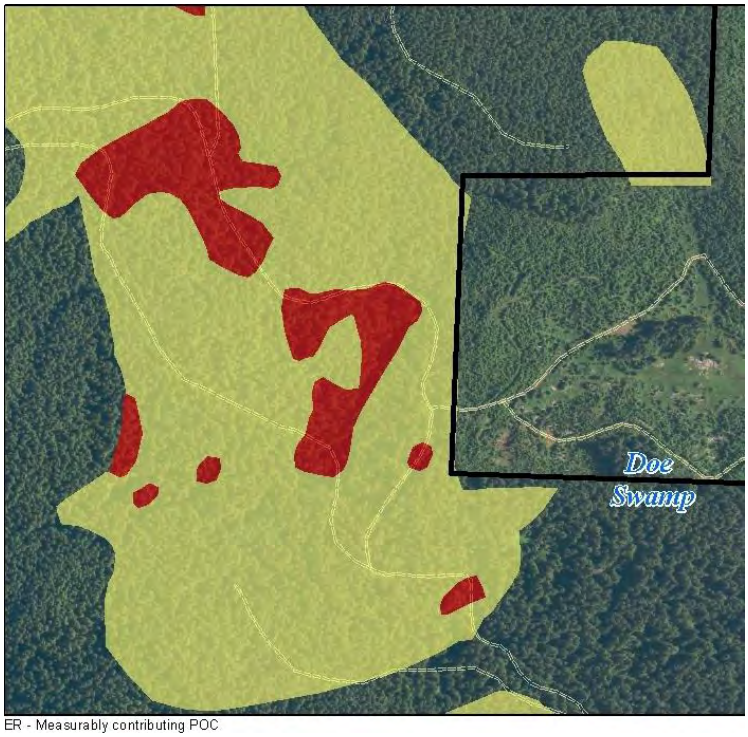
Canopy cover 1 can be considered to not measurably contribute to land management objectives[7]. For the Powers Ranger District, POC canopy cover of 6% or greater is the threshold for POC that measurably contributes to meeting management objectives. Where POC is a small percentage of the stand or does not provide unique stand attributes, its loss is probably not meaningful when measured against management objectives (USDA 2004, p. 34). In these circumstances, the decision to manage for POC is determined by the ER Interdisciplinary Team.

Landscape-scale POC distribution should be considered for ER as surrounding private timber company land is being managed for planted Douglas-fir regeneration on a 50 year rotation. Dead and dying POC seedlings and saplings, likely infected with PL are present in road ditches and drainages in the surrounding land ownership. PL has been diagnosed in dying POC regeneration alongside the 5000 Road west of the eight mile gate before entering into FS ownership (June 14, 2011, field trip with Frank Betlejewski, Interregional POC Manager).

Measurably contributing POC and PL infection is present west of the private inholding around Doe Swamp (MAP II-4). This area is mapped as canopy cover 2, defined as 6-20% POC present in mapped polygons. Proposed treatment activities can have potentially adverse effects to POC in this area. A project-specific POC Risk Key assessment is required in areas with measurably contributing POC to help determine where risk reduction management practices would be applied and to comply with the LRMP amendment.

[7] Pers. conv. Frank Betlejewski, Interregional Port-Orford-cedar Program Manager, Southwest Forest Insect and Disease Service Center.

MAP II-4. POC and PL Infection near Doe Swamp



ER - Measurably contributing POC

Port-Orford-cedar Risk Key

The POC Risk Key is used to clarify the environmental conditions that require implementation of one or more of the disease controlling management practices listed in the *2004 Record of Decision (ROD) and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon Siskiyou National Forest*. The objectives of the amended POC management Standard and Guidelines are to:

- Maintain POC on sites where the risk for infection is low.
- Reduce the spread and severity of root disease in high-risk areas to retain its ecological function to the extent practicable.
- Reestablish POC in plant communities where its numbers or ecosystem function have been significantly reduced.
- Reduce the likelihood of root disease becoming established in disease-free 7th field watersheds.

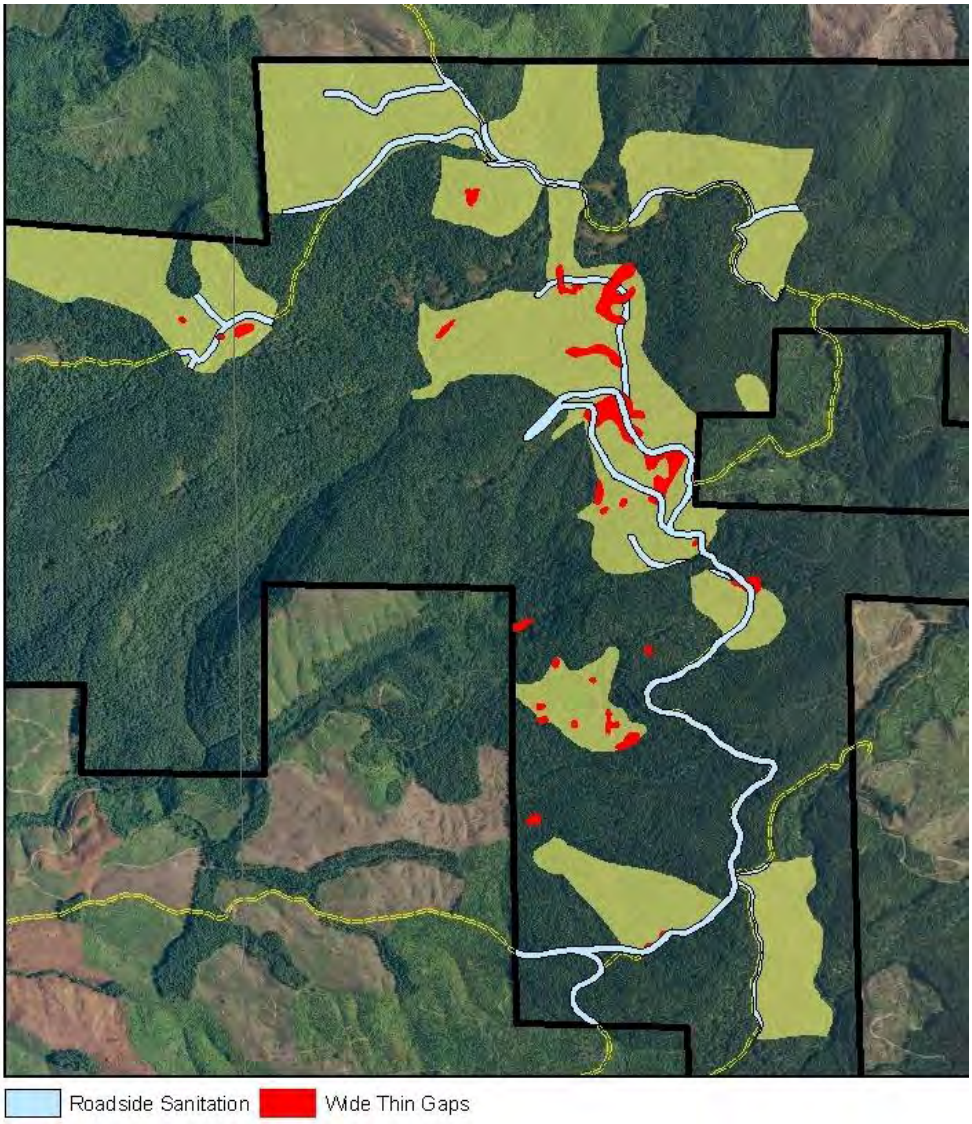
Program objectives are to maintain POC as an ecologically and economically significant species on National Forest (NF) lands. POC management will provide cost-effective mitigation for management activities that create appreciable additional risk to important uninfected POC though not to reduce all risk to all trees at all cost (USDA-FS 2004). In areas proposed for timber harvest and road building, mitigation would be required as described in the POC Risk Key assessment (see EIS Appendix B, Port-Orford-cedar Report).

This project-specific NEPA analysis will appropriately document the application of the risk key and the consideration of the available management practices, and will make the project consistent with the mid- and large-geographic and temporal-scale effects described by the 2004 SEIS analysis and Forest Plan Amendment, and permit the project analysis to tier to the discussion of those effects (USDA FS 2004).

Recommended POC Treatments

The POC Risk Key assessment for ER (see EIS Appendix B) recommends the following active treatments (MAP II-6):

MAP II-6. Port-Orford-Cedar Root Disease Treatments



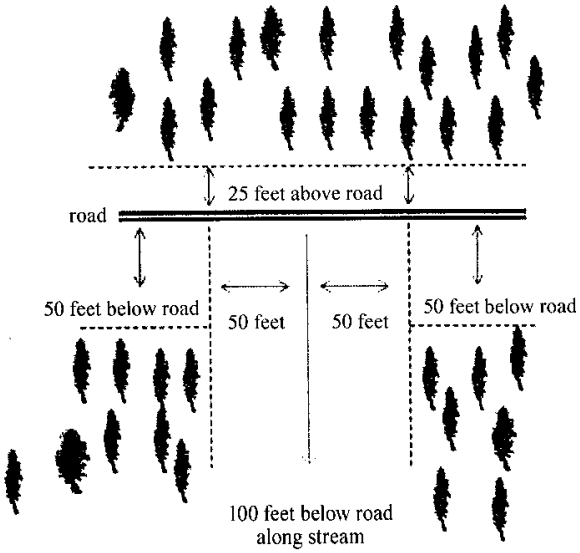
Wide-Thin Gap Treatments

Remove all live POC within PL infection sites. Leave non-susceptible tree species on site. Thin out all live POC within 2 to 3 crown radii from last infected POC along the perimeter of infection sites to separate healthy POC from potential root contact with infected POC. Pile and burn all POC slash and follow-up underburn to potentially mitigate disease presence. Sites can be planted with non-susceptible tree seedlings.

Roadside Sanitation
Manage for non-susceptible tree species by removing all POC along road sides and high risk sites as follows:

100-feet below roads at stream crossings, width of high water table.
25 feet above roads and 50-feet below roads in non-streamside areas.

Figure II-5. POC High-risk Sites



Planting
Restore POC within its natural range by planting non-PL infested areas and low risk areas with resistant POC. Gaps and root rot pockets may be site prepared and planted with Port-Orford-cedar seedlings for stand health and enhance structural and species diversity within a stand.

Sudden Oak Death (SOD)
Currently, the Eden Ridge Timber Sales Planning Area is outside the designated quarantine area for SOD. If new SOD infestations result in an expansion of the quarantine area boundary to include the Planning Area, compliance with state and federal quarantine regulations will be required.

e. Activity Fuels Treatments

Activity fuels treatment refers to the slash and accumulated fuel resulting from the proposed variable density management and other silvicultural treatments. While there may be some slash from previous harvesting or from natural conditions, the majority of material would be generated through density treatment and commercial removal from these actions. Activity fuels treatments proposed for this project include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk. The combination of density management and activity fuels treatments should leave the stands in a condition where a wildfire could burn through the stand, in the form of a surface fire that would not create unacceptable levels of mortality.

Harvest activities associated with the Action Alternatives would add needles, limbwood, and tops to the existing fuel bed in varying degrees throughout each treatment area. Disturbed ground vegetation and larger woody material would contribute to the dead fuel loading. In comparison with the natural long-term accumulation of ground fuels, harvest would contribute fuels to the site at an accelerated rate. The fuels remaining after harvest would be mostly of the smaller size classes, as most of the larger fuels would be removed for utilization, unless contractual requirements specify that they be left on site.

Below, are fuels treatment options considered for the proposed units. Implementation of these fuels treatment methods would likely be one or a combination of several treatments.

No treatment: This method would be appropriate for sites where fuel loadings fall well below LRMP Standard and Guideline recommendations by photo series (S&G 12-2, page IV-59). When residual fuels exceed the guidelines, not treating the fuels may be appropriate in areas of low risk where risks may be assumed for a period, until the hazard has been reduced by natural processes.

Hand piling fuels concentrations: This method would be effective in breaking up fuel continuity thereby reducing fire spread rates. Hand piling, followed by burning of the piles, can remove most fuels from a site. Hand piling is most effective in continuous moderate fuel loadings (25 to 50 tons per acre), and is less effective in scattered light fuels. This method may also be employed in areas where no other disposal methods are prescribed, or in conjunction with non-burning types of treatments, but where the risks may warrant some sort of hazard reduction; such as the piling proposed along Roads 5000, 290, 440, and 448. On the commercially thinned units that are adjacent to the aforementioned roads, logging slash within 100 feet of these roads would be hand piled and burned.

Forest-wide Standards and Guidelines for detrimental soil conditions and erosion (SNF-LRMP; pages IV-44-45) would be applied for this project. Slash piles have the potential to create severely burned and bare soils in the footprint of the piles. By minimizing the size and maximizing the spacing between piles, and burning in the winter and spring windows of opportunity when soil and fuel moistures are high, soil detrimental impacts and mineral soil exposure is minimized. This would also compliment the objectives of maximizing the retention of Large Woody Material (LRMP S&G 7-8).

Yarding of tops: This method would be effective in removing concentrations of the 0 to 3-inch size class fuels. In all treatment areas using ground-based or skyline yarding, tops of commercial trees would be left attached to a commercial log while yarding (Yard Tops Attached – YTA). The tops would be piled and disposed at the landing location.

Piling and Burning Landing Slash: This method would be effective in disposing of all remaining un-merchantable vegetation on log landings (piling and burning).

Forest-wide Standards and Guidelines for fire management (SNF-LRMP; pages IV-59 through 62) would be applied to this project. The fire hazard presented by natural, activity or prior activity fuels should be reduced to appropriate levels; and proposed activities should be designed and coordinated on the ground to help make the fuel treatment and fire protection as practical and economical as possible.

f. Harvest (Logging) Systems

Considerations for Application of Logging Systems
All candidate stands have all been previously logged, with the majority of the Eden Ridge Planning Area being previously logged via historical railroad systems. A Transportation and Logging Systems Report (Roads Analysis) Appendix I is attached to this document and incorporated by reference. This report documents the basis for application of potential logging systems and provides the basis for road use and proposed new road construction.

Past treatments had different (and typically less) consideration for sensitive slopes, sensitive soils and sensitive riparian areas. The entire area was logged with “steam donkey” cable systems. Past cable yarding systems, as associated with railroad transport, employed “high lead” or systems that did not require or utilize log suspension (as would be required today). Some terrain (as seen in the Action Alternatives) would require partial suspension (or full suspension) systems on stands that had previously been cable logged without suspension in the past.

The proposal of system(s) to be used in any given stand is based on existing classified road access, new system or temporary road construction needs, as well as economic and technical feasibility identified for each treatment unit. The two primary concerns involved with use of the various logging systems is the potential detrimental effects to soils and the construction of new roads. New classified or temporary roads may be necessary due to the need for a change in the logging system design or to access areas that retain no access, reflecting an adherence to current standards and guidelines set forth in the Forest Plan. Soil concerns elevate when ground based equipment is considered for use on steeper slopes, sensitive riparian areas, sensitive soil types, or unstable areas.

Conversely, there is an operational concern for economics between the various systems being considered, i.e., ground based systems are most economic from an operational cost viewpoint, skyline systems increase in operational costs, and aerial (full suspension or helicopter) systems are the most costly. Road access and landing accessibility and construction costs are also factors to consider.

Logging System Options
Within the Eden Ridge Timber Sales Project, logging system options for stands that provide opportunities for commercial extraction include ground-based systems, skyline cable systems, and aerial (helicopter) systems. Estimates of anticipated logging system needs by Action Alternative are provided in sub-section C, 2, this Chapter. This Section provides background and explanation of these systems.

Ground-based Systems - Refers to a group of logging methods that are considered ground-based, and may also include mechanized harvesting equipment. Typically, logs are harvested using mechanized heavy equipment to skid the logs to a landing area, where they would be loaded onto a truck. These ground-based systems are usually utilized on terrain where slopes are less than 25-35 percent. The maximum percent slope for ground based systems, as designed for the Eden Ridge Planning Area is 35%.

In all cases, all proposed skid trails should be pre-designated by the operator and approved by the Forest Service before felling and skidding. Skid trails should not be allowed to cross specified stream channels or only at Forest Service approved locations. In general, skid trail spacing should average 100 feet apart and located on the fall line, especially if using harvester-forwarder systems due to the forwarder‟s high center of gravity. It is estimated that an average skid trail spacing of 100 feet apart would result in approximately 12% to 15% of the area being covered with skid trails.

Tractor - In this system, a cutter will fall to lead toward designated skid trails, then limb and buck the tree in the bed where it landed when it was felled. Three methods of skidding can then be utilized, loader or shovel yarding, grapple or choker skidding. Shovel yarding consists of a heal boom loader grabbing the logs and swinging them towards the landing in stages. Grapple skidding uses swing grapples attached to the rear of the tractor. The clamps pick up one end of the log and the operator positions the log for skidding. When several logs are bunched, the grapple can pick up several ends at one time and skid the turn to the landing. The third method involves chokers that are attached to the logs and a tractor equipped with a winch pulls the logs from their beds into the skid trail. When a group of logs are assembled into a turn, the chokers are gathered together, the leading ends of the logs are suspended above the ground behind the tractor by way of an integrated arch or similar apparatus, and the trailing end of the logs drag along the ground on the way back to the landing. At the landing, a front-end or a knuckle-boom loader is used to sort and load logs decked at the landing onto log trucks.

"Winch/line" Some areas of timber harvest where slopes generally exceed 35% slope but are relatively small – usually less than 250 feet wide –can be reached by a winch line from a ground based machine or reached from a road by a winch line or loader. The tractor uses a "bull line" to pull the logs to the skid trail or road. These areas are usually inside larger ground based inclusions and are considered part of the ground based system.

Rubber-tired Skidder - This system is essentially the same as tractor logging in technique, although the skidding equipment has some operational and functional differences. While most tractors have steel tracks with cleats that run along a rigid rail and tend to churn up some soil when it turns, rubber-tired skidders are often articulated in their middle instead of a rigid frame, and they displace somewhat less topsoil than a tractor would when it turns. Both types of equipment can have advantages, depending on the situation.

Typically, tractors can work on somewhat steeper slopes, while skidders are faster and average skidding distances can be somewhat longer. By virtue of the fact that both tractors and skidders bear the weight of one end of the logs being skidded, the weight of the machine skidding logs is not evenly distributed, but is instead concentrated near the back of the machine. This configuration can create disproportionately higher ground pressure on the soils being skidded upon than the machines rated or calculated pressure (in pounds per square inch) would indicate.

Harvester-Forwarder - A harvester and forwarder are two separate pieces of equipment. The harvester (while traveling on pre-designated harvester trails) reaches its boom out to cut the tree, and lays it on its side approximately perpendicular to the axis of the skid trail. Rollers on the cutting head then pull the tree through delimbing knives which drops the limbs in the harvester trailing front of the harvester as they are severed. As each pre-determined length of log has been fed through the harvester head, logs are cut to length and allowed to fall into a stack of uniform length logs alongside the harvester trail. As the harvester travels through the stand, it rides on the layer of limbs that act as a cushion to help minimize soil compaction.

Later, a forwarder uses the same trails to pick up the logs, load them onto its bunk, and transport the logs to the landing, completely free of the ground instead of dragging them behind the machine. Because the logs are transported free of the ground, the weight is evenly distributed over all of its wheels, so the resultant ground pressure is less than with other ground based systems. This method not only minimizes soil compaction, but it virtually eliminates any exposure of subsoil so there is rarely any detrimental displacement or erosion. Because of the specialized equipment, there is a slightly higher cost, compared to tractor or rubber-tired skidder.

Skyline - Is a system that transports logs from stumps to landings using a wire rope cable that is suspended between a tower and a tail tree. This cable (or skyline) functions as an overhead track for a load-carrying carriage. Logs are lifted by cables or other devices attached to the carriage and pulled into a skyline corridor. The carriage is then pulled to the landing by a mainline powered by a yarder. The skyline provides vertical lift so that the logs have their leading end suspended above the ground during inhaul. In some cases, the entire log may be suspended above the ground.

Skyline logging is generally specified where road access is suitable, on slopes greater than 35%, and/or where soil or water conditions are a concern. In all cases, one-end log suspension would be required in all skyline units. Where logs are to be yarded across specified stream channels or wet areas, full log suspension would be required over the designated stream channel. In order to get adequate deflection in some units, the skyline may have to be rigged across major streams and/or existing roads.

Guyline anchors are needed and within the Eden Ridge Planning Area, should be adequate in most areas. However, in some locations multiple stump anchors, machine anchors, and/or “deadman” anchors may be needed. Guyline anchors should generally be green Douglas-fir 15” to 26” dbh and 40+ years of age. Guy trees would have to be felled before being used.

Tail tree and tail tree anchors would be needed on most skyline corridors. Tree sizes should be from 15” to 26”+ in most locations (Douglas-fir). Tail tree rigging heights may be up to 50 feet. Tree sizes and rigging heights should be guided by OR-OSHA Chapter 437, Division 6.

Skyline landings would mostly be located in the road prism. Landing orientation would utilize both parallel and centralized (radial) configurations. In some cases, landings would need to be placed on narrow roads, therefore, a swing boom type yarder would be necessary. If the project specifies that tops be left attached to the top log in skyline units, some log processing may be needed on the landings (i.e., the whole tree system). This would require slightly larger landings and/or the back-haul of slash in order to accommodate the residual slash from the top log and residual limbs. Log processing could be accomplished by a relatively small and inexpensive "pull-thru" log processor or a more expensive and more efficient mechanical processor.

Helicopter - This logging system utilizes medium or heavy-lift helicopters to transfer the logs from where they are cut to a landing where they are loaded on trucks for haul to a mill. Helicopters are divided into three classes, depending on their lift capabilities. Helicopters have high operating costs and are usually utilized where there are concerns for ground disturbance or where road building is not desired. Aerial systems (e.g., helicopters) would be a system used to accomplish commercial density management where existing access systems are not available or would cause extensive resource damage if utilized.

Helicopters can be used to move material from the treatment area sites, and move them to processing areas (i.e., landings). From the landings, material can then be removed from the forest by trucks, utilizing existing classified roads suitable for such use. The use of helicopters allows for full suspension of trees or material from the treatment area to the landing area and does not create excessive ground disturbance via skid trails or skyline corridors.

This system (helicopter) can be utilized where there is no directly adjacent road access. There are limitations however on the flight distance and elevation change from the landing to the stand where material would be transported. Landings must be within a distance of approximately 1 mile from the treated stand. There are also other factors to consider regarding helicopter systems and economic feasibility, including turn size, maintenance and fuel storage landings, etc.

Within the Eden Ridge Planning Area, numerous potential log and service landings are available. Helicopter landings, in general, have an average size of about 80 feet by 200 feet and be located as close as possible to the harvest units they serve. However, the actual landing size and location can vary widely depending on terrain, slope, volume flown per acre, and flight direction. In general, landings should be cleared of trees and stumps and leveled as much as possible. In some cases, some surrounding green tree might have to be removed to facilitate flight direction. Some of the landings associated with the Eden Ridge Planning Area may be located on private land or private roads. These locations would need approval from the private land holder if used. Service landing(s) need to be no more than 1 mile from the harvest units (less if possible) and accessible by highway fuel trucks.

Prebunching

This system can be subordinate to any of the above systems. It typically involves machine cutting, weighing, and bundling logs to make log transport more efficient. A tracked, self-leveling machine can typically work on ground up to 35% slope gradient, with minimal adverse effect to soils (minimal additional detrimental soil effects and within soils Standards and Guidelines). By making one pass through the stand and walking on slash and compacting and dispersing it, slash treatment costs can be bypassed and fire danger lessened.

Use of this equipment can make all phases of the ground based, skyline, and helicopter logging considerably more economical and can also treat the slash at the same time. While pre-bunching could be used in any systems (where slopes allow), it is especially applicable to helicopter systems. The biggest cost factor in helicopter logging is the aircraft cost per hour; anything that can boost the volume per hour produced can bring down unit costs.

Pre-bunching timber in a thinning into flyable bundles with a "cut-to-length" processing machine has been proven to maximize volume flown per hour. Production can be increased as the turns fly faster, loading is consistent, no excess weight (slash) is flown, landing impact and size are minimized, and labor and loading costs are cheaper. The savings from this type of operation is estimated to be about 20-25%.

g. Existing Road (Access) Systems

A Transportation and Logging Systems Report (Roads Analysis) Appendix I, is attached to this document and incorporated by reference. This report documents the basis for application of potential logging systems and provides the basis for road use and proposed new road construction. The following discussion summarizes the basis for use of existing roads.

Roads are organized into four types; existing Forest Service Classified (or permanent system) roads, existing unclassified roads on National Forest System Lands (NFSL), existing roads currently under a Share Cost Agreement with adjacent private landowner interests, and roads that are private roads (not inventoried or managed by the Forest Service.

Considerable effort was made during this planning effort to correctly locate and inventory existing roads systems discussed in Appendix I and in this section. In many cases, roads appearing on maps or in database inventories were determined to be incorrect based on field examination. These anomalies occurring in several ways, e.g., some roads being tracked and mapped as existing Classified roads were in fact not correct.

In other cases, roads existed and are being used that were not being tracked as Classified roads. Unclassified roads likewise were found to be in error, either existing as Classified roads or not existing but were being tracked as unclassified roads. In order to facilitate use, existing share cost roads and the inventory of adjacent privately managed roads was updated for this project.

Specific listing of existing road needs (length and quantity) and locations are unique to each of the Action Alternatives considered in detail and are contained in the descriptions of each alternative.

Classified Road Systems

The following discussion includes the basis for use of (Classified or permanent system) roads. Forest System Roads are under the jurisdiction of the Forest Service and are deemed necessary for protection, administration, and use of NFSL. These roads are inventoried, maintained, and managed by the Forest Service. Generally, these NFS roads are identified as Maintenance Level 1, 2, 3, 4, or 5, under the following definitions.

Table II-8. Road Maintenance Level Definitions

Level 1	Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. While being maintained at level 1, roads are closed to vehicular traffic.
Level 2	Assigned to roads open for use by high clearance vehicles. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses.
Level 3	Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.
Level 4	Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.
Level 5	These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.

Most of the currently existing Classified road system within Eden Ridge is currently managed as Maintenance Level 1 or 2.

Unclassified Roads
The Eden Ridge Planning Area contains additional roads, trails or grades that are not inventoried, maintained, or currently managed by the Forest Service. As noted above, some unclassified roads were found to be in error, either existing as Classified roads or not existing but were being tracked as unclassified roads. Further use of correctly inventoried unclassified roads is discussed in the next section under proposals for construction, reconstruction or use as part of the Eden Ridge Proposed Action.

Cost Share Roads
The Eden Ridge Planning Area is completely surrounded by private lands owned and managed for timber production. There is an extensive network of existing roads to facilitate access to these lands. In the past, some of these roads also facilitated access to NFSL and cooperative Cost Share Agreements were put in place.

These agreements require a proportionate share of use, maintenance and reconstruction of roads that serve mutual benefit. The intent of the cost share agreement is to eliminate the need for duplicate road systems and share in the cost and maintenance of these facilities that benefit both parties. While some cost share roads currently exist, construction, reconstruction and/or use of additional cost share roads is discussed in the next section. Some existing roads on private lands are also being proposed to be added to existing Cost Share agreements to minimize the need for construction of new roads.

Private Roads
As noted above, the Eden Ridge Planning Area is completely surrounded by private lands owned and managed for timber production. There is an extensive network of existing roads to facilitate access to these lands. While not providing direct access to NFSL, in some cases these roads provide the most logical product haul and may be used under agreement or permit under the Eden Ridge Timber Sales Project.

h. Proposed Road (Access) Systems

Product Transport or Haul
Hauling involves loading and transporting logs or other products on log trucks along roads associated with the harvest activity areas. These roads need to be in a safe and acceptable condition for this purpose, and could require Classified road reconstruction or maintenance prior to this use. Hauling occurs on all road surface types including asphalt, aggregate gravel, and native-surfaced.

Classified Road Maintenance
This activity includes several related activities which maintain drainage, cuts and fills and surfacing of the road prism to accommodate light and commercial road traffic; while maintaining the integrity of the road facility and minimizing effects to natural resources adjacent to the road. Much of this work is done with a motor grader, dump trucks and backhoe.

Road maintenance includes travel way surface maintenance, drainage ditch maintenance, culvert cleaning, surface rock replacement, shaping of the roadway and ditches by blading, removal of slough materials, compacting and other mechanized and hand work. Classified road maintenance involves activities of a lesser scale and effect than Classified road reconstruction. Note that some items associated with routine road maintenance are sometimes included in contracts and identified as road reconstruction.

It is estimated that road maintenance would be needed on the road system utilized for this project, over a number of years. This would vary according to the Actions Alternatives due to stand treatment locations, the proposed harvest access and logging system, and the conditions preceding the need for the road. Road maintenance renders the road durable and useable, and when not further needed, allows it to be in a storage condition that minimizes effects on soil, water and other resources.

Road maintenance includes use of rock quarries and water sources, roadside brushing, grading, ditching, rocking of perennial stream crossings on native surface roads and other activities needed to maintain the road facility in good condition. Maintenance work is usually performed commensurate to the use of the road and the condition of the road.

Classified Road Reconstruction
Reconstruction involves maintenance and improvements to existing Classified (system) roads, to make them suitable for logging equipment and harvest treatment access. Reconstruction involves restoring a Classified system road to its previous operational condition. Road repairs could have one or more of the following work items: removing fallen trees, cleaning out culvert inlets, removing and disposing of small cut slope slides, falling danger trees, replacing minor amounts of road surfacing, replacing, adding additonal drainage structures, etc.

Treatments could include grading, clearing, restoring road width loss, or stabilizing a cut or fill (embankment) slope that was lost due to storm damage, by placing riprap materials (large boulders) against existing slopes, and may include widening and surface rock replacement.

Previously existing spur roads, skid roads, or old railroad grades could be reconstructed and utilized for development of Classified road access. This would place the impacts on areas already affected and lessen the environmental impact associated with new road construction in undeveloped areas. A reconstructed Classified road is often more environmentally sound than a temporary road because it is designed to a higher standard. When closed for a long period of time, a Classified road can be a more stable facility when left in a storage condition.

It is estimated that road reconstruction would be needed on portions of the road system utilized for this project, over a number of years and projects. This would vary according to the Actions Alternatives due to stand treatment locations, the proposed harvest access and logging system, and the conditions preceding the need for the road. Performing road repairs could also be accomplished by future commercial timber sales or stewardship contracts that would include requirements to perform minor road reconstruction work and applicable road maintenance work.

Culvert replacement may occur in some stream channels and drains that relieve road ditches. Many culverts in channels are determined to be undersized to handle the water and sediment from areas above the structure. Culverts have a lifespan and effectiveness that diminishes as rust and corrosion decrease the strength and integrity of the structure. These culverts would be replaced as necessary. This project provides the opportunity to upgrade culverts for additional resource protection and enhancement.

Work would entail excavating the fill covering the current culvert and removing the culvert. Fills placed over the new pipe would be compacted and the road prism shaped to provide good drainage in and around the new culvert. Project Design Criteria and preventive mitigation measures would be used to minimize stream channel disturbance at the site and reduce the amount of unconsolidated material remaining in the channel after installation of the new culvert is completed.

New Classified Roads
The Eden Ridge Planning Area currently has a minimal existing road network and when the logging that created the candidate stands of today were created, most of the area was logged by historical railroad systems. Most of the existing Classified roads evolved from early railroad grades but do not adequately serve the Planning Area for today's needs and systems. Because the area is primarily allocated to Matrix, the Forest Service conducted a Roads Analysis process which identified the need for additional, permanent, Classified roads (Appendix I (Roads Analysis).

New Classified roads were determined to be necessary to minimize temporary impacts on resources, especially, land, water, wildlife, and air. These new Classified roads are necessary to to maintain a quality that permits future use without need to re-accomplish or replace work that is currently in satisfactory condition. Construction should minimize repeated impacts and avoid unacceptable risks to resources. It should not result in higher future capital expenditures that could be required if, for example, roads had to be rebuilt or relocated for each sale or entry.

New Classified road construction is designed to result in the lowest total transportation cost (construction, hauling, and maintenance) for the intended management use, while ensuring safety and minimizing temporary or extended resource impacts (FSM 2432.34 and FSM 7700). Timber sale contracts may authorize construction of both specified Classified roads and temporary roads.

All proposed new Classified roads would be created and managed as Operational Maintenance Level 2 roads and Maintenance Level 1 when not in use for harvest activities. System roads are for long-term, multiple management needs, often with some potential for future use every five-to-ten years. At this time, the critical vehicle has been identified as a skyline yarder, and the design vehicle has been identified as a log truck. The traveled-way width would be generally 12-14 feet plus curve widening, fill widening, and turnouts, unless the critical vehicle dictates otherwise.

All proposed new system roads would be rocked as needed to minimize erosion and allow for extended use during wet conditions. All new Classified roads (including those crossing Riparian Reserve) would be engineered and designed to minimize environmental impacts. Designed roads constructed on NFSLwould be accompished to standards appropriate for the intended uses; considering safety, cost of transportation, and impacts on lands and resources. Designed roads would be constructed as stable and durable structures to facilitate maintenance during and after use.

This design would include necessary drainage facilities, adequate erosion control, closure devices, and resource protection devices. Closure of all new construction of system roads would typically be accomplished via a road entrance closure of native materials (logs, earth, boulders) after timber sale activites had occurred, placing them into Maintenance Level 1 Status.

Some new Classified roads would cross Riparian Reserves, under specially designed Project Design Criteria (see Section 3, Project Design Criteria For Riparian Reserves, this Chapter.

In addition, some of these proposed new Classified roads would potentially be constructed under terms of the existing Cost Share Agreement (subject to agreement between the Government and private landowners.)

Temporary Road (Access) Systems and Landings

A temporary road is a road necessary for emergency operations or authorized by contract, permit, lease or other written authorization that is not a Forest road and that is not included in a Forest transportation atlas (36 CFR 212.1). For the Eden Ridge Timber Sales Project, some new temporary road construction may be needed for candidate stand access. Temporary roads include those roads needed only for the purchaser‟s use for a given timber sale(s), such as roads used to haul timber from landings to permanent National Forest System roads.

The Forest Service and the purchaser must agree upon the location, resource protection requirements for road construction, clearing widths, and closure or rehabilitation requirements. Temporary roads are not constructed to serve long-term future uses and must be closed prior to closure of the timber sale (FSM 2432.34b).

Temporary roads are proposed where it is likely that a one-time access is needed as part of a contract, for access to harvest units. They typically have a lower planning, design, and initial development cost than permanent system roads. Forest Service regulations (36 CFR 223.37) require temporary roads to be revegetated within ten years. These roads cannot be compared to engineered roads (permanent system roads) as they are not designed for multiple uses or long-term resource protection (e.g., all-weather maintenance).

In this analysis, a temporary road is defined as a created travel way, for the purpose of transporting logs that is built, utilized, and decommissioned (obliterated) over the course of the treatment/harvest operation. Temporary roads would not be surfaced (rocked) and would be used during dry conditions only.

These roads would be built and removed by the operator as part of the Forest Service timber sale or stewardship contract. In constructing these temporary roads, no large diameter trees (e.g., late-seral or "old-growth" type trees would be felled for road clearing. Estimates of temporary road needs are provided in sub-section D, 2, this Chapter, and would vary according to the Actions Alternatives due to stand treatment locations, the proposed harvest access and logging system, and the conditions preceding the need for the road.

In many cases, these temporary roads are essentially access to or an extension of a landing (a few hundred feet), or could actually be a travel way of up to 1,800 feet. Temporary roads are considered as part of the affected (detrimental) soil conditions under the Soil Quality Standards and Guidelines. Maximum percent of area for detrimental soil conditions would be 15 percent for an activity area (including roads and landings: SNF LRMP Standards and Guidelines for Soils; 7-2).

Temporary roads would be managed in accordance with water quality Best Management Practices[8] (BMPs) R-23. In order to prevent continued low level casual use, and to minimize resource impacts, such roads and landings would be obliterated at the completion of their intended use. Effective obliteration is generally achieved through a combination of the following measures:

-Temporary culverts are removed and natural drainage configuration is re-established;
-Road surfaces are ripped;
-Sideslopes are reshaped and stabilized; road is effectively drained; and
-Road is blocked to further use, and road is returned to vegetation production through revegetation (seeding, planting browse species, or hardwood/conifer trees).

Landings

Some of the areas associated with the candidate stands have an existing network of roads and landings from previous harvests. However, there would also be a need for some additional areas created for log landings. These would primarily occur in areas where no landing currently exist or where a change in logging systems (e.g., where skyline logging is now prescribed in areas previously railroad logged).

These additional landings are highly variable by Action Alternative and the selected logging system. For example, helicopter systems typically require larger (1 acre) landing areas, whereas a tractor system could utilize areas barely larger than a road-width, although tractor and skyline systems would typically require many more landings.

Temporary road (and landing) locations and stabilization measures are typically determined by the Forest Service Contract Administrator, with agreement by the contractor/purchaser. The Contract Administrator may request the advice of a watershed specialist in determining the most appropriate location and stabilization measures to be applied. Special stabilization measures would be required if need for a temporary road would extend for more than one year (seasonal mitigation measures).

[8] General Water Quality Best Management Practices, Pacific Northwest Region, November 1988.

Log landings may be a specified road requirement when they meet all of the following conditions: 1) when constructing the landing and the road simultaneously would reduce cost and soil disturbance, 2) when logging system planning has confirmed the need to locate the landing on a specified location, 3) when the landing lies on or immediately adjacent to the road, and 4) when the landing area is to remain a permanent part of the road. The road and landing must result in a contiguous cross-section. To the extent possible, location of landings would coincide with turnouts, borrow areas, and turnarounds.

i. Other Connected and/or Related Actions

Other miscellaneous actions would be included under the Proposed Action and the Action Alternatives; they are designed as resource enhancement, restoration, or improvements. They could be financed through collections generated via forthcoming timber sales (i.e., Knutson-Vandenberg [KV] funds), or through Forest Service appropriated resource and enhancement funding, or stewardship contract agreements. These actions would occur in proximity to managed stand treatments; they would not be authorized as landscape scale enhancement opportunities. There may also be opportunities for public learning and interpretation of actions associated with this project.

Non-Commercial Treatments

Non-commercial treatments are proposed for 363 acres within the ER Planning Area (see Table II-9 and MAP II-7). Options include restoration, rehabilitation, reforestation, removal or thinning of non-commercial sized trees. An example of stand conditions that could benefit from these treatments is shown in Figure II-6. The purpose of these treatments, considered Timber Stand Improvement, is to comply with the National Forest Management Act of 1976 and the 1989 LRMP.

Table II-9. Eden Ridge Non-Commercial Treatment Units

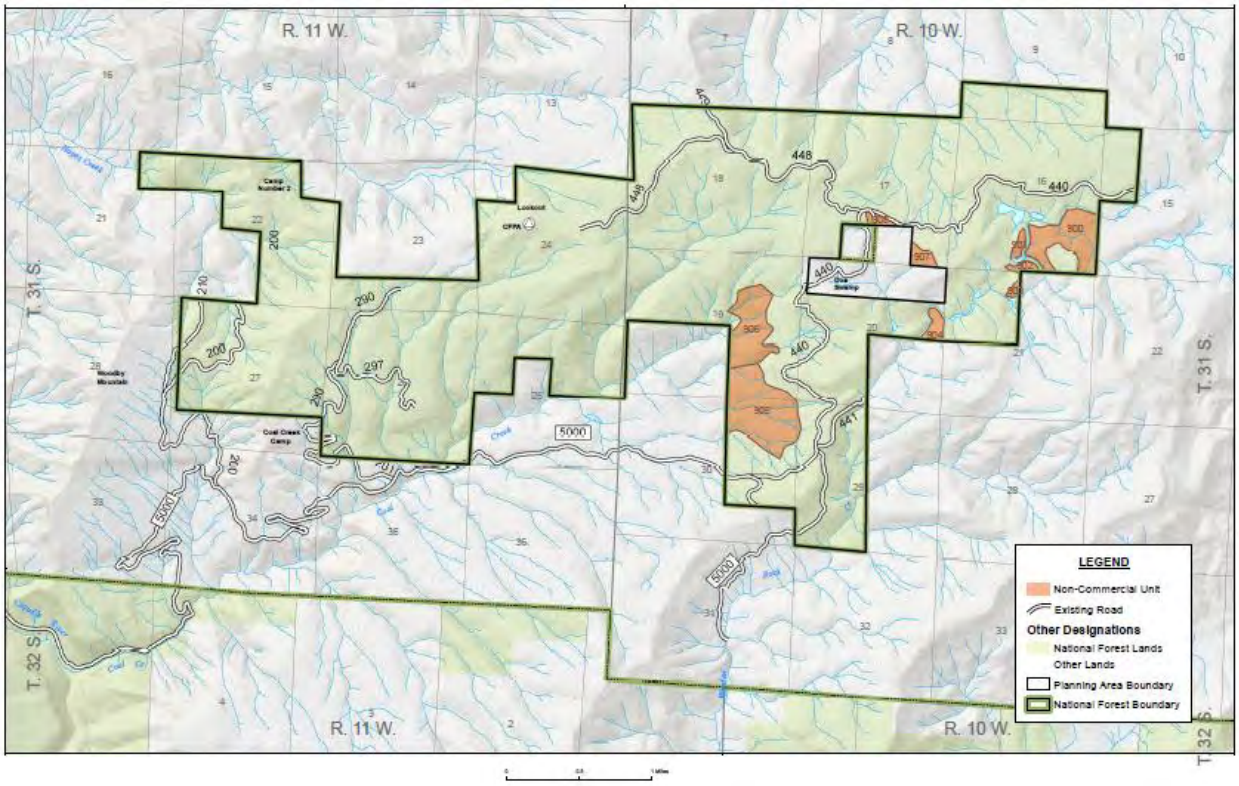
Unit Reference	Acres
900	85
901	7
902	7
903	5
904	14
905	140
906	82
907	12
908	9
Total	**363**

Figure II-6. Example of Dense Stands Proposed for Non-Commercial Treatment



Unit 905

MAP II-7. Non-Commercial Treatments within Eden Ridge Planning Area



Portions of proposed units for non-commercial treatments have high height to diameter ratios on overstory trees and forest health issues with laminated root rot, shallow soils and windthrow (e.g., Unit 908). These areas may be treated by removing small diameter material for biomass and planting with POC and other resistant tree species.

Some plantations within commercial unit boundaries are non-commercial due to tree size, density and high height to diameter ratios. These areas may also be treated (or skipped) by removing small diameter material for biomass and planting.

Snag/Down Wood Creation

Following harvest operations, if KV or stewardship funding is available, in areas where there is a lack of large snags needed for cavity nesting species, snags may be created from live trees left in stands. Creation can be through girdling, topping the trees with chain saws, blasting, inoculation with heart rot fungi, or deliberate injury. These methods would open the trunk to development of a hollow core used by woodpeckers and a variety of other birds, mammals, and other wildlife. Whenever possible, creation of snags over 14" dbh should be part of each prescription (see Section 2, c., snag and large wood objectives for the western hemlock plant series in the coast geographic region, as applicable to the Eden Ridge Project).

Meadow Enhancement

Following harvest operations, if KV or stewardship funding is available, non-commercial treatments to enhance meadow and other grassy area conditions, may be enacted. These treatments have already been analyzed under NEPA and a separate decision already made. The Eden Ridge Timber Sales Project may provide the funding mechanism. Treatments may include removal of encroaching brush and conifers, underburning and vehicle access controls. The site locations include Coal Meadows, Sweeney Meadows, proximity of Unit 316, and other identified locations within the Project Area but outside of treatment units. Treatment of these sites would be directed by Wildlife Biologists.

Stream Enhancement
The Eden Ridge Project proposes to place 150 large trees in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Live and dead trees may be removed from riparian areas to provide wood for enhancement projects, under special conditions described in the Design Criteria (see EIS Appendix H). This action could involve the use of log trucks and dump trucks for transport and excavator-type machinery, low ground pressure equipment, cable yarders, draft horses, or helicopters for placement. Plans and designs would be consistent with Forest Plan direction, K-V opportunities, and watershed restoration plans (e.g., USDA FS 2006).

Approximately 1 Mile of upper Coal Creek tributaries within Units 905 and 906 would have trees felled toward the channel and approximately 1 mile of Wooden Rock would have stream enhancement. Approximately 50 trees per mile would be placed within approximately 3 miles of stream (150 trees total, 22,650 cubic feet). The proposed enhancement is located in resident fish habitat ranging from ten miles to twenty seven miles upstream of critical coho habitat and three to eight miles for essential fish habitat (see Appendix H).

Native Grass/Forb Seeding
Following harvest operations, if KV or stewardship funding is available, seeding of disturbed sites associated with logging skid trails, landings, temporary roads and burned slash piles would reduce the opportunity for non-native plants(including noxious weeds) to invade disturbed sites and reduce erosion from exposed mineral soils. Seeding exposed mineral soil with native grass seed (~4-8 lbs/acre) would restore and improve forage for wildlife that benefit from grasses and forbs; e.g. deer, elk, mice, rabbits and their predators.

Invasive Plant Treatments
Monitor and treat invasive plants within project area boundaries to reduce/eliminate current populations and reduce the future spread of non-native vegetation. Treatment would be completed in disturbed areas within the watersheds by hand pulling only.

Depending upon funding availability (KV), monitor and treat invasive species within the Planning Area for up to 5 years after completion of the project.

Other Wildlife Opportunities
Following harvest operations, if KV or stewardship funding is available, artificial nest/roost box creation for cavity nesting species may be appropriate. Locations include any created gaps/openings within all treatment units, meadows or grassy areas, and riparian areas within the Project Area.

j. Assumptions Regarding Treatment Application (Implementation)

A key assumption common to all Action Alternatives is the basis of implementation. The Action Alternatives utilize a concept that treatments would be located and conducted as specified in the design of the alternative, the Project Design Criteria and/or employment of specific mitigation measures. Certain actions are proposed associated with certain design criteria or limitations. The on-the-ground conditions that trigger these criteria are to be identified and validated at the time of, or concurrent with implementation (and prior to operation).

Given the assumptions identified in this Section and this EIS, for density management, **there is no intent to treat any candidate stand, unless it needs and would benefit from treatments**. When current relative density is not greater than 50 percent (i.e., it is not overly dense) it would not be treated. Considerations for steep slopes, unstable areas and sensitive soil types are provided in design elements and alternatives.

Contracts for commercial harvest or stewardship operations would require certain provisions and mitigation measures to be incorporated as contract requirements. The Forest Service has long-standing experience in applying mitigation measures under traditional timber sale contracts; Forest Service contract administrators are responsible for enforcing the implementation of contract provisions.

This project EIS will not analyze or make a decision on financing or packaging of implementation contracts, e.g., which units would associated or packaged into which sales. This would be accomplished later, based on the selected course of action and the types of treatments (including yarding systems), and locations that are included.

3. PROJECT DESIGN CRITERIA FOR RIPARIAN RESERVES

This Sub-section discusses elements related to the design of treatments and actions (i.e., Project Design Criteria), applicable to Riparian Reserves, under the Action Alternatives. These elements were utilized to develop proposals and/or are to be employed during on-the ground project designation/implementation and are designed to address overall objectives (attain the Purpose and Need) and resource objectives to manage consequences (obtain compliance with Standards and Guidelines). Other elements that manage consequences during actual operations are termed "Mitigation Measures" and are discussed in Section 9 of this Chapter.

Project Design Criteria are employed concurrent with the various silvicultural treatment elements described in Section 2 of this Chapter. Many specific Riparian Reserve design elements would require site-specific recommendations from Forest Service resource professionals. This is an overall design element/mitigation measure applicable to all treatments.

The primary silvicultural objective for ER is to control existing dense stocking conditions and to treat subordinate amounts of root disease infection within candidate stands to improve forest health and to sustain or increase tree growth and vigor throughout treatment areas including the Riparian Reserve. Felling actives would be designed using variable density thinning (VDT) techniques. VDT uses a combination of low and crown thinning to release larger dominant and co-dominant trees. Spacing between trees is variable depending on tree diameter distribution on the ground and thinning intensity. Individual stand characteristics would be heterogeneous and post-harvest tree spacing would not have a rigid, grid-like appearance. All existing late seral (old-growth) trees would be retained.

Density management and/or commercial extraction within Riparian Reserve shall only be considered to maintain, enhance or restore Aquatic Conservation Strategy (ACS) objectives. Timber harvest in Riparian Reserves is prohibited unless treatments promote desired vegetation characteristics needed to attain ACS objectives or to mitigate damaging effects from catastrophic events such as fire, flooding, volcanic, wind, or insect damage (NWFP Standards and Guidelines, Timber Management, TM-1).

Situations in which timber harvest may be needed to attain ACS objectives include thinning in forested Riparian Reserves to improve root strength, and other characteristics having to do with overall health and vigor of the stand. A young healthy stand has greater potential to restore the timing, volume, rate, and character of sediment input and storage (water quality and aquatic habitat). A young healthy stand also has greater potential to grow into a late seral forest, eventually providing late-successional habitat.

Riparian Reserve and its appurtenant Standards and Guidelines apply where these reserves overlap other land allocations (i.e., within Matrix). Consequently, field identification of Riparian Reserves and validation of fish-bearing status and stream classification would be required before implementation of treatments. An estimate of Riparian Reserve treatment acreage associated with the each Action Alternative has been made and is described in sub-section C, 2, this Chapter.

Thinning within Riparian Reserves associated with perennial streams within some candidate stands is proposed, based on field reconnaissance. Further investigation during implementation may identify Riparian Reserves that are currently fully functioning and not in need of thinning treatments. There are likely to be intermittent or perennial streams not yet identified. These areas would need to be identified through additional field reconnaissance and mapped in GIS. Some, all or none of these Riparian Reserves may need vegetative treatment to maintain or improve their function in accordance with the ACS.

Specifically for the Eden Ridge Timber Sales Project, proposed Riparian Reserve treatments and connected actions are to be designed to *avoid or minimize conditions* that would increase hydrologic connectivity, increase drainage from roads into steams (especially higher order streams), increase interception and concentration of subsurface slope flow by road cuts, concentrate runoff into centralized drainage conduits (especially near higher order streams), increase runoff from impervious surfaces or concentrated areas of compaction (landings, skyline pads, roads), and increase activity generated sediment, especially in high risk areas.

High risk areas for increased runoff, erosion and hydrologic connectivity as classified for the Eden Ridge Timber Sales Project include steep slopes, high water table areas, proximity to previously disturbed areas (e.g., regeneration harvest along FS/private land boundaries, and proximity to high order streams (mid- and low- slope positions in watersheds).

a. Overall Project Design Criteria for Riparian Reserve Treatments

This section discusses criteria for proposed silvicultural treatments and connected actions associated with timber yarding and felling within Riparian Reserves. Access and haul are discussed in the next section on roads. Burning design criteria are also discussed below.

Riparian Reserve widths are based on one site-potential tree height[9] each side of stream course (assumed to be 175 feet for all areas). The width for fish-bearing streams is two site potential tree heights on each side. All Riparian Reserves would be identified during implementation and prior to treatments (including currently unmapped Riparian Reserves within treatment areas).

Riparian Reserve treatments and project design elements fall into three categories; **fish-bearing perennial streams, non-fish-bearing perennial streams**, and **intermittent streams, wetlands and unstable areas** (see next sections). The following table presents the overall Project Design Criteria developed for Riparian Reserves (PDCRR), for Eden Ridge Timber Sales. Further explanation of categories and terms used in these criteria are contained below.

[9] A site potential tree height is the average maximum height of the tallest dominant trees (200 years or older) for a given site class.

Table II-10. Overall Design Criteria for Timber Yarding and Felling within Riparian Reserves

Stream Channel	Project Activities	Buffer	Riparian Reserve	PDCRR Name	Range of Commercial Prescriptions Outside of Buffer (TPA)
Ephemeral and Intermittent	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 25 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Light Thin = 150-225
Non-fish **Bearing Streams**	*Density management and commercial extraction* allowed.	25 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Light Thin = 150-225
Ephemeral and Intermittent	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 35 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Medium Thin = 90-150
Non-fish **Bearing Streams**	*Density management and commercial extraction* allowed.	35 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Medium Thin = 90-150
Ephemeral and Intermittent	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 40 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Heavy Thin = 50-90
Non-fish **Bearing Streams**	*Density management and commercial extraction* allowed.	40 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Heavy Thin = 50-90
Perennial	*No-cut buffer* (same as Ephemeral and Intermittent	Streamside to 50-60 feet along both sides of channel	**Same as above**	**Primary Shade Zone** (includes Stream Channel Protection Zone)	Light Thin = 150-225 Medium Thin = 90-150 Heavy Thin = 50-90
Non-fish **Bearing Stream**	*Density management and commercial extraction* allowed (same as Ephemeral and Intermittent).	50-60 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on *one size potential tree height*.		**Riparian Treatment Zone**	Light Thin = 150-225 Medium Thin = 90-150 Heavy Thin = 50-90
Perennial	*No-cut buffer* (same as Ephemeral and Intermittent	Same as Perennial ***Non-fish*** Bearing Stream	**Two** site potential tree height each side of stream (350 feet each side; total width 700 feet)	Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225 Medium Thin = 90-150 Heavy Thin = 50-90
Fish **Bearing Streams**	*Density management and commercial extraction* allowed (same as Ephemeral and Intermittent).	Same as Perennial ***Non-fish*** Bearing Stream, except Riparian Treatment Zone extends from 50-60' buffer limit to edge of *two site-potential tree buffer*		Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225 Medium Thin = 90-150 Heavy Thin = 50-90

Silvicultural treatments within Riparian Reserves would include density management thinning via removal of intermediate and suppressed trees. Treatments would be designed to produce a variable thin and create an uneven canopy closure across the stand. For the Eden Ridge Timber Sales Project, Riparian Reserve treatments would typically occur within the outer edges of Riparian Reserves (upland, farthest from stream course, typically with no riparian vegetation).

- No density management treatment would reduce the existing overstory canopy within Riparian Reserve to less than 50%.
- Commercial extraction of trees would occur outside of variable, no-treatment stream course buffers, according to stream category and thinning intensity (see next sections).
- To reduce the risk of sediment delivery, soil compaction or the loss of soil infiltration capacity in the riparian area to the streams, yarding activities, **within 100 feet of stream courses, pre and post activity would not result in a loss of more than 10% of the soil infiltration capacity which reduces concerns for sediment reaching the stream**. This activity would include existing skid trails, which could be re-utilized as necessary and then be ripped (as feasible) to re-establish soil infiltration capacity. Use of long-lining (winch line) to remove from treatment areas is allowed where it is determined to be of benefit to Riparian Reserve conditions such as reducing the amount of skid trails needed.
- Yarding activities should achieve full suspension over the active channel[10]. To facilitate log suspension with skyline operations, corridors for cable rigging would be allowed to pass through Riparian Reserves. A maximum clearing width of 12 ft. is required and logs may be yarded through this corridor if necessary. Corridors must be spaced at a minimum of 200 feet apart if they pass through Riparian Reserves. Corridor "rub trees" within the Riparian Reserve, even if damaged, would either be left standing or felled and left in place.
- No new temporary roads or landings, gap treatments, or heavy thinning is proposed nor allowed within Riparian Reserves without prior field examination by a Soils Scientist, Hydrologist, or Geologist to prescribe site specific mitigation, if needed (including relocation of the road).

b. Design Criteria for Perennial Streams

This category includes permanently flowing perennial fish-bearing and non-fish-bearing streams. The primary concern regarding yarding Riparian Reserves with fish bearing streams is prevention of sediment delivery to streams, prevention of concentrated overland flow, wood recruitment, and maintenance of stream temperatures. Project design features would follow direction provided in NWFP Temperature TMDL Implementation Strategies 2005[11]. This involves protection, maintenance and enhancement of existing stream shade, and maintenance of the existing micro-climate, ambient air temperature, and air movement.

The primary difference between fish-bearing and non-fish-bearing stream is the width of the entire Riparian Reserve (which is differentiated by fish-bearing status) as shown below:

> **<u>Fish-bearing</u> Riparian Reserve widths are two site potential tree heights each side of stream course (175 ft. X 2 = 350 ft. each side; total width 700 ft).**
>
> **<u>Nonfish-bearing</u> Riparian Reserve widths are one site potential tree height each side of stream course (175 ft. each side; total width 350 ft.).**

The **Stream Channel Protection Zone** buffer is 50-60 feet from the edge of stream course based on the Primary Shade Zone. This zone is an area where no commercial extraction would occur (larger trees felled for skyline corridor clearing would be left), however some enhancement treatments could occur. Distance from active stream channel varies according to height of existing overstory trees and hill slope in immediate area. The following table establishes the width of the Primary Shade Zone.

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[10] Active channel is the bank full width of flowing perennial or intermittent streams.

[11] Northwest Forest Plan Temperature TMDL Implementation strategies - Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy and Associated Tools to achieve and maintain stream temperature water quality standards. USFS and BLM; latest version September 9, 2005.

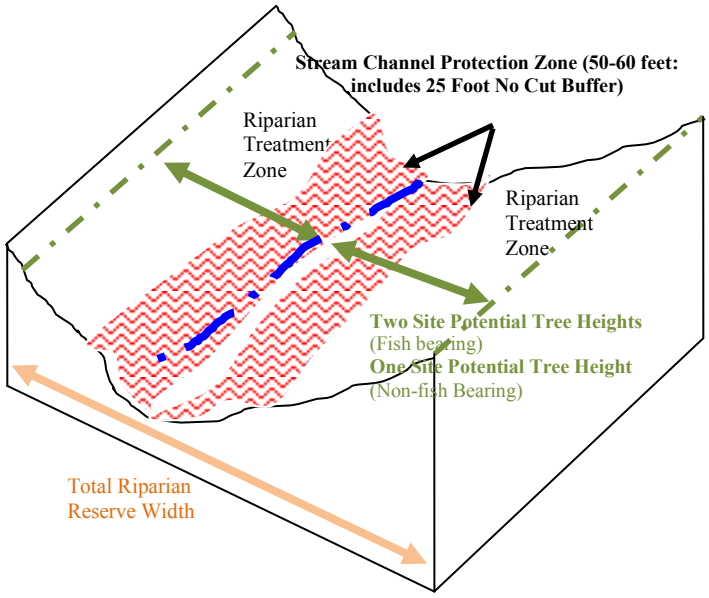
Table II-11. Primary Shade Zone Width, Based on Adjacent Hill Slope within Perennial Streams

	Hill Slope <30%	Hill Slope 30% to 60%	Hill Slope >60%
Primary Shade Zone Width (slope distance)	50 ft.	55 ft.	60 ft.

The Temperature Implementation Strategies allow the distances in the above table to be less (but not less than 25 ft.) if the trees are located on a south facing slope (175-185 degree azimuth) and therefore do not provide stream shade. Note: no large wood, or remnant trees with a potential for instream recruitment would be cut.

The **Riparian Treatment Zone** is an area where density management, fuels reduction or other enhancement treatments could occur, outside of the Stream Channel Protection Zone, in accordance with design criteria.

Figure II-7. Riparian Reserve Design Elements – *Perennial Fish & Non-Fish Bearing Streams*

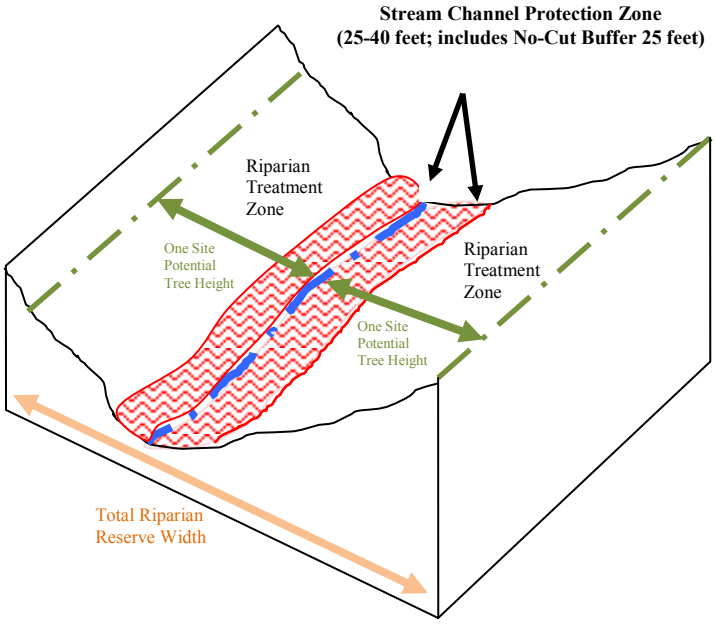


c. Design Criteria for Non Fish-bearing Intermittent and Ephemeral Streams

Seasonally flowing intermittent and ephemeral non-fish-bearing streams have buffers established for the prevention of sediment delivery to streams, prevention of concentrated overland flow, and maintenance of micro-climates, ambient air temperature and humidity. There are no fish-bearing ephemeral or intermittent stream channels.

The primary difference between perennial and intermittent/ephemeral stream are the buffers for no-cut, and density management and commercial extraction. The intermittent/ephemeral Riparian Reserves and non-fish bearing Riparian Reserves are the same, one site potential tree heights on each side of stream course (175 feet on each side; total is 350 feet).

Figure II-8. Riparian Reserve Design Elements – *Ephemeral and Intermittent Stream Channels*



d. Project Design Criteria for Roads and Landings Within Riparian Reserves

As noted herein and as documented in the Road Analysis (Transportation and Logging Systems Report, Appendix I), the Eden Ridge Planning Area currently has a minimal existing road network-and when the logging that created the candidate stands of today were created, the area was logged by historical railroad systems. Most of the existing roads evolved from early railroad grades but do not adequately serve the Planning Area for today's needs and systems.

In order to adequately and efficiently access the Planning Area for today's management systems, a need was identified for additional Classified roads. Given the current situation, these proposed new access roads could not be developed without the need to cross some drainages designated as Riparian Reserve.

General Design Criteria

- ***Minimize hydrologic connectivity and sediment delivery from roads***. This includes roads inside and outside of Riparian Reserves. Road drainage would be routed away from potentially unstable channels, fills, and hillslopes.
- All exposed soils near streams would be mulched for erosion control.
- Avoid side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in Riparian Reserves.
- Minimize or avoid disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow when considering constructing or reconstructing roads or landings either inside or outside of Riparian Reserves.
- New or replaced permanent stream crossings would be designed to accommodate at least the 100-year flood, including associated bedload and debris.
- Relief ditch spacing would be shortened on new road segments within Riparian Reserves to reduce concentration of road runoff into stream courses.
- Where physically feasible, construction or reconstruction of stream crossings would avoid diversion of streamflow out of the channel and down the road in the event of crossing failure.

Landing Design Criteria

All landings, designated skid trails, staging or decking within Riparian Reserves would:

- Be of minimum size as possible to only allow operations;
- Be located above the break in slope above the stream channel;
- Landing slopes would be armored with logs or other woody material capable of protecting the slope surface;
- Landing surfaces would drain away from the stream channel during ~~and after~~ use, and, would be revegetated/mulched after use; and
- Landing site restoration would consist of :
  - -Loose soil material on the downslope side would be pulled back.
  - -Placement of slash on bare soils located on the downhill slope.
- All new landings will be at least 100 feet away from stream channels.

Temporary Road Construction and Decommissioning Design Criteria

Temporary road construction and decommissioning would be managed in accordance with water quality Best Management Practices[12] (BMPs) R-23. In order to prevent continued low level casual use, and to minimize resource impacts, such roads would be obliterated at the completion of their intended use. Effective obliteration is generally achieved through a combination of the following measures:

- Temporary culverts are removed and natural drainage configuration is re-established;
- Road surfaces are ripped;
- Sideslopes are reshaped and stabilized; road is effectively drained; and
- Road is blocked to further use, and road is returned to vegetation production through revegetation (seeding, planting browse species, or hardwood/conifer trees).

Temporary roads built would be closed after the season of use of if kept open over winter would be winterized. Drainage work to winterize temporary roads would include water bars at suitable intervals and out sloping.

New Road Construction Project Design Criteria

Some of the proposed new classified roads would cross Riparian Reserves under specially designed Project Design Criteria for Riparian Reserves (see below).

- No new road construction is proposed nor would be allowed to cross or disturb any fish bearing perennial stream, especially the banks of fish bearing portions/tributaries of Coal Creek and Wooden Rock Creek.
- New classified road construction would only be allowed to cross non fish bearing perennial streams or intermittent streams and would include engineering design as Operational Maintenance Level 2 roads during use and Maintenance Level 1 when not in use for harvest activities.
- Perennial channels would be dewatered or water would be rerouted during construction with manufactured or natural sediment filters placed within the channel to prevent sediment from discharging downstream.
- New permanent stream crossings would be designed to accommodate at least the 100-year flood, including associated bedload and debris.

[12] General Water Quality Best Management Practices, Pacific Northwest Region, November 1988.

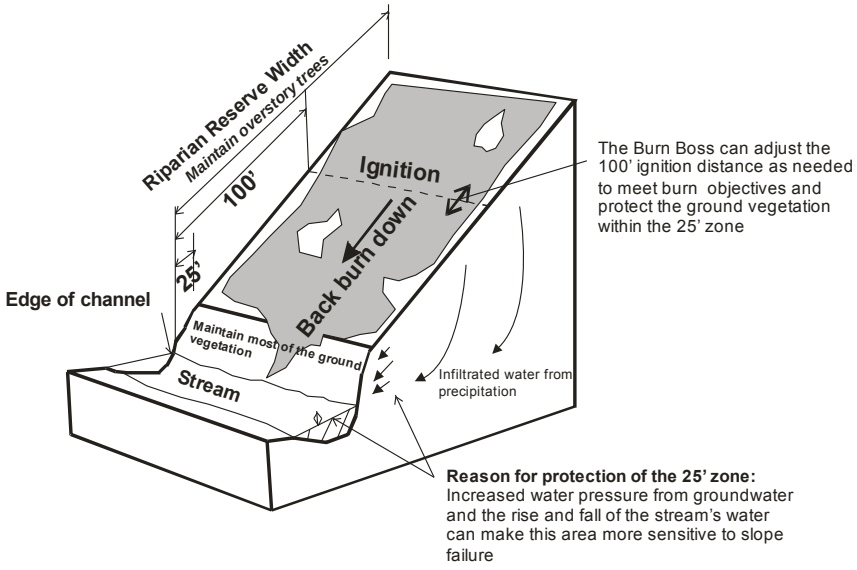
- Relief ditch spacing would get spaced and the road sloped such that water does not channelize when leaving the relief culvert.
- Roads would be designed to minimize hydrologic connectivity and sediment delivery. This includes roads inside and outside of Riparian Reserves. Road drainage would be routed away from potentially unstable channels, fills, and hillslopes.
- No side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in Riparian Reserves.
- Minimize or avoid disruption of natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow when considering constructing or reconstructing roads or landings either inside or outside of Riparian Reserves.
- Where physically feasible, construction of stream crossings would avoid diversion of stream flow out of the channel and down the road.

e. Special Design Criteria for Burning in Riparian Reserves

Activity fuels treatment refers to the slash and accumulated fuel resulting from the proposed density management treatments. While there may be some slash from previous harvesting or from natural conditions, the majority of material would be generated through density management treatment and commercial removal. Activity fuels treatments proposed for this project include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk. Specially designed criteria for burning within Riparian Reserves are show below.

- A stream protection zone is from the edge of the stream course up to 25 feet (see Figure II-9).
- No hand piles would be located or burned within the stream channel.
- Prescribed fire would not be ignited within this zone but fire may be allowed to "back down" to the stream channel. Specially designed criteria for prescribed burning within Riparian Reserves are show in Figure II-9.

Figure II-9. Riparian Reserve Design Elements - Prescribed Burning



Reducing high fuel Loading - Use mechanical treatment and pile burning as needed prior to under burning to protect the overstory trees. Pile and burning should be no closer to the stream than 25' to maintain ground vegetation.

Pump chances - Fire, engineering and aquatic resource personnel will work together to determine suitable pump chances and the measures needed for the protection of aquatic resources. Refuel 100' feet from a stream or use measures to assure fuel does not reach flowing water. Water withdrawal equipment must have a 3/32 intake screen in order to avoid fish entrapment.

f. Stream Enhancement Project Design Criteria

- Place large wood (LWM) and boulders only in those areas where they would naturally occur and in patterns that closely mimic that which would naturally occur for that particular stream type.
- LWM includes whole conifer and hardwood trees, logs, and root wads. LWM size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5 x bankfull channel width, while logs without root wads should be a minimum of two times the bankfull width. Place wood in a manner that most closely mimics natural accumulations of LWM for that particular stream type. Structures may partially or completely span stream channels or be positioned along streambanks.
- No conifers should be felled in the riparian area for in-channel large wood placement unless conifers are fully stocked and are consistent with project design criteria in vegetation treatment categories. Felled hazard trees can be used for in-channel wood placement.
- LWM may be buried into the streambank or channel but shall not constitute the dominant placement method of LWM.
- Tree Removal for LWM Projects:
    - Trees may be removed by cable, ground based equipment, horses or helicopters, or felled directly into the stream. Felled trees may be stock-piled for later instream enhancement projects.
    - Individual trees or small groups of trees (<5) should come from the periphery of permanent openings (roads etc.) or from the periphery of non-permanent openings (e.g., plantations, along recent clear-cuts, etc.).
    - Trees selected for LWM enhancement projects must be spaced at least one site potential tree height apart and at least one crown width from any trees with potential nesting structure for ESA-listed bird species.
    - Instream work would occur during the ODFW instream work period.

4. WILDLIFE PROJECT DESIGN CRITERIA

This Sub-section discusses elements related to the design of treatments and actions (i.e., Project Design Criteria), applicable to wildlife, under the Action Alternatives. These elements were utilized to develop proposals and/or are to be employed during on-the ground project designation/implementation and are designed to address overall objectives (attain the Purpose and Need) and resource objectives to manage consequences (obtain compliance with Standards and Guidelines). Other elements that manage consequences during actual operations are termed "Mitigation Measures" and are discussed in Section 9 of this Chapter.

Maintain Northern Spotted Owl Dispersal Habitat
Canopy cover within proposed stands (all units) would be maintained at 40% or greater. Maintain decadent woody material such as large snags and downed wood providing benefits for spotted owl prey species (see Section 2, c., snag and large wood objectives for the western hemlock plant series in the coast geographic region, as applicable to the Eden Ridge Project).

Protect all Known Del Norte Sites
To protect any talus habitat from ground disturbing activities that may cause compaction; designate a buffer of at least one site potential tree or at least 100' horizontal distance, whichever is greater for all known Del Norte Salamander locations (see Appendix G, Table G-15, page G-51) . Maintain at least 40% canopy closure and avoid activities that would disturb the surface talus layer. Partial harvest within the buffer may be possible if 40% canopy closure can be maintained; in such cases, tree harvest must be conducted using helicopter or suspended cable systems to avoid compaction or other disturbance of talus.

Protect Northern Spotted Owl Nesting, Roosting, and Foraging Habitat
Exclude from treatment any stand or portion thereof meeting Recovery Action 32; high-quality spotted owl nesting, roosting, and foraging (NRF) habitat. To be determined by wildlife biologist.

Protect Potential High-Quality Spotted Owl Nesting, Roosting, and Foraging Habitat and Potential Marbled Murrelet Habitat
As part of implementation, an analysis exercise would be done to determine whether or not any 5-acre portion of a candidate stand contains 6 or more trees with potential late-successional habitat structure. If an area contains 6 or more remnant trees[13] with potential structure, it constitutes potential suitable habitat.

Any stand with a potential suitable habitat (remnant tree component) would be further assessed with a walk-through of the area that would be impacted (USDI, 2006). If a late successional component is confirmed, that portion of the stand (or the entire stand) would be excluded from treatments (including ½ site tree un-thinned buffer).

Maintain Wildlife Reserve Trees, Snags, and Down Wood
Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem for multiple species. In conformance with the marking guidelines, within harvest units, leave up to 4 dominant / co-dominant trees per acre which contain nests, wildlife cavities, structural deformities, and/or damage likely to lead to snag formation.

To provide for structural diversity for multiple species, remnant trees would be retained. Remnant trees felled for operational safety needs would be retained on-site.

To the extent compatible with safety provisions, retain all snags with tree diameter >=10". Retain on site, all commercial size down-woody material. "Leave-trees" damaged during project operations would be left on site. The intent is to maintain or minimize the loss of existing snag numbers following all treatment activities. All snags felled for safety would remain on site.

5. BOTANICAL RESOURCES PROJECT DESIGN CRITERIA

This Sub-section discusses elements related to the design of treatments and actions (i.e., Project Design Criteria), applicable to botanical resources, including invasive species, under the Action Alternatives. These elements were utilized to develop proposals and/or are to be employed during on-the ground project designation/implementation and are designed to address overall objectives (attain the Purpose and Need) and resource objectives to manage consequences (obtain compliance with Standards and Guidelines). Other elements that manage consequences during actual operations are termed "Mitigation Measures" and are discussed in Section 9 of this Chapter.

Sensitive Plant *Bensoniella oregana*
Protect existing known sites (see Appendix F for locations) of the sensitive plant *Bensoniella oregana* by avoiding direct trampling, maintaining coarse woody material for moisture retention and maintaining the current amount of shade to light ratio. Layout aggregated retention zones or skips in areas where *Bensoniella oregana* was found. A buffer of 100 foot radius from the edge of each population is recommended. Protect existing known sites of the sensitive plant *Bensoniella oregana* by avoiding direct trampling, maintaining coarse woody material for moisture retention and maintaining the current amount of shade to light ratio.

[13] Remnant trees = Generally large old trees that were not removed during earlier regeneration harvest activities or that survived stand replacement fires. In some cases they are single trees, while other areas have groups of older trees up to a half acre in size. These trees generally range from 34" dbh to in excess of 60" dbh and are often at least twice the diameter of the average tree in the stand they are located in. They often have a "wolfy" structure consisting of moss covered limbs/platforms > 4-6" diameter, and fire scars or charred bark. Generally, bark is thicker and more furrowed and crowns tend to be more flat topped, less "pointed" than younger trees.\

Populations of *Bensoniella oregana* found within the road prisms (e.g., proposed Road W in Unit 326) would be flagged prior to implementation of the project. The proposed new road should be moved further to the north of the buffer area. No equipment or vehicles should be parked or driven within the flagged areas. Protect existing known sites of the sensitive plant *Bensoniella oregana* by precluding any direct trampling of individuals or a population.

Avoid thinning below 40% canopy cover with 60% or above preferred for this species. Use dispersed retention with random aggregate retention or skips as outlined in the Silviculture Report for this project. Allow for continued and future ectomycorrhizal colonization of remaining trees post-thinning.

Fungi
Maintain down wood in all stages of decay across forested landscapes. Following the current forest standards should meet this criterion. Many fungal species are associated with larger down woody material in advanced stages of decay. Allow for future saprophytic fungi colonization by retaining as much downed large wood as possible.

Maintain all larger well decayed logs during stand treatments. In younger stands, following disturbance or harvest, the presence of large, well decayed down wood legacy can provide habitat for both ectomycorrhizal and wood-decay fungi, as well as plant seedlings. For some fungi, spore dissemination into disturbed areas is the primary method of re-establishment.

6. ALTERNATIVE 2 (Proposed Action)

a. Function

Alternative 2 is the Proposed Action and was developed by identifying treatment opportunities within the Planning Area using an interdisciplinary team process. Vegetative management needs and silvicultural opportunities were identified and field verified. Treatments of proposed candidate stands were analyzed for compliance with Forest Plan Standards and Guidelines and other laws and policies.

The Proposed Action is designed to address and maximize attainment of the Purpose and Need outlined in Chapter I. Specifically for the Eden Ridge Timber Sales project, Needs include *Improvement of Overall Forest Vigor and Resiliency*, and *Contribution of Commercial Timber to the Probable Sale Quantity.*

Alternative 2 responds to the goals and objectives outlined by the Land and Resource Management Plan (1989 Forest Plan) for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan, and helps move the Planning Area toward desired conditions described in that plan. This alternative is designed to improve overall forest health by stimulating natural processes that encourage more stable and resilient forest vegetative conditions, manage stand densities and species composition, and provide for a sustainable yield of commercial timber and other commodities.

b. Description

Alternative 2 proposes intermediate commercial harvest treatments using variable density thinning techniques and other connected actions on approximately 3,314 acres of second growth conifer stands artificially and naturally regenerated following timber harvest during the 1930s through the 1940s. Commercial and other silvicultural treatments are detailed in Table II-12 and displayed on MAP II-8. Candidate stands are located on suitable forest land primarily designated as the Matrix land allocation under the Forest Plan as amended by the Northwest Forest Plan. Within the 3,314 acres of treatments, also included are treatments within Riparian Reserves that overlap into overstocked drier upland forests (1,097 total acres).

Commercial treatments would involve harvest of conifers with diameters 7 inches and larger dbh which is a viable product size under current and anticipated market conditions. No old residual trees (old-growth) would be cut, except for danger trees. Estimated commercial volume could average 8 to 20 thousand board feet (mbf) per acre. Other wood product commodities are anticipated including biomass (chips), and firewood. Harvest treatments from this alternative could yield up to an estimated 53 million board feet[14] and would be implemented utilizing multiple timber sale contracts over an approximate 5-year period.

Treatments would occur within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds (as indicated in Table II-12). Treatments segregated by watershed were identified to assist with effects analysis and alternative formulation.

Silvicultural Treatments

The primary silvicultural treatment is to control dense stocking conditions through variable density thinning treatments (VDT) to improve overall forest health, vigor and resiliency. Silvicultural treatments include management of two forest pathogens, Port Orford cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*) affecting forest health in small portions of the Planning Area as discussed in this Chapter, Section C, 2, d.

Under Alternative 2 and within Matrix, thinning would include variable spacing between trees, no-treatment areas (skips), and small irregular shaped openings (up to 2 acres) created to treat root disease areas. Root disease areas would retain non-host tree species and planting of disease-resistant Port-Orford-Cedar seedlings or Douglas-fir seedlings.

The need for tree harvest in Riparian Reserves is primarily for aquatic and wildlife habitat enhancement. Silvicultural practices would be applied to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives. Tree harvest within Riparian Reserve is a byproduct of vegetative treatments. Variable density thinning treatments would occur when vegetative conditions could be improved within the outer portions of Riparian Reserve of some perennial and intermittent streams, in accordance with specially designed Project Design Criteria (see Section B, sub- section 3, this Chapter). Table II-12 provides an estimate of the total Riparian Reserve within a unit, as well as the maximum extent of treatments within Riparian Reserves, within a given unit.

Site-specific, integrated silvicultural prescriptions would be developed following a decision on the Eden Ridge Timber Sales Project. Tree spacing would be variable and would not have a rigid or grid-like appearance. Species diversity would be maintained or increased and would include some hardwoods and species of limited local occurrence. No remnant trees would be cut, except for danger trees. If remnant trees were felled as danger trees, they would not be removed.

Silvicultural prescriptions would describe desired conditions of treated stands and associated stand structures, tree species composition, canopy retention, tree spacing or basal area retention, fuels treatments, snag numbers (where present), large woody material and other key stand components. Final silvicultural prescriptions would be approved by Region 6 certified silviculturists working closely with resource specialists to ensure integrated resource objectives are met.

[14] Based on an overall average of 17.5 thousand board feet (mbf) per acre removed. This is an estimate only and is not considered an output threshold for the project.

Actual conditions on the ground may differ from map-delineated stands; therefore, there would be a need to be flexible and adjust treatments and/or stand boundaries as needed. All Project Design Criteria (Section 3) and Mitigation Measures (Section 9) are incorporated as part of this alternative.

Non-commercial treatments are proposed for 363 acres (see MAP II-7). Options include restoration, rehabilitation, reforestation, removal or thinning of non-commercial sized trees. The purpose of these Timber Stand Improvement treatments is to comply with the National Forest Management Act of 1976 and the 1989 Land and Resource Management Plan.

Logging Systems
Treatment methods would include use of mechanized machinery and chainsaws. Trees could be felled using mechanized feller-bunchers, cut-to-length harvesters, or hand (chainsaw) felling. Under this alternative, commercial products could be yarded to landings or decking areas using ground-based systems (tractor or log forwarder), or skyline cable systems. Logging systems projected to be utilized to harvest trees are also displayed in Table II-12. Tractor, or ground-based systems, would be used on approximately 2,119 acres, or 64% of the treated area. Skyline systems would be used on approximately 1,195acres, or 36% of the treated area. Helicopter systems are not proposed under this alternative but could be an option to reduce environmental effects if economics were favorable. Under this alternative, harvest systems were designed to meet specific environmental protection needs and Forest Plan Standards and Guidelines in the most cost-effective manner.

Road (Access) Systems
Products would be hauled using existing system (Classified) roads or newly constructed roads to manufacturing plants by log trucks or chip vans. Use of approximately 31 miles of existing Classified roads is proposed. In addition, approximately 6 miles of reconstruction of existing Classified roads are proposed, as well as approximately 6 miles of existing Classified road maintenance (Table II-15). Approximately 2 miles are proposed as Share Cost use roads.

New Classified (system) and temporary road construction is proposed to access some units under this alternative, as discussed in this Chapter, Section C, 2, h. Also see EIS Appendix I (Roads Analysis) for the basis of new road construction under this alternative. A total of approximately 11.1 miles of new road construction (Table II-13) is proposed. New road construction would include approximately 10.8 miles of new Classified roads, in 43 segments, ranging from 0.11 miles to 1.93 miles. New Classified roads would be managed as Maintenance Level 1 (closed until further need). Approximately 0.29 miles of new temporary road is proposed, in two segments, not longer than 0.25 miles in length (Table II-14).

Refer to Map II-8 for the general locations of road use and proposed road construction, reconstruction, and maintenance needs associated with the Proposed Action.

Activity Fuels Treatments
Activity fuels treatments proposed under this alternative include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk, as discussed in this chapter, Section C, 2, e. The combination of density management and activity fuels treatments are designed to leave the stands in a condition where a wildfire could burn through the stand, in the form of a surface fire that would not create unacceptable levels of mortality. Several methods of activity fuels treatment are being proposed, including: Yarding with Tops Attached, Hand Piling fuels concentrations: Piling and Burning landing slash and No Treatment.

No activity fuel treatment would occur where the extent of tree removal is light (associated with the silvicultural prescription) and the resulting slash created and fuels loading would result in a fire with acceptable level of mortality. These methodologies are sometimes used in combination within a particular proposed treatment area, depending on existing post treatment conditions, treatment type, and location.

Table II-12. Alternative 2 (Proposed Action) - Silvicultural Treatments

Unit Reference	Estimated Unit Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access	New Road Access Reference
001	187	95	92	VDT/LRR/POC-PLT	GB	YTA	CRM & CRR	-
002	137	108	29	VDT/LRR/POC-PLT	GB	YTA	CRM	-
003	135	63	72	VDT/LRR/POC-PLT	S	YTA,P & B	CRU	A
004	8	8	0	VDT/LRR/POC-PLT	GB	YTA, P & B	-	A
005	126	66	60	VDT/LRR/POC-PLT	GB	YTA, P & B	-	B
006	102	87	15	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU & CRR	D
007	70	54	16	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	E1, E2
101	65	46	19	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU	F
102	46	32	14	VDT/LRR/POC-PLT/POC-RS	S	YTA, P & B	CRU	G
103	61	46	15	VDT/LRR/POC-WTG/POC-RS	S	YTA	CRU	H
201	117	105	12	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	-
202	57	24	33	VDT/LRR/POC-PLT	S	YTA, P & b	CRU	-
203	19	15	4	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	-
204	48	40	8	VDT	S	YTA, P & B	-	E1, E3
205	14	13	1	VDT	S	YTA	-	E2
206	25	18	7	VDT	GB	YTA	CRU & CRR	I
207	17	10	7	VDT	GB	YTA	CRR	I & J
208	21	13	8	VDT	S	YTA	CRM	-
209	79	41	38	VDT	S	YTA, P & B	CRM	K & L
210	13	13	0	VDT	GB	YTA	CRM	C & M
211	23	11	12	VDT	S	YTA	CRM	C & M
212	26	18	8	VDT	S	YTA, P & B	CRM	C & M
213	22	8	14	VDT	S	YTA	CRM	N
214	36	18	18	VDT/ POC-RS	S	YTA, P & B	CRU	
215	29	29	0	VDT/ POC-RS	S	YTA, P & B	-	O1, O2
216	17	17	0	VDT/ POC-RS	GB	YTA	-	O1, O3
217	6	6	0	VDT	S	YTA, P & B	-	D
218	17	14	3	VDT	GB	YTA, P & B	CRU	-
301	13	3	10	VDT/P-3 treatment	S	YTA, P & B	CRU	-
302	7	5	2	VDT/P-3 treatment	S	YTA, P & B	CRU	-
303	12	12	0	VDT	GB	YTA, P & B	CRU	P2
304	6	6	0	VDT	S	YTA	-	P3
305	8	7	1	VDT	S	YTA	-	P3
306	15	11	4	VDT	S	YTA	-	P4
307	24	15	9	VDT	GB	YTA	-	Q1, Q2, Q3
308	13	1	12	VDT	GB	YTA	-	Q1, Q2, Q4
309	14	3	11	VDT	GB	YTA, P & B	CU	R
310	49	37	12	VDT	GB	YTA	-	S1, S2
311	36	24	12	VDT	GB	YTA	CRR	S1, S2, S3, S4, S5, S6 & T
312	38	19	19	VDT	S	YTA	CRR	S1, S2, S3, S4, S5 & S6
313	93	73	20	VDT	GB	YTA	CRR	S1, S2, S3, & T
314	40	22	18	VDT	S	YTA	-	T
315	26	22	4	VDT	S	YTA	CRR	S1, S2, S3, S4, S5, S6 & S8
316	33	23	10	VDT	S	YTA	-	T
317	74	48	26	VDT	GB	YTA	CRR	S1, S2, S3, S4, S5, S6 & S8
318	25	20	5	VDT	GB	YTA	CRR	-
319	86	72	14	VDT/ POC-RS	GB	YTA	CRU & CRR	T
320	37	21	16	VDT/LRR/POC-PLT/POC-RS	S	YTA	CRU	T
321	16	16	0	VDT	S	YTA	CRR	-
322	35	35	0	VDT	GB	YTA	CRR	V

Unit Reference	Estimated Unit Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access	New Road Access Reference
323	31	11	20	VDT	S	YTA	CRR	V
324	95	58	36	VDT/LRR/POC-PLT	GB	YTA	CRR	U
325	135	101	34	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU	X & Y
326	155	106	49	VDT/POC-WTG/ POC-RS/ P3,P8,P9 treatment	GB	YTA	CRR	W
327	47	23	23	VDT/LRR/POC-PLT/ POC-WTG/ POC-RS	GB	YTA	CRR	W
328	52	42	10	VDT/ POC-RS/P3 treatment	S	YTA	-	D
329	41	14	27	VDT/POC-WTG/POC-RS/P9 treatment	S	YTA	CRR	-
330	18	7	11	VDT POC-RS/P9 treatment	GB	YTA	CRR	-
331	13	7	6	VDT/POC-WTG/ POC-RS/P3 treatment	S	YTA, P & B	CRR	-
332	44	39	5	VDT/POC-WTG/POC-RS	GB	YTA, P & B	CRU	-
333	86	65	21	VDT/POC-WTG/POC-RS	GB	YTA, P & B	CRU	-
334	88	46	42	VDT/POC-WTG/POC-RS	GB	YTA, P & B	CRU	Z
335	38	27	11	VDT/POC-WTG/POC-RS	S	YTA, P & B	CRU	-
336	49	24	25	VDT/POC-WTG/POC-RS	S	YTA, P & B	CRU	-
337	19	16	3	VDT	S	YTA, P & B	-	C & M
338	24	2	22	VDT	S	N/A	CRR	S1, S2, S3, S4, & T
340	19	11	8	VDT/ POC-RS	S	YTA, P & B	-	Q4
341	25	12	13	VDT/ POC-RS	GB	YTA, P & B	CRU	Q4
342	16	7	9	VDT	S	YTA	CRU	-
343	18	18	0	VDT/ POC-RS	GB	YTA	-	Q1, Q3
344	30	27	3	VDT/ POC-RS	S	YTA, P & B	-	Q1, Q3
345	17	17	0	VDT/ POC-RS	GB	YTA, P & B	CRU	-
401	8	8	0	VDT/P6 treatment	GB	YTA	CRU	-
402	20	14	6	VDT/P6 treatment	S	YTA	CRU	-
403	5	2	3	VDT	S	YTA	CRU	-
75 Total Units	**3,314**	**2,217**	**1,097**					

Table Notes and Legend

There is no Unit 339

000s Middle Fork Coquille 5th Field, (Lower) Rock Creek 6th Field watershed
100s Middle Fork Coquille 5th Field, Myrtle Creek 6th Field watershed
200s South Fork Coquille 5th Field, Wooden Rock Creek 6th Field watershed (Headwaters SF Coquille)
300s South Fork Coquille 5th Field, Coal Creek 6th Field watershed
400s South Fork Coquille 5th Field, Mill Creek 6th Field watershed

VDT Variable Density Thinning (Commercial)
POC-PLT Port Orford Cedar; site prep and planting of resistant POC seedlings
POC-WTG Port Orford Cedar; Wide Thin Gap, eradication treatment
POC-RS Port Orford Cedar; Roadside Sanitation

LRR Laminated Root Rot; gap treatments centered around disease pockets, possible plant with POC and other species
P-# Plantation thinning (circa 1939-1963); commercial and non-commercial thinning

YTA Yarding Tops Attached
P&B Pile and Burn

GB Ground based logging systems
S Skyline logging systems

CRU Classified road use
CRM Classified road use with reconstruction
CRR Classified road use with reconstruction

Table II-13. Proposed New Classified (System) Road Construction – Alternative 2

Road Segment Reference	Length (miles)	Notes
A	0.23	Ridgetop road, skyline access, no grade
B	0.74	Crosses some riparian; some grade up to 10%
C	0.03	Begins on PVT; ties to road M for FS access
D	0.60	Ridgetop road, skyline access, no grade
E1	0.34	Ridgetop road, skyline and GB access, no grade
E2	0.22	Ridgetop road, skyline and GB access, no grade
E3	0.20	Ridgetop road, skyline access, no grade
F	0.39	Crosses riparian, minimal grade
G	0.15	Ridgetop road, skyline access, no grade
H	0.21	Ridgetop road, skyline access, no grade
I	0.09	Ties to existing route planned for reconstruction
J	0.08	Crosses riparian; provides GB access
K	0.36	Begins on PVT; for FS skyline access
L	0.01	Begins on PVT; for FS skyline access
M	0.81	Ties to road C for FS access, minimal grade
N	0.04	Begins on PVT for FS access
O1	0.28	First segment for skyline access; minimal grade
O2	0.23	Second segment for skyline access; minimal grade
O3	0.24	Third segment for skyline access; minimal grade
O4	0.18	Additional segment for skyline access; minimal grade
P1	0.06	Begins on PVT, ties to P2 for FS access
P2	0.08	Ties to P1 for FS access
P3	0.13	Ridgetop skyline access
P4	0.11	Ridgetop skyline access
Q1	0.11	Begins on PVT; ties to roads Q2 & Q3 for FS access
Q2	0.05	Second segment for GB access
Q3	0.10	Second segment for GB access
S1	0.09	Joins existing road with existing road planned for reconstruction
S2	0.12	Joins existing road with existing road planned for reconstruction
S3	0.06	Construction of old railroad grade trestle to classified road
S4	0.15	Additional segment for GB access
S5	0.05	Construction of old railroad grade trestle to classified road
S6	0.24	Additional segment for GB & skyline access
S7	0.11	Construction of old railroad grade trestle to classified road
S8	0.04	Construction of old railroad grade trestle to classified road
S9	0.06	Construction of old railroad grade trestle to classified road
T	1.93	Crosses some riparian; some grade up to 10%
U	0.38	Crosses some riparian; minimal grades
V	0.14	Ridgetop road, skyline & GB access, no grade
W	0.61	Crosses some riparian; minimal grades
X	0.22	GB access; minimal grade
Y	0.18	GB access; minimal grade
Z	0.35	Crosses some riparian; some grade up to 10%
TOTAL	**10.81**	

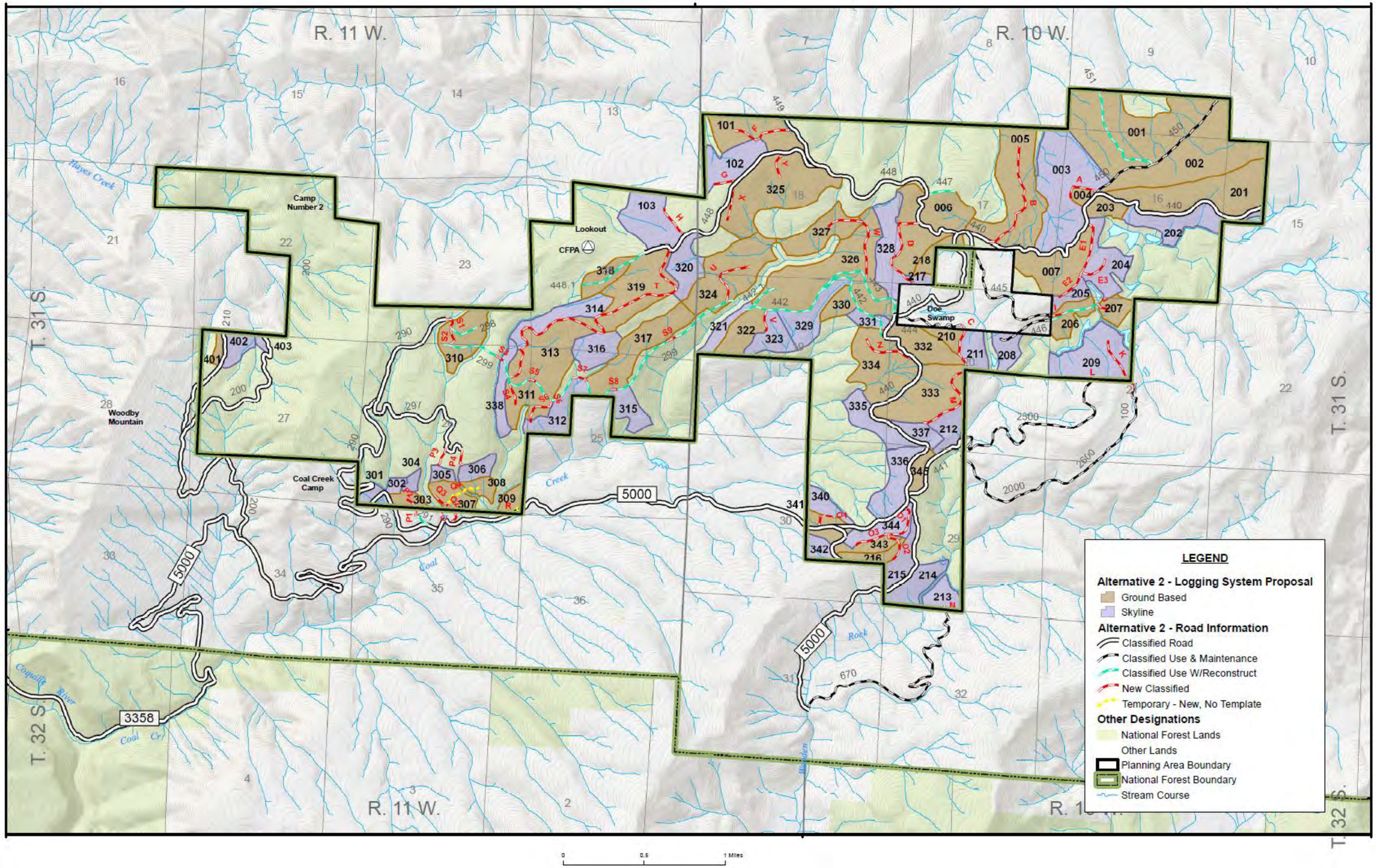
Table II-14. Proposed New Temporary Road Construction – Alternative 2

Road Segment Reference	Length (miles)	Notes
Q4	0.25	No template crosses riparian
R	0.03	Short spur; joins with existing road
TOTAL	**0.29**	

Table II-15. Proposed Classified Road Use, Maintenance, and Reconstruction - Alternative 2

Classified Road Use	Reference	Miles
	3300000	1.21
	3358000	1.01
	5000000	10.36
	5000200	4.25
	5000210	0.75
	5000290	3.00
	5000297	1.10
	5000420	0.34
	5000440	5.06
	5000441	0.56
	5000445	0.11
	5000448	2.90
	5000449	0.38
Classified Road Use Total		**31.03**
Classified Use & Maintenance	2000	0.76
	2600100	0.26
	5000444	0.42
	5000445	0.89
	5000446	0.35
	5000450	1.01
	5000670	1.75
	5000671	0.06
Classified Use & Maintenance Total		**5.50**
Classified Use W/Reconstruction	5000291	0.10
	5000298	0.18
	5000299	2.02
	5000299.1	0.03
	5000442	1.24
	5000442.1	0.18
	5000443	0.72
	5000446	0.31
	5000447	0.19
	5000448.1	0.45
	5000451	0.65
Classified Use W/Reconstruct Total		**6.07**

MAP II-8. Alternative 2 (Proposed Action)



c. Summary of Alternative 2

Summary

Alternative 2 *would enact the following vegetation management actions:*

3,314 acres *of* ***commercial*** *variable density management* ***thinning treatments*** *(in several separate timber sales), on* ***75 Units****, producing approximately* ***53 million board feet*** *of commercial volume****;***

Ground-based systems *would be used on* ***approximately 2,119 acres, or 64%****;* ***Skyline systems*** *would be used on* ***approximately 1,190 acres, or 36%*** *of the treated area.*

Use of approximately ***31 miles of existing Classified roads****, Construction of* ***10.8 miles of new Classified road*** *(in 43 segments), Construction and decommissioning of* ***0.3 miles of temporary road,*** *Use and* ***reconstruction of 6.1 miles*** *of existing Classified road, Use of and* ***maintenance of 5.5 miles*** *of existing Classified road; and*

363 acres *of* ***non-commercial*** *silvicultural* ***treatments.***

7. ALTERNATIVE 3

a. Function

Alternative 3 is similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only "high to moderate road benefit/low to moderate environmental risk" new roads. This theme was derived from comments received during scoping. For the Eden Ridge Timber Sales analysis, a "high benefit" new road would be one that provides current and future access for a large area, as compared to a "low benefit" road which for its length and potential environmental impact, would access fewer acres. A "high environmental cost" new road could be one that would require crossing high risk or a number of Riparian Reserve areas, or is in a position on the terrain that would allow surface runoff into perennial streams, or is a road that would have steeper grades and/or involve a large amount of cut and fill of material during construction. An assessment of the new roads associated with the Proposed Action (Roads Analysis) is contained in EIS Appendix I (Transportation and Logging Systems Report).

In relation to Alternative 2, this modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative includes helicopter logging systems, based on the change in access for conventional systems.

Alternative 3 also responds to the goals and objectives outlined by the Land and Resource Management Plan (1989 Forest Plan) for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan, and helps move the Planning Area toward desired conditions described in that plan. This alternative is also designed to improve overall forest health by stimulating natural processes that encourage more stable and resilient forest vegetative conditions, manage stand densities and species composition, and provide for a sustainable yield of commercial timber and other commodities, with less environmental impact and risk (primarily associated with roads), as compared to the Proposed Action.

b. Description

Alternative 3 proposes intermediate commercial harvest treatments using variable density thinning techniques and other connected actions on approximately 3,240 acres of second growth conifer stands artificially and naturally regenerated following timber harvest during the 1930s through the 1940s. Commercial and other silvicultural treatments are detailed in Table II-16 and displayed on Map II-9.

Candidate stands are located on suitable forest land primarily designated as the Matrix land allocation under the Forest Plan as amended by the Northwest Forest Plan. Within the 3,240 acres of treatments, also included are treatments within Riparian Reserves that overlap into overstocked drier upland forests (1,053 total acres).

Commercial treatments would involve harvest of conifers with diameters 7 inches and larger dbh which is a viable product size under current and anticipated market conditions. No old residual trees (old-growth) would be cut, except for danger trees. Estimated commercial volume could average 8 to 20 thousand board feet (mbf) per acre. Other wood product commodities are anticipated including biomass (chips), and firewood. Harvest treatments from this alternative could yield up to an estimated 52 million board feet (see footnote #9 above) and would be implemented utilizing multiple timber sale contracts over an approximate 5-year period.

Treatments would occur within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds (as indicated in Table II-16).

Silvicultural Treatments
The primary silvicultural treatment is to control dense stocking conditions through variable density thinning treatments (VDT) to improve overall forest health, vigor and resiliency. Silvicultural treatments include management of two forest pathogens, Port Orford cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*) affecting forest health in small portions of the Planning Area as discussed in this Chapter, Section C, 2, d. Treatments would include creation of irregular shaped openings centered on disease areas, favoring non-host tree species for leave trees, and site preparation and planting of Douglas-fir and disease-resistant Port-Orford-Cedar seedlings.

Under Alternative 3 and within Matrix, thinning would include variable spacing between trees, no-treatment areas (skips), and small irregular shaped openings (up to 2 acres) created to treat root disease areas. Root disease areas would retain non-host tree species and planting of disease-resistant Port-Orford-Cedar seedlings or Douglas-fir seedlings.

The need for tree harvest in Riparian Reserves is primarily for aquatic and wildlife habitat enhancement. Silvicultural practices would be applied to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives. Tree harvest within Riparian Reserve is a byproduct of vegetative treatments. Variable density thinning treatments would occur when vegetative conditions could be improved within the outer portions of Riparian Reserve of some perennial and intermittent streams, in accordance with specially designed Project Design Criteria (see Section B, sub- section 3, this Chapter). Table II-16 provides an estimate of the total Riparian Reserve within a unit, as well as the maximum extent of treatments within Riparian Reserves, within a given unit.

Site-specific, integrated silvicultural prescriptions would be developed following a decision on the Eden Ridge Timber Sales Project. Tree spacing would be variable and would not have a rigid or grid-like appearance. Species diversity would be maintained or increased and would include some hardwoods and species of limited local occurrence. No remnant trees would be cut, except for danger trees. If remnant trees were felled as danger trees, they would not be removed.

Silvicultural prescriptions would describe desired conditions of treated stands and associated stand structures, tree species composition, canopy retention, tree spacing or basal area retention, fuels treatments, snag numbers (where present), large woody material and other key stand components. Final silvicultural prescriptions would be approved by Region 6 certified silviculturists working closely with resource specialists to ensure integrated resource objectives are met.

Actual conditions on the ground may differ from map-delineated stands; therefore, there would be a need to be flexible and adjust treatments and/or stand boundaries as needed. All Project Design Criteria (Section 3) and Mitigation Measures (Section 9) are incorporated as part of this alternative.

Non-commercial treatments are also proposed for 363 acres (see MAP II-7). Options include restoration, rehabilitation, reforestation, removal or thinning of non-commercial sized trees. The purpose of these Timber Stand Improvement treatments is to comply with the National Forest Management Act of 1976 and the 1989 Land and Resource Management Plan.

Logging Systems
Treatment methods would include use of mechanized machinery and chainsaws. Trees could be felled using mechanized feller-bunchers, cut-to-length harvesters, or hand (chainsaw) felling. Under this alternative, commercial products could be yarded to landings or decking areas using ground-based systems (tractor or log forwarder), skyline cable systems, or full suspension aerial systems (helicopter). Logging systems projected to be utilized to harvest trees are also displayed in Table II-16. Tractor, or ground-based systems, would be used on approximately 1,786 acres, or 55% of the treated area. Skyline systems would be used on approximately 941 acres, or 29% of the treated area, and helicopter systems are proposed under this alternative on approximately 513 acres or 16% of the treated area.

Road (Access) Systems
Products would be hauled using existing system (Classified) roads or newly constructed roads to manufacturing plants by log trucks or chip vans. Use of approximately 31 miles of existing Classified roads is proposed. In addition, approximately 4 miles of reconstruction of existing Classified roads are proposed, as well as approximately 6 miles of existing Classified road maintenance (Table II-19).

New Classified (system) and temporary road construction is proposed to access some units under this alternative, as discussed in this Chapter, Section C, 2, h. Also see EIS Appendix I (Roads Analysis) for the basis of included new road construction. A total of approximately 4.5 miles of new road construction (Table II-17) is proposed. New road construction would include approximately 4.45 miles of new Classified roads, in 27 segments, ranging from 0.11 miles to 0.60 miles. New Classified roads would be managed as Maintenance Level 1 (closed until further need). Approximately 0.03 miles of new temporary road is also proposed, in one segment (Table II-18). Refer to Map II-9 for the general locations of road use and proposed road construction, reconstruction, and maintenance needs associated with this alternative.

Activity Fuels Treatments
Activity fuels treatments proposed under this alternative include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk, as discussed in this Section C, 2, e. The combination of density management and activity fuels treatments are designed to leave the stands in a condition where a wildfire could burn through the stand, in the form of a surface fire that would not create unacceptable levels of mortality.

Several methods of activity fuels treatment are being proposed, including: Yarding with Tops Attached, Hand Piling fuels concentrations: Piling and Burning landing slash and No Treatment. No activity fuel treatment would occur where the extent of tree removal is light (associated with the silvicultural prescription) and the resulting slash created and fuels loading would result in a fire with acceptable level of mortality. These methodologies are sometimes used in combination within a particular proposed treatment area, depending on existing post treatment conditions, treatment type, and location.

Table II-16. Alternative 3 – Silvicultural Treatments

Unit Reference	Estimated Unit Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access	New Road Access Reference
001	187	95	92	VDT/LRR/POC-PLT	GB	YTA	CRM & CRR	-
002	137	108	29	VDT/LRR/POC-PLT	GB	YTA	CRM	-
003	135	63	72	VDT/LRR/POC-PLT	S	YTA,P & B	CRU	A
004	8	8	0	VDT/LRR/POC-PLT	GB	YTA, P & B	-	A
005	55	20	35	VDT/LRR/POC-PLT	GB	YTA, P & B	-	B
005A	72	47	25	VDT/LRR/POC-PLT	H	YTA	- HL 7&8	-
006	119	101	18	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU & CRR	D
007	70	54	16	VDT/LRR/POC-PLT	GB	YTA	CRU	E1, E3
101	65	46	19	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU	-
102	46	32	14	VDT/LRR/POC-PLT/POC-RS	S	YTA, P & B	CRU	G
103	61	46	15	VDT/LRR/POC-WTG/POC-RS	S	YTA	CRU	H
201	117	105	12	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU	-
202	57	24	33	VDT/LRR/POC-PLT	S	YTA, P & b	CRU	-
203	19	15	4	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	-
204	48	40	8	VDT	S	YTA, P & B	-	E1, E3
206	25	18	7	VDT	GB	YTA	CRU & CRR	I
207	17	11	7	VDT	H	YTA	CRR, HL 8	-
208	21	13	8	VDT	S	YTA	CRM	-
209	79	41	38	VDT	S	YTA	CRM	K & L
210	13	13	0	VDT	GB	YTA, P & B	CRM	C & M
211	23	11	12	VDT	S	YTA	CRM	C & M
212	44	32	12	VDT	H	YTA	CRM, HL 10	-
213	22	8	14	VDT	S	YTA, P & B	CRM	N
214	36	18	18	VDT/ POC-RS	S	YTA	CRU	
215	81	70	11	VDT/ POC-RS	H	YTA, P & B	- HL 10&11	-
216	35	35	0	VDT/ POC-RS	GB	YTA, P & B	-	-
301	13	3	10	VDT/P-3 treatment	S	YTA, P & B	CRU	-
302	7	5	2	VDT/P-3 treatment	S	YTA, P & B	CRU	-
303	12	12	0	VDT	GB	YTA, P & B	CRU	-
305	8	7	1	VDT	S	YTA	-	P3
306	15	11	4	VDT	S	YTA	-	P4
307	37	16	21	VDT	H	YTA	- HL 1&2	-
309	14	3	11	VDT	GB	YTA	CU	R
310	49	37	12	VDT	GB	YTA	-	S1, S2
311	36	24	12	VDT	GB	YTA, P & B	CRR	S1, S2, S3, S5, S6 & T
312	38	19	19	VDT	S	YTA	CRR	S6
313	55	44	11	VDT	GB	YTA	CRR	-
315	26	22	4	VDT	S	YTA	CRR	S1, S2, S3, S4, S5, S6 & S8
316	112	84	28	VDT	H	YTA	-HL 3&4	-
317	74	48	26	VDT	GB	YTA	CRR	S1, S2, S3, S5, S6 & S8
318	25	20	5	VDT	GB	YTA	CRR	-
319	70	56	14	VDT/ POC-RS	GB	YTA	CRU & CRR	T

Unit Reference	Estimated Unit Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access	New Road Access Reference
320	42	25	17	VDT/LRR/POC-PLT/ POC-RS	S	YTA	CRU	T
321	16	16	0	VDT	H	YTA	CRR, HL 5&6	-
322	35	35	0	VDT	GB	YTA	CRR	V
323	31	11	20	VDT	S	YTA	CRR	V
324	63	46	17	VDT/LRR/POC-PLT	GB	YTA	CRR	U
325	99	89	10	VDT/LRR/POC-PLT/ POC-RS	GB	YTA	CRU	-
326	138	105	33	VDT/POC-WTG/POC-RS P3,P8,P9 treatment	GB	YTA	CRR	-
327	131	48	81	VDT/LRR/POC-PLT/ POC-WTG/POC-RS	H	YTA	CRR, HL 5&6	
328	52	42	10	VDT/ POC-RS P3 treatment	S	YTA, P & B	-	D
329	41	14	27	VDT/POC-WTG/ POC-RS/P9 treatment	S	YTA	CRR	-
330	18	7	11	VDT/ POC-RS/P9 treatment	GB	YTA	CRR	-
331	13	7	6	VDT/POC-WTG/ POC-RS/P3 treatment	S	YTA	CRR	-
332	44	39	5	VDT/POC-WTG/POC-RS	GB	YTA	CRU	-
333	86	65	21	VDT/POC-WTG/POC-RS	GB	YTA	CRU	-
334	74	45	29	VDT/POC-WTG/POC-RS	GB	YTA, P & B	CRU	-
335	38	27	11	VDT/POC-WTG/POC-RS	S	YTA, P & B	CRU	-
336	49	24	25	VDT/POC-WTG/POC-RS	S	YTA, P & B	CRU	-
341	22	9	13	VDT/POC-RS	GB	YTA, P & B	CRU	-
342	16	7	9	VDT	S	YTA, P & B	CRU	-
345	17	17	0	VDT/POC-RS	GB	YTA, P & B	CRU	-
401	8	8	0	VDT/P6 treatment	GB	YTA	CRU	-
402	20	14	6	VDT/P6 treatment	S	YTA	CRU	-
403	5	2	3	VDT	S	YTA	CRU	-
65 Total Units	**3,240**	**2,187**	**1,053**					

Table Notes and Legend

000s Middle Fork Coquille 5th Field, (Lower) Rock Creek 6th Field watershed
100s Middle Fork Coquille 5th Field, Myrtle Creek 6th Field watershed
200s South Fork Coquille 5th Field, Wooden Rock Creek 6th Field watershed (Headwaters SF Coquille)
300s South Fork Coquille 5th Field, Coal Creek 6th Field watershed
400s South Fork Coquille 5th Field, Mill Creek 6th Field watershed

VDT Variable Density Thinning (Commercial)
POC-PLT Port Orford Cedar; site prep and planting of resistant POC seedlings
POC-WTG Port Orford Cedar; Wide Thin Gap, eradication treatment
POC-RS Port Orford Cedar; Roadside Sanitation

LRR Laminated Root Rot; gap treatments centered around disease pockets, possible plant with POC and other species
P-# Plantation thinning (circa 1939-1963); commercial and non-commercial thinning

YTA Yarding Tops Attached
P&B Pile and Burn

GB Ground based logging systems
S Skyline logging systems
H Helicopter logging system
HL Helicopter landing and reference

CRU Classified road use
CRM Classified road use with reconstruction
CRR Classified road use with reconstruction

Table II-17. Proposed New Classified (System) Road Construction – Alternative 3

Road Segment Reference	Length (miles)	Notes
A	0.23	Ridgetop road, skyline access, no grade
B	0.27	Shortened to avoid riparian and steeper grades
C	0.03	Begins on PVT; ties to road M for FS access
D	0.60	Ridgetop road, skyline access, no grade
E1	0.34	Ridgetop road, skyline and GB access, no grade
E3	0.20	Ridgetop road, skyline access, no grade
F	0.22	Shortened to avoid riparian, minimal grade
G	0.15	Ridgetop road, skyline access, no grade
H	0.21	Ridgetop road, skyline access, no grade
I	0.09	Ties to existing route planned for reconstruction
K	0.36	Begins on PVT; for FS skyline access
L	0.01	Begins on PVT; for FS skyline access
M	0.25	Ties to road C for FS access
N	0.04	Begins on PVT for FS access
P3	0.13	Ridgetop skyline access
P4	0.11	Ridgetop skyline access
Q1	0.11	Begins on PVT; ties to roads Q2 & Q3 for FS access
Q2	0.05	Second segment for GB access
Q3	0.10	Second segment for GB access
S1	0.09	Joins existing road with existing road planned for reconstruction
S2	0.12	Joins existing road with existing road planned for reconstruction
S3	0.06	Construction of old railroad grade trestle to classified road
S5	0.05	Construction of old railroad grade trestle to classified road
S6	0.24	Additional segment for GB & skyline access
S7	0.11	Construction of old railroad grade trestle to classified road
S8	0.04	Construction of old railroad grade trestle to classified road
S9	0.06	Construction of old railroad grade trestle to classified road
T	0.32	Shortened to avoid riparian and reduce grade
U	0.12	Shortened to avoid riparian and grade
V	0.14	Ridgetop road, skyline & GB access, no grade
TOTAL	**4.45**	

Table II-18. Proposed New Temporary Road Construction – Alternative 3

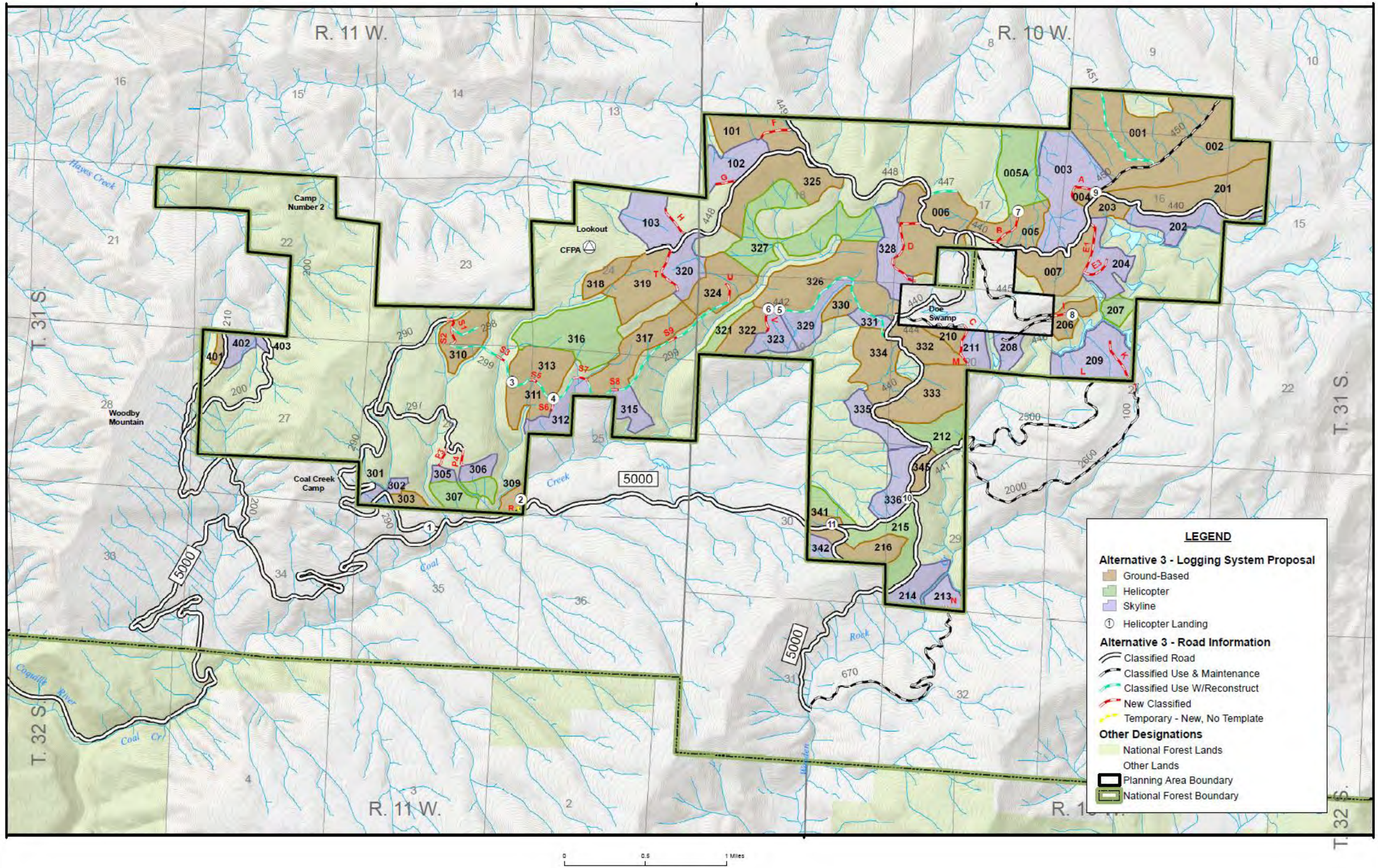
Road Segment Reference	Length (miles)	Notes
R	0.03	Short spur; joins with existing road
TOTAL	**0.03**	

Table II-19. Proposed Classified Road Use, Maintenance, and Reconstruction - Alternative 3

Classified Road Use	Reference	Miles
	3300000	1.21
	3358000	1.01
	5000000	10.36
	5000200	4.25
	5000210	0.75
	5000290	3.00
	5000297	1.10
	5000420	0.34
	5000440	5.06
	5000441	0.56
	5000445	0.11
	5000448	2.90
	5000449	0.38
Classified Road Use Total		**31.03**
Classified Use & Maintenance	2000	0.76
	2600100	0.26
	5000444	0.42
	5000445	0.89
	5000446	0.35
	5000450	1.01
	5000670	1.75
	5000671	0.06
Classified Use & Maintenance Total		**5.50**
	5000298	0.18
	5000299	1.98
	5000442	1.09
	5000447	0.19
	5000451	0.65
Classified Use W/Reconstruct Total		**4.09**

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MAP II-9. Alternative 3



c. Summary of Alternative 3

Summary

Alternative 3 *would enact the following vegetation management actions:*

3,240 acres *of* ***commercial*** *variable density management* ***thinning treatments*** *(in several separate timber sales), on* ***65 Units****, producing approximately* ***52 million board feet*** *of commercial volume****;***

Ground-based systems *would be used on* ***approximately 1,789 acres, or 55%****;* ***Skyline systems*** *would be used on* ***approximately 941 acres, or 29%;*** *and* ***helicopter systems*** *would be used on* ***approximately 513 acres, or 16%*** *of the treated area.*

Use of approximately ***31 miles of existing Classified roads****, Construction of* ***4.5 miles of new Classified road*** *(in 27 segments), Construction and decommissioning of* ***0.03 miles of temporary road,*** *Use and* ***reconstruction of 4.1 miles*** *of existing Classified road, Use of and* ***maintenance of 5.5 miles*** *of existing Classified road; and*

363 acres *of* ***non-commercial*** *silvicultural* ***treatments.***

8. ALTERNATIVE 4

a. Function

Alternative 4 is also similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only the use (with reconstruction and maintenance) of existing roads for treatment access. This alternative also excludes some of the higher risk treatments within Riparian Reserves (primarily those associated with perennial streams).

In relation to Alternative 2 and Alternative 3, these modification would reduce the treated area on some units, resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative includes helicopter logging systems, based on the change in access for conventional systems.

Alternative 4 also responds to the goals and objectives outlined by the Land and Resource Management Plan (1989 Forest Plan) for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan, and helps move the Planning Area toward desired conditions described in that plan. This alternative is designed to improve overall forest health by stimulating natural processes that encourage more stable and resilient forest vegetative conditions, manage stand densities and species composition, and provide for a sustainable yield of commercial timber and other commodities, with less environmental impact and risk (primarily associated with roads and treatments in proximity to perennial streams), as compared to the Proposed Action or Alternative 3.

b. Description

Alternative 4 proposes intermediate commercial harvest treatments using variable density thinning techniques and other connected actions on approximately 3,058 acres of second growth conifer stands artificially and naturally regenerated following timber harvest during the 1930s through the 1940s. Commercial and other silvicultural treatments are detailed in Table II-20 and displayed on Map II-10.

Candidate stands are located on suitable forest land primarily designated as the Matrix land allocation under the Forest Plan as amended by the Northwest Forest Plan. Within the 3,058 acres of treatments, also included are treatments within Riparian Reserves that overlap into overstocked drier upland forests (965 total acres).

Commercial treatments would involve harvest of conifers with diameters 7 inches and larger dbh which is a viable product size under current and anticipated market conditions. No old residual trees (old-growth) would be cut, except for danger trees. Estimated commercial volume could average 8 to 20 thousand board feet (mbf) per acre. Other wood product commodities are anticipated including biomass (chips), and firewood. Harvest treatments from this alternative could yield up to an estimated 49 million board feet (see footnote #9 above) and would be implemented utilizing multiple timber sale contracts over an approximate 5-year period.

Treatments would occur within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds (as indicated in Table II-20).

Silvicultural Treatments

The primary silvicultural treatment is to control dense stocking conditions through variable density thinning treatments (VDT) to improve overall forest health, vigor and resiliency. Silvicultural treatments include management of two forest pathogens, Port Orford cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*) affecting forest health in small portions of the Planning Area as discussed in this Chapter, Section C, 2, d. Treatments would include creation of irregular shaped openings centered around disease areas, favoring non-host tree species for leave trees, and site preparation and planting of Douglas-fir and disease-resistant Port-Orford-Cedar seedlings.

Under Alternative 4 and within Matrix, thinning would include variable spacing between trees, no-treatment areas (skips), and small irregular shaped openings (up to 2 acres) created to treat root disease areas. Root disease areas would retain non-host tree species and planting of disease-resistant Port-Orford-Cedar seedlings or Douglas-fir seedlings.

The need for tree harvest in Riparian Reserves is primarily for aquatic and wildlife habitat enhancement. Silvicultural practices would be applied to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives. Tree harvest within Riparian Reserve is a byproduct of vegetative treatments. Variable density thinning treatments would occur when vegetative conditions could be improved within the outer portions of Riparian Reserve of intermittent streams, in accordance with specially designed Project Design Criteria (see Section B, sub- section 3, this Chapter). Table II-20 provides an estimate of the total Riparian Reserve within a unit, as well as the maximum extent of treatments within Riparian Reserves, within a given unit.

Site-specific, integrated silvicultural prescriptions would be developed following a decision on the Eden Ridge Timber Sales Project. Tree spacing would be variable and would not have a rigid or grid-like appearance. Species diversity would be maintained or increased and would include some hardwoods and species of limited local occurrence. No remnant trees would be cut, except for danger trees. If remnant trees were felled as danger trees, they would not be removed.

Silvicultural prescriptions would describe desired conditions of treated stands and associated stand structures, tree species composition, canopy retention, tree spacing or basal area retention, fuels treatments, snag numbers (where present), large woody material and other key stand components. Final silvicultural prescriptions would be approved by Region 6 certified silviculturists working closely with resource specialists to ensure integrated resource objectives are met.

Actual conditions on the ground may differ from map-delineated stands; therefore, there would be a need to be flexible and adjust treatments and/or stand boundaries as needed. All Project Design Criteria (Section 3) and Mitigation Measures (Section 9) are incorporated as part of this alternative.

Non-commercial treatments are also proposed for 363 acres (see MAP II-7). Options include restoration, rehabilitation, reforestation, removal or thinning of non-commercial sized trees. The purpose of these Timber Stand Improvement treatments is to comply with the National Forest Management Act of 1976 and the 1989 Land and Resource Management Plan.

Logging Systems
Treatment methods would include use of mechanized machinery and chainsaws. Trees could be felled using mechanized feller-bunchers, cut-to-length harvesters, or hand (chainsaw) felling. Under this alternative, commercial products could be yarded to landings or decking areas using ground-based systems (tractor or log forwarder), skyline cable systems, or full suspension aerial systems (helicopter). Logging systems projected to be utilized to harvest trees are also displayed in Table II-20. Tractor, or ground-based systems, would be used on approximately 1,441 acres, or 47% of the treated area. Skyline systems would be used on approximately 457 acres, or 15% of the treated area, and helicopter systems are proposed under this alternative on approximately 1,160 acres or 38% of the treated area.

Road (Access) Systems
Products would be hauled using existing system (Classified) roads or newly constructed roads to manufacturing plants by log trucks or chip vans. Use of approximately 31 miles of existing Classified roads is proposed. In addition, approximately 2 miles of reconstruction of existing Classified roads are proposed, as well as approximately 6 miles of existing Classified road maintenance (Table II-21).

Under this alternative, no new Classified (system) or temporary road construction is proposed. The theme of this alternative is to utilize only existing Classified system roads for access. Reconstruction along 3 rail grades includes new road construction where stream crossings replace rail trestle bridges. Refer to Map II-10 for the general locations of road use, reconstruction, and maintenance needs associated with this alternative.

Activity Fuels Treatments
Activity fuels treatments proposed under this alternative include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk, as discussed in this Chapter, Section C, 2, h. The combination of density management and activity fuels treatments are designed to leave the stands in a condition where a wildfire could burn through the stand, in the form of a surface fire that would not create unacceptable levels of mortality. Several methods of activity fuels treatment are being proposed, including: Yarding with Tops Attached, Hand Piling fuels concentrations: Piling and Burning landing slash and No Treatment.

No activity fuel treatment would occur where the extent of tree removal is light (associated with the silvicultural prescription) and the resulting slash created and fuels loading would result in a fire with acceptable level of mortality. These methodologies are sometimes used in combination within a particular proposed treatment area, depending on existing post treatment conditions, treatment type, and location.

Table II-20. Alternative 4 – Silvicultural Treatments

Unit Reference	Estimated Unit Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access
001	187	95	92	VDT/LRR/POC-PLT	GB	YTA	CRM & CRR
002	137	108	29	VDT/LRR/POC-PLT	GB	YTA	CRM
003	31	16	15	VDT/LRR/POC-PLT	S	YTA,P & B	CRU
003A	51	19	32	VDT/LRR/POC-PLT	S	YTA	-
004	8	8	0	VDT/LRR/POC-PLT	GB	YTA, P & B	-
005	55	20	35	VDT/LRR/POC-PLT	GB	YTA, P & B	-
005A	124	74	51	VDT/LRR/POC-PLT	H	YTA	- HL 9&15
006	119	101	18	VDT/LRR/POC-PLT/POC-RS	GB	YTA	CRU & CRR
007	70	54	16	VDT/LRR/POC-PLT	GB	YTA	CRU
101	33	23	10	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU
102	26	19	7	VDT/LRR/POC-PLT/POC-RS	S	YTA, P & B	CRU
102A	52	37	15	VDT/LRR/POC-PLT	H	YTA	CRU, HL 19
103	43	28	15	VDT/LRR/POC-WTG/POC-RS	S	YTA, P & B	CRU
103A	17	17	0	VDT/LRR/POC-WTG	H	YTA	CRU, HL 20
201	117	105	12	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU
202	51	19	32	VDT/LRR/POC-PLT	S	YTA, P & B	CRU
203	19	15	4	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU
204	104	82	23	VDT	H	YTA	- HL 9&15
208	21	13	8	VDT	S	YTA, P & B	CRM
209	79	41	38	VDT	H	YTA	CRM ,HL 13&14
211	36	24	12	VDT	H	YTA	CRM , HL 16&17
212	44	32	12	VDT	H	YTA	CRM, HL 10
213	22	8	14	VDT	H	YTA	CRM ,HL 12
214	33	17	16	VDT/ POC-RS	S	YTA, P & B	CRU
215	81	70	11	VDT/ POC-RS	H	YTA	- HL 10&11
216	35	35	0	VDT/ POC-RS	GB	YTA, P & B	-
310	49	37	12	VDT	H	YTA	- HL 21
312	38	19	19	VDT	H	YTA	CRR, HL 2&22
313	130	99	31	VDT	H	YTA	CRR, HL 2&22
315	26	22	4	VDT	H	YTA	CRR, HL 2&22
316	33	23	10	VDT	H	YTA	- HL 21&22
317	74	48	26	VDT	H	YTA	CRR, HL 21&22
319	121	96	25	VDT/ POC-RS	GB	YTA, P & B	CRU & CRR
320	37	21	16	VDT/LRR/POC-PLT/POC-RS	H	YTA	CRU, HL 20
322	35	35	0	VDT	GB	YTA, P & B	CRR
323	59	22	37	VDT	S	YTA, P & B	CRR
324	95	59	36	VDT/LRR/POC-PLT	H	YTA	CRR, HL 5,6&20
325	99	89	10	VDT/LRR/POC-PLT/POC-RS	GB	YTA, P & B	CRU
326	138	105	33	VDT/POC-WTG/POC-RS/ P3,P8,P9 treatment	GB	YTA, P & B	CRR
327	116	67	50	VDT/LRR/POC-PLT/ POC-WTG	H	YTA	CRR, HL 18&19
330	18	7	11	VDT/ POC-RS/P9 treatment	GB	YTA, P & B	CRR
331	13	7	6	VDT/POC-WTG/POC-RS/P3	S	YTA, P & B	CRR

Unit Reference	Estimated Unit Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access
				treatment			
332	44	39	5	VDT/POC-WTG/ POC-RS	GB	YTA, P & B	CRU
333	86	65	21	VDT/POC-WTG/POC-RS	GB	YTA, P & B	CRU
334	74	45	29	VDT/POC-WTG/POC-RS	GB	YTA, P & B	CRU
335	38	27	11	VDT/POC-WTG/POC-RS	S	YTA, P & B	CRU
336	49	24	25	VDT/POC-WTG/POC-RS	S	YTA, P & B	CRU
341	22	9	13	VDT/POC-RS	GB	YTA, P & B	CRU
342	16	7	9	VDT/POC-RS	S	YTA, P & B	CRU
345	17	17	o	VDT/POC-RS	GB	YTA, P & B	CRU
401	8	8	0	VDT/P6 treatment	GB	YTA	CRU
402	20	14	6	VDT/P6 treatment	S	YTA	CRU
403	5	2	3	VDT	S	YTA	CRU
53 Total Units	**3,058**	**2,093**	**965**				

Table Notes and Legend

000s Middle Fork Coquille 5th Field, (Lower) Rock Creek 6th Field watershed
100s Middle Fork Coquille 5th Field, Myrtle Creek 6th Field watershed
200s South Fork Coquille 5th Field, Wooden Rock Creek 6th Field watershed (Headwaters SF Coquille)
300s South Fork Coquille 5th Field, Coal Creek 6th Field watershed
400s South Fork Coquille 5th Field, Mill Creek 6th Field watershed

VDT Variable Density Thinning (Commercial)
POC-PLT Port Orford Cedar; site prep and planting of resistant POC seedlings
POC-WTG Port Orford Cedar; Wide Thin Gap, eradication treatment
POC-RS Port Orford Cedar; Roadside Sanitation

LRR Laminated Root Rot; gap treatments centered around disease pockets, possible plant with POC and other species
P-# Plantation thinning (circa 1939-1963); commercial and non-commercial thinning

YTA Yarding Tops Attached
P&B Pile and Burn

GB Ground based logging systems
S Skyline logging systems
H Helicopter logging system
HL Helicopter landing and reference

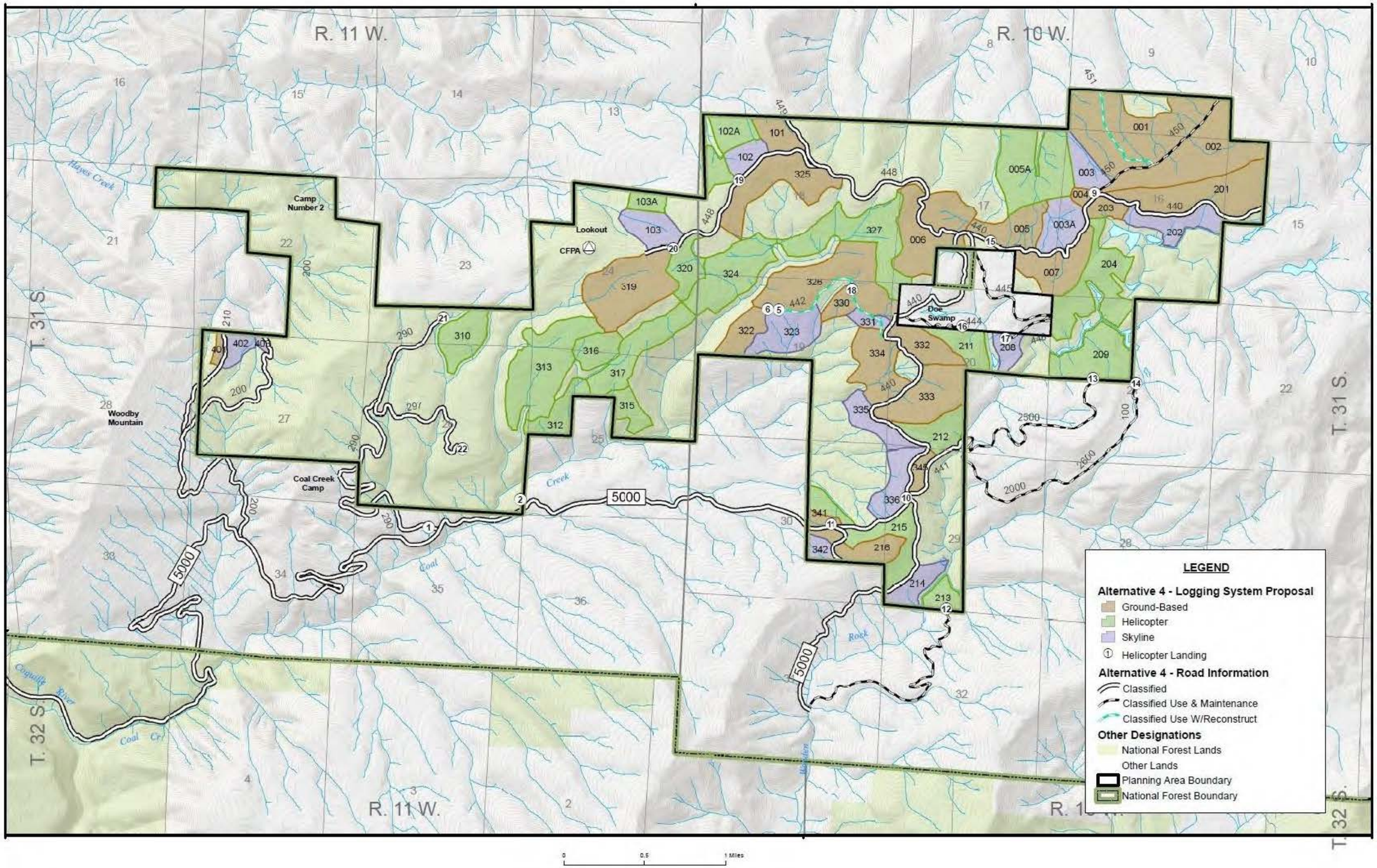
CRU Classified road use
CRM Classified road use with reconstruction
CRR Classified road use with reconstruction

Table II-21. Proposed Classified Road Use, Maintenance, and Reconstruction - Alternative 4

Classified Road Use	Reference	Miles
	3300000	1.21
	3358000	1.01
	5000000	10.36
	5000200	4.25
	5000210	0.75
	5000290	3.00
	5000297	1.10
	5000420	0.34
	5000440	5.06
	5000441	0.56
	5000445	0.11
	5000448	2.90
	5000449	0.38
Classified Road Use Total		**31.03**
Classified Use & Maintenance	2000	0.76
	2600100	0.26
	5000444	0.42
	5000445	0.89
	5000446	0.35
	5000450	1.01
	5000670	1.75
	5000671	0.06
Classified Use & Maintenance Total		**5.50**
Classified Use W/Reconstruct[15]	5000442	1.09
	5000451	0.65
Classified Use W/Reconstruct Total		**1.74**

[15] Reconstruction along 3 rail grades includes 0.25 miles of new road construction where stream crossings replace rail trestle bridges.

MAP II-10. Alternative 4



c. Summary of Alternative 4

Summary

Alternative 4 *would enact the following vegetation management actions:*

3,058 acres *of* ***commercial*** *variable density management* ***thinning treatments*** *(in several separate timber sales), on* ***53 Units****, producing approximately* ***49 million board feet*** *of commercial volume****;***

Ground-based systems *would be used on* ***approximately 1,441 acres, or 47%****;* ***Skyline systems*** *would be used on* ***approximately 457 acres, or 15%;*** *and* ***helicopter systems*** *would be used on* ***approximately 1,160 acres, or 38%*** *of the treated area.*

Use of approximately ***31 miles of existing Classified roads****, Use and* ***reconstruction of 1.74 miles*** *of existing Classified road, Use of and* ***maintenance of 5.5 miles*** *of existing Classified road; and*

363 acres *of* ***non-commercial*** *silvicultural* ***treatments.***

9. MITIGATION MEASURES ASSOCIATED WITH ACTION ALTERNATIVES

This Sub-section discusses elements that would be required of an Action Alternative to manage consequences during actual operations; these are termed "Mitigation Measures" Other elements associated with the design of treatments and actions (i.e., Project Design Criteria), are applicable to Action Alternatives and are to be employed during on-the ground project designation or implementation (see Sub-section 3).

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

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

The Proposed Action may include commercial tree harvest and removal that would be accomplished by private contractors. Contracts for commercial harvest operations would require mitigation measures to be incorporated as contract requirements. The Forest Service has long-standing experience in applying mitigation measures under traditional timber sale contracts, and therefore, contract language that could be applied to contracts is included. Forest Service contract administrators are responsible for enforcing the implementation of contract provisions.

Note that some measures would be enacted only if certain (future) conditions exist that would require it (e.g., if a nesting pair of spotted owls is discovered adjacent (within 300 meters) to a proposed treatment area or a previously unknown heritage site is discovered).

Proposed mitigation measures and standard operating procedures designed to avoid or minimize adverse effects (or implement positive effects) are identified by resource topic area, and in some cases, by the specific component or sub-component activity. These measures are specific to implementation of actions considered within this EIS. Standards and Guidelines and mitigation measures identified in the Siskiyou National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan are incorporated by reference as required measures.

In addition, all contracts or other methodology for implementation of actions would comply with all requirements and standards for protection of Threatened, Endangered and Sensitive species, in compliance with the Endangered Species Act.

The effectiveness and feasibility of the following mitigation measures are assessed based upon the following rating system. These ratings are applied to all mitigation measures. Each measure identifies the code for effectiveness and feasibility at the end of the statement or paragraph. Ratings were determined by professional resource specialists, based on current scientific research and/or professional experience or judgment.

Table II-22. Effectiveness and Feasibility Rating System

EFFECTIVENESS (E)

E1	Unknown or experimental; logic or practice estimated to be less than 75% effective; little or no experience in applying this measure.
E2	Practice is moderately effective (75 to 90%). Often done in this situation; usually reduces impacts; logic indicates practice is highly effective but there is minimal literature or research.
E3	Practice is highly effective (greater than 90%). Almost always reduces impacts, almost always done in this situation; literature and research can be applied.

FEASIBILITY (F)

F1	Unknown or experimental; little or no experience in applying this measure; less than 75% certainty for implementation. May be technically difficult or very costly. May be legally or socially difficult.
F2	Technically probable; greater than 75% certainty for implementation as planned; costs moderate to high in comparison to other options. Legally or socially acceptable with reservations.
F3	Almost certain to be implemented as planned; technically easy; costs low in comparison to other options. Legally or socially expected.

The following discussion by specific resource areas, provide additional mitigation and further explanation of the methodology, effectiveness, and feasibility of the mitigation measures.

a. Geology

The Northwest Forest Plan Aquatic Conservation Strategy includes unstable and potentially unstable areas within Riparian Reserves. No commercial activities will occur within the Riparian Reserves of unstable and potentially unstable terrain. A Hydrologist or Geologist will assist in field validation and identification of additional unstable areas during layout of stand treatments (BMP T-6). **E3/F3**

b. Soils

Mitigation Measures designed for the protection of soils, site productivity, and water quality are generally referred to as Best Management Practices (BMPs) as described in *General Water Quality Best Management Practices,* Pacific Northwest Region, November 1988. While the terminology in the BMPs is dated (for example Streamside Management Unit now falls under Riparian Reserve), they are still considered effective under today"s management direction.

Prelocate skid roads in all ground based treatment units; up to 150 feet endlining required to designated skid roads. Skid road locations are to be approved by the Forest Service (BMP T-11). Ground-identified pre-designated skid trail patterns are to be authorized that will limit the area used for harvest access skid trails when employing ground-based harvest systems to ensure compliance with Standards and Guidelines to protect the soil resource and long-term site productivity. **E3/F3**

During operations, heavy machinery use within a treatment unit shall be planned and approved by the Contract Administrator to be consistent with Forest Plan Standard and Guidelines for Soils. The maximum percent of area for detrimental soil conditions under the LRMP is 15% for an activity area (SNF LRMP S&G 7-2). This standard includes roads and landings. The 10% soil infiltration capacity standard also applies within Riparian Reserves, as noted above. **E3/F2**

The use of vehicles and equipment shall be limited to dry soil conditions to minimize compaction. Percent moisture levels are to be determined by a Soil Scientist, using standard soils methodology, during project layout and implementation. **E3/F2**

During implementation, management activities will be designed to retain effective ground cover to protect the soil resource, as specified in the SNF LRMP (1989), and to leave woody material in accordance with the silvicultural prescription. **E3/F2**

All skyline logging will be done with equipment capable of suspending one end of the log; up to 150 foot lateral yarding required to skyline corridors (BMP T-12). Whenever feasible, parallel yarding corridors are preferred over „fan" settings in order to minimize soil/vegetation disturbance immediately below the yarder. Yarding corridors shall target a spacing of no closer than 150 feet as much as possible (BMP T-12). An effective slash cover and/or water bars in skyline corridors and skid trails will be installed following the completion of operations for erosion control (BMP T-16). **E3/F3**

During implementation, complete maintenance and erosion control on landings/roads/trails prior to the onset of extended periods of wet weather (BMP T-13, R-18). Restrict hauling on roads during extended periods of wet weather. (BMP R-20). **E3/F3**

During implementation, ground-based heavy equipment used for cutting/ skidding/forwarding will be restricted to Forest Service-designated or approved skid trails that are obligated for this use, or to locations where thick slash mats are created using mechanized limbing/topping systems, or to periods when the ground is frozen or snow-covered to a depth that minimizes soil compaction. **E3/F3**

Ground-based systems are restricted to slopes of 35% or less. Designated skid trails and skyline corridors are to be spaced at a distance approved by the Forest Service to keep detrimental soil conditions to within the maximum percent of area for detrimental soil conditions under the LRMP; 15% for an activity area (SNF LRMP S&G 7-2). (BMP T-5, T-9, T-11, T-13, VM-1, VM-4). **E3/F2**

During implementation, pre-existing (legacy) skid trails, temporary roads and landings shall be re-used to the extent practicable; so as to minimize additional ground impacts (detrimental soil conditions). (BMP T-11). **E3/F2**

One or more of the following soil restoration methods shall be used (alone or in combination) to rehabilitate soil conditions on detrimentally disturbed ground (for example, on legacy or newly-designated skid trails and landings) where compaction tests or other monitoring identifies a need for a remedial or impact containment action. (BMP T-14, T-15, T-16, R-23):

After completion of logging, deep subsoiling of heavily compacted skid trails and landings may be employed, where soil conditions are feasible. This operation would use a specially-designed subsoiler implement, mounted on a -tracked excavator, to fracture and loosen compacted soil layers to re-establish water infiltration and deep root penetration. Mechanized equipment used for subsoiling would be restricted to the ground areas already disturbed to avoid creating additional ground impacts.

After completion of logging, scarification (ripping) of skid trails and other disturbed soil areas may be employed. This operation would use standard rock rippers or similar equipment, to superficially cultivate the surface of tractor skid trails as a way to promote natural herbaceous re-vegetation by providing seed catchments and shallow water infiltration.

During subsoiling or scarification, 5 to 10 tons per acre of woody material and/or slash may be placed on top of disturbed ground areas, either manually or with a machine. Dispersing organic material evenly across tractor skid trails, landings, and other bare soil areas reduces erosion and increases water infiltration.

Following completion of logging operations, and in situations where rapid (within months) protection of bared soils is necessary, mulching, grass seeding, shrub planting or tree planting may be conducted using native, non-invasive (and weed-free) grass seed or local native plants (as recommended by a botanist). Optionally, or in combination, sediment capture devices, such as rice straw wattles or bales, may be used to control erosion and reduce sediment movement.

Selection and use of these actions would be based on the existing condition of the site following completion of logging operations. These actions do not result in instant restoration; rather they begin the process of restoration. **E3/F2**

All re-constructed or newly-constructed temporary roads would be reclaimed as soon as practical by the contractor before the storm season, unless mitigated with prescriptions provided on a case-by-case basis from a soils/geology/hydrology specialist. **E3/F2**

Reclamation of temporary roads may include one or more of the following actions: removal of temporarily installed culverts, excavating cross ditches (water bars) to drain water captured by the former running surface, placing large logs or rocks onto the running surface to deter vehicle use, or re-contouring the road template to near-natural ground conditions. In addition, any of the soil restoration methods above may be used to decommission temporary truck roads as well. (BMP R-23). **E3/F2**

Plan pile burning operations for when litter, duff, and soil moistures are high enough to minimize consumption of soil organic matter and minimize soil heating. Minimize the size of slash hand piles. Distribute piles to reduce severe burn impacts from concentrated fuel. (BMP F-2, F-3). **E3/F2**

c. Hydrology

Special Riparian Reserve Mitigation Measures:

In addition to Riparian Reserve PDCs (Section C, 3) the following measures will apply to hydrology:

Currently unmapped Riparian Reserves within the Project Areas or within one site-potential tree (assumed to be 175 feet for all areas) of the Project Area boundary will be identified prior to implementation of treatments by watershed specialists and/or biologists. **E3/F3**

Yarding activities should achieve full suspension over the active channel. To facilitate log suspension with skyline operations, corridors for cable rigging would be allowed to pass through Riparian Reserves. A maximum clearing width of 12 ft. is required and logs may be yarded through this corridor if necessary. Corridors must be spaced at a minimum of 200 feet apart if they pass through Riparian Reserves. Corridor "rub trees" within the Riparian Reserve, even if damaged, would either be left standing or felled and left in place. **E3/F3**

No new temporary roads or landings, gap treatments, or heavy thinning is proposed nor allowed within Riparian Reserves without prior field examination by a Soils Scientist, Hydrologist, or Geologist to prescribe site specific mitigation, if needed (including relocation of the road). **E3/F3**

Fire, engineering and aquatic resource personnel will work together to determine suitable pump chances and the measures needed for the protection of aquatic resources. Refuel 100 feet from a stream or use measures to assure fuel does not reach flowing water. Water withdrawal equipment must have a 3.82 intake screen in order to avoid fish entrapment. **E3/F3**

Special Haul Restrictions to Prevent Fine Sediment Delivery to Streams:[16]

OPERATIONS WITHIN THE NORMAL OPERATING SEASON **(June 1 to Oct 31st),** Project design features would be implemented to make it unlikely that sediment would reach stream channels. **E3/F3**

- Road crown would be maintained.
- Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.
- If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.

IF OPERATIONS OUTSIDE THE NORMAL OPERATING SEASON: November 1 through May 31st are allowed, the following rules must be applied to timber haul on gravel roads adjacent EFH or any stream type stream channels: **E3/F3**

- Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.
- If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.
- Road Rutting: No hauling down the gravel road surface if rutting is occurring, indicating the subsurface is wet.
- Wet weather conditions must be monitored daily by the US Forest Service for the chance of precipitation, especially 1 inch of rain in 24 hours.

Road Activity Mitigation Measures

Best Management Practices (BMPs) will be used for all road activities such as road reconstruction and/or maintenance work (Land and Resource Management Plan, Siskiyou National Forest, 1989, Appendix F and General Water Quality Best Management Practices, PNW, November 1988). **E3/F3**

[16] Luce, C.H. and Black T.A. 2001. Effects of Traffic and Ditch Maintenance on Forest Road Sediment Productions, Rocky Mountain Research Station, Boise, Idaho.

Follow Road River-Siskiyou National Forest Road Use Rules. **E3/F3**

Follow Road Management Objectives (RMO) Operational Restrictions for hauling under wet conditions. **E3/F3**

d. Recreation

Not all areas will receive treatment at the same time – efforts should be made to ensure that a range of recreational experiences remain available to the recreating public. Public safety should be a top priority.

A number of mitigation measures will be implemented as necessary to reduce the effects of implementation on recreation users. These would include advanced notice of closures, signing at appropriate locations, alternate route suggestions, and notification of various user groups. **E3/F3**

Identify any recreation improvements (trails, trailheads, signs) on contract area maps and protect, repair and restore any damage caused by project operations. **E3/F3**

All project activities (Forest Service and contract) will comply with State and Federal Occupational Safety and Health (OSHA) codes. All Forest Service project operations will be guided by FS Handbook 6709.11 (Health and Safety Code Handbook). **E3/F3**

As necessary, restrict or close areas to hunting where contractors or Forest Service personnel are working. **E3/F2**

No trash will be left on public lands by any contractor or contractor crew associated with this project. This includes commercial timber removal, non-commercial treatments, activity fuels treatment contractors and includes items such as aluminum cans, lunch wrappers, paint cans, and other refuse. **E3/F3**

e. Botanical and Invasive Plant Species

Invasive Species
To prevent the introduction of invasive plant seed into the Planning Area from other projects that the contractor has worked on in the recent past, before entering RRSNF lands, the contractor is required to clean the undercarriage, tires, wheels and other parts of off-road equipment to prevent the spread of seed from off forest areas. When leaving RRSNF to work in other areas the contractor should clean vehicles again before returning to work on this project. **E3/F3**

Contracts and permits should contain appropriate clauses concerning the prevention or spread of Invasive Plants as described in the Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (September 2005). **E3/F3**

Operational site should be surveyed for invasive species; if detected, appropriate action will be taken in accordance with RRSNF Integrated Noxious weed Plans. **E3/F3**

To prevent the inadvertent establishment of non-native grass species into the project area, use locally collected native grass seed for erosion control, wildlife seeding and invasive plant abatement. **E3/F3**

To prevent the inadvertent establishment of non-native grass species into the project area, use only certified weed free straw/mulch if needed for erosion control or other purposes during road construction. **E3/F3**

To prevent the inadvertent dispersal of invasive plant seed into the project areas, all rock sources for road work/construction must first be inspected by a botanist on the district to ensure they are weed free before being used. **E3/F3**

Use prevention practices found in Pacific Northwest Invasive Plant Program ROD (2005) and ROD and LRMP Amendment for Management of Port-Orford-Cedar in Southwest Oregon, Siskiyou National Forest (March 2004). This direction includes making sure heavy equipment brought to the forest is clean of noxious weeds (including seeds), any material brought to the forest (such as hay, rock, soil) is noxious weed free material, and conducting road maintenance activities in a way to minimize noxious weed introduction/spread. **E3/F3**

f. Port-orford-cedar Management Practices

The following management practices for Port-orford-cedar are taken from the Risk Key assessment (EIS Appendix B - September 15, 2011)

Project Scheduling- schedule commercial treatments/road building west of Doe Swamp to occur during the dry season (or wash project equipment). **E3/F3**

Utilize Uninfested Water- Use uninfested water sources for equipment washing, road watering and other water-distribution needs or treat water with Clorox bleach to prevent/reduce the spread of *Phytophthora lateralis* (PL). **E3/F3**

Unit Scheduling- Conduct work in all timber sale units where PL is not present before working in units infested with PL. **E3/F3**

Road Management Measures- Implement proactive disease-prevention measures including not building roads (e.g., Road W through PL pockets in Units 326 and 327) or relocating the proposed road to avoid these infested areas. **E3/F3**

Resistant POC Planting- Silvicultural prescriptions for sites having potential for growing POC will provide for the establishment of the species through natural or artificial regeneration and maintenance as a viable stand component through the current and future rotations. **E2/F3**

Washing Project Equipment- Wash project equipment prior to beginning work in uninfested project areas, when leaving infested areas to work in uninfested areas, and when leaving the project area to minimize the transportation of infested soil to uninfested areas. **E3/F3**

Site-Specific POC Management- Manage to favor POC uphill from creeks, on ridgetops and on well-drained sites to emphasize management of POC on sites where conditions make it likely that trees will escape infection. Emphasis may include priority retention during thinning or other silvicultural treatments and planting to increase the presence of POC in areas unfavorable to PL. **E2/F2**

g. Terrestrial Wildlife Species and Habitat

In addition to Wildlife PDCs (Section C, 4) the following measures will apply to terrestrial wildlife species and habitats:

Mitigation Measures to protect northern spotted owls include:

If spotted owls are detected in or adjacent to treatment units, Project Design Criteria from the USDI Fish and Wildlife Service Formal Consultation on timber harvest, meadow restoration and quarry activities proposed by the Rogue River–Siskiyou National Forest (TAILS #: 13420-2009-F-0146) dated August 27, 2009 (USDA/USDI, 2009c) would be applied to proposed activities (PDC# 2&3, Wildlife Report Attachment A). **E3/ F3**

If a previously unknown spotted owl nest or activity center is located, delay project activities within or adjacent to a Project Area until September 30th, or until a Forest Service Wildlife Biologist determines that the site is non-reproductive. **E3/ F3**

Any of the following mitigation measures may be waived in a particular year if nesting or reproductive success surveys conducted according to the FWS-endorsed survey guidelines reveal that spotted owls are non-nesting or that no young are present that year. Waivers are valid until March 1 of the year following the survey. Previously known sites: activity centers are assumed occupied unless protocol surveys indicate otherwise.

Work activities (such as tree felling, yarding. road construction, hauling on roads not generally used by the public, muffled blasting) that produce loud noises above ambient levels, or produce thick smoke that would enter the stand, will not occur within specified distances (see table below) of any nest site or activity center of known pairs and resident singles between **1 March and 30 June** (or until two weeks after the fledging period) - unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt. **E3/F3**

March 1 — June 30 is considered the critical early nesting period. The agency biologist has the option to extend the restricted season to as late as 30 September during the year of harvest, based on site-specific knowledge (such as a late or recycle nesting attempt). The restricted area is calculated as a radius from the assumed nest site (point). See Appendix F of the Biological Opinion for a discussion of the rational for the 30 June restriction date.

Broadcast burning (or smoke producing activities) will not take place within 0.25 mile of known active northern spotted owl nests between 1 March and 30 June (or until two weeks after the fledging period) unless smoke will not drift into the nest stand. **E3/F3**

Table II-23. Northern Spotted Owl Restrictions- Harassment Distances

Type of Activity	Zone of Restricted Operation
Blast of more than 2 pounds of explosive	I mile
Blast of 2 pounds or less of explosive	120 yards
Impact pile driver, jackhammer. or rock drill	60 yards
Helicopter or single-engine airplane	120 yards for small helicopters; 0.25 miles for Type I or II helicopters
Chainsaws (hazard trees. tree harvest. etc.)	65 yards
Heavy equipment	35 yards

Mitigation Measures to protect marbled murrelet include:

To protect marbled murrelets from disturbance; the following Project Design Features from the USDI Fish and Wildlife Service Formal Consultation on timber harvest, meadow restoration and quarry activities proposed by the Rogue River–Siskiyou National Forest (TAILS #: 13420-2009-F-0146) dated August 27, 2009 (USDA/USDI, 2009) would be applied to proposed activities.

PDCs apply to two different inland management zones. The Wildlife report in the Analysis File shows these two Areas. PDCs deal with *removal/degradation* of habitat and *disturbance* of nesting murrelets.

Area A = Area west of the line between the coastal Western Hemlock/Tanoak Zone and inland Mixed Conifer/Mixed Evergreen Zone; this area is the known range for marbled murrelet in SW Oregon. **Area B** = Area 6.5 miles (10 km) east of Area A (although Area B is outside the known range for this species, potential nesting habitat will continue to be surveyed in this "buffer" area, where projects may affect this potential habitat). No surveys for marbled murrelets are required on land outside of (east of) Areas A and B. **E3/F3**

(I) For Survey Areas **A and B, if the project removes or degrades suitable habitat, the project must be surveyed to protocol** (current Pacific Seabird Group two year protocol – to document presence/absence of murrelet). If it is not feasible to complete the two-year protocol, the FWS will be contacted on a case-by-case basis to discuss other means of insuring that potential nest trees are not impacted.

The action agency has the option of not surveying suitable habitat and classifying these stands as "Occupied." A "new" LSR must be established for any timber stand in Areas A or B that is determined to be or assumed to be occupied by marbled murrelet (per NWFP ROD, page C-10).

(II) For **Survey Areas A and B work activities** (such as tree felling, yarding, road and other construction activities, hauling on roads not generally used by the public, muffled blasting) which produce noises above ambient levels **will not occur within specified distances (see table below) of any occupied stand or unsurveyed suitable habitat between April 1 – August 5**. **For the period between August 6 – September 15, work activities will be confined to between 2 hours after sunrise to 2 hours before sunset**.

(III) **Clean up trash and garbage daily** at all construction and logging sites. Keep food out of sight so as to not attract crows and ravens (predators on eggs or young murrelets).

(IV) **Blasting** (open air/unmuffled) – **No blasting activities 1 April through 15 September within 1.0 mile of occupied stands or unsurveyed suitable habitat.** This distance may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the blast and nest sites or less than 2 lbs of explosives are used. If so, then use described distance.

Table II-24. Murrelet Restrictions- Harassment Distances

Type of Activity	Zone of Restricted Operation
Blast of more than 2 pounds of explosive	I mile
Blast of 2 pounds or less of explosive	120 yards
Impact pile driver, jackhammer. or rock drill	120 yards
Helicopter or single-engine airplane	120 yards for small helicopters; 0.25 miles for Type 1 or 2 helicopters
Chainsaws (hazard trees. tree harvest. etc.)	120 yards
Heavy equipment	120 yards

Mitigation Measures to protect peregrine falcon include:

To manage habitat for Sensitive species (peregrine falcon) viability and maintenance of populations throughout their existing range on the Forest protect all existing and newly discovered peregrine falcon nest sites during the courtship period through the dispersal of young (January 1 - July 31). Implement Seasonal Restrictions on All Activities (January 1 to July 31) within disturbance distances. **E3/F3**

To limit harassment and disturbance to nesting Sensitive species – peregrine falcon, helicopter landing locations within 1 mile of the known or any newly found peregrine falcon sites will require approval of the district wildlife biologist prior to implementation. **E3/F3**

General Terrestrial Wildlife Mitigation:

Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem for multiple species. Leave trees damaged during harvest operations will be left standing or felled for safety, but left on site. The intent is to maintain damaged trees, which may become snags or develop cavities, to contribute to the large woody material needs following all treatment activities. **E3/F3**

To protect grassy areas which provide habitat for deer, elk, and other wildlife, do not operate equipment in or construct/locate corridors, skid trails, landings, slash piles, or any roads within meadows and identified grassy areas. **E3/F3**

Should future surveys locate any R6-listed Sensitive species (or if new species known to occur within the area become listed) management within associated units will be halted pending analysis of the impacts of the activities. Management may continue, prescriptions or timing altered, or units may be dropped, based on the analysis. **E3/F3**

General Recommendation for Neo-tropical Migratory Birds:

Efforts should be made to reduce impacts to nesting birds that may be present in project areas that may be directly impacted by broadcast burning operations. Operations should occur outside of the spring breeding/nesting season as much as possible (February-May). **E2/F2**

h. Aquatic Species and Habitat

All project elements would be accomplished within Forest Service Forest Plan Standards and Guides, Best Management Practices (BMPs) and Standard Operating Procedures. Standard Operating Procedures include adherence to State Water Quality standards; ODFW instream work periods; hazardous materials plans; EPA requirements for storage and use of petroleum products; ODFW, and NOAA Fisheries criteria for culvert replacements; and BMPs for rock quarry operations.

Additional site specific BMPs and Project Design Criteria were developed to further avoid, minimize or reduce adverse impacts to aquatic resources, SONC coho salmon, their critical habitat and Essential Fish Habitats. **Mitigation measures for density management, timber felling, yarding and hauling are primarily discussed within Project Design Elements for Riparian Reserve (EA Chapter II, and in Mitigation Measures described above for Hydrology and Water Quality.**

Refuel power equipment, or use absorbent pads for immobile equipment, and prepare concrete at least 150 feet (or as far as possible from the water body where local site conditions do not allow a 150 foot setback) from water bodies to prevent direct delivery of contaminants into associated water bodies. Develop and implement an approved spill containment plan that includes having a spill containment kit on-site and at previously identified containment locations. **E3/F3**

Water withdrawal equipment must have a fish screen installed, operated and maintained in accordance with NOAA Fisheries recommendations (3/32" mesh size). **E3/F3**

Rock quarries on the forest may be utilized to produce aggregate for rocking roads, landings, or pump chances. Shape rock quarries for drainage and apply appropriate erosion control techniques for rock quarries used for waste disposal. Require quarry development plans to include BMPs and mitigation measures as part of the contract, monitoring plans to comply with stormwater pollution directives, and a site restoration plan to comply with Regional directives. **E3/F3**

i. Cultural (Heritage) Resources

Where historical railroad grades contain multiple tracks, road construction will be confined to one track. Most of the historical features also lie along the old grades. Those features that retain some integrity will be avoided. In some cases, timber may be removed from within the feature boundary by directional felling and keeping equipment outside the feature. Skid trail features that still retain donkey mounds and other associated features will be avoided. Where necessary, designate yarding corridors crossing perpendicular to features. **E3/F2**

Notify Archaeologist of any cultural resources discovered during project implementation. If a cultural resource is found, cease construction or operational activities at that location until site evaluation and determination of effect have been completed. **E3/F2**

Maintain strict confidentiality of the location of any identified heritage sites within project areas by designating them as "avoidance areas". No equipment transport, work-crew "lunch camps," or other activities will be permitted in avoidance areas. **E3/F3**

Eden Ridge historical railroad logging provides an opportunity to bring interpretive displays to the public. This has already been recognized by the USFS and the town of Powers in the creation of the video *When Everybody Was Working*. In order to further mitigate impacts, information about the early logging at Eden Ridge will be made available on the Rogue River-Siskiyou National Forest webpage. **E2/F3**

j. Fuels and Air Quality

Using prescribed fire as a treatment for activity fuels can generate a considerable amount of smoke particulates. Fire managers plan the dispersal of smoke away from designated areas in accordance with the State of Oregon Smoke Management plan. Burn plans will be submitted and authorized prior to ignition. **E3/F2**

Efforts to reduce smoke emissions from prescribed fire are being implemented to lessen the impact on air quality. One effort is seasonal burning. Spring burning, for example, results in reduced fuel consumption and emissions due to high fuel moistures. Springtime weather conditions may also have more favorable atmospheric conditions that can lead to better smoke dispersion. **E3/F2**

Other efforts include burning concentrations of fuel (spot-burning) rather that the entire area, burning when the 1,000 hour fuel moistures are high, burning within 4 -8 months of slash creation when higher fuel moistures are present in the larger material, burning when the duff moisture is high, using rapid ignition to achieve a high intensity fire, prompt "mopping up" of fires after flames have diminished, and further utilization of material prior to burning, i.e., firewood. These methods will aid in reducing the total amount of pollutants produced by burning. **E3/F2**

Optimizing flaming combustion can be achieved by burning piled fuels, rather than broadcast burning. Careful machine piling reduces the amount of dirt in piles, thereby reducing the smolder phase of a fire. In addition, real time monitoring can be preformed such that ignition can be halted if smoke impacts become greater than acceptable. **E3/F2**

10. MONITORING

This Section discusses monitoring elements and requirements that would be specifically designed for proposed management activities, under the action selected under the NEPA process. Monitoring is important for tracking the implementation of a project; ensuring projects are implemented as planned, as well as to measure success in meeting the stated project goals, objectives, and application of design elements and required mitigation.

Monitoring of all activities is required for all selected actions and would be carried out according to the Monitoring Plan. A draft Monitoring Plan Framework is included in this Section. However, a detailed Monitoring Plan will be incorporated by reference and made an attachment to the Record of Decision Notice, if a decision for the Eden Ridge Timber Sales Project is rendered. This will allow it to be developed specifically to the alternative and the components and methodology it may contain, and be specific to the area(s) where actions are being authorized.

a. Monitoring Framework

Monitoring and evaluation are separate, sequential activities that provide information to determine whether programs and projects are meeting Forest Plan direction. Monitoring collects information, on a sample basis, from sources specified in the Forest Plan.

When designing a monitoring plan, a full spectrum of techniques and methods should be used to evaluate the results obtained from monitoring. Evaluation techniques include, but are not limited to:

- Site-specific observations by on-site resource specialists.
- Field assistance trips by other technical specialists.
- On-going accomplishment reporting processes.
- Formal management reviews on a scheduled basis.
- Discussions with other agencies and various public users.
- Interdisciplinary team reviews of monitoring results.
- Involvement with existing research activities.
- Review and analysis of records documenting monitoring results.
- Re-measuring existing permanent inventory plots.

This Monitoring Plan Framework is developed as an iterative tool for assessing whether the projects are achieving the overall goals and objectives. This plan establishes monitoring objectives and protocol for implementation, baseline, and effectiveness monitoring.

Implementation monitoring will track the project through layout, contract preparation, during and immediately following project implementation, to ensure that it is implemented as planned. This asks, "Did we do what we said we were going to do as outlined in the Record of Decision?"

Baseline monitoring will be carried out in conjunction with effectiveness monitoring. Baseline data will be collected prior to project implementation to characterize the existing conditions specifically for comparison to post project conditions and will provide a basis for effectiveness monitoring.

Effectiveness monitoring will determine if the project activities were effective in achieving the stated goals and objectives based on comparison of pre (baseline) and post project conditions. Effectiveness monitoring asks, "Were the results of the project as we had planned?"

The lessons learned from monitoring and data collection will be useful for modifying project plans to better meet project goals and objectives. If monitoring indicates laws, regulations, standards or critical objectives are not being met, the project will be modified as necessary and appropriate.

b. Implementation Monitoring

Implementation monitoring asks the question, did we implement the project as outlined in the Decision Notice, including consistency with land allocations guiding the implementation of management activities in the project areas? The following monitoring question will be used to complete implementation monitoring:

Evaluation Question
Were treatments implemented according to project design criteria, including appropriate mitigation measures and management constraints outlined in the Record of Decision?

If implementation deviated from design criteria and mitigation measures, document how and why implementation deviated and whether the desired objectives as documented in the EIS were achieved.

Approach
A table can be used to track project implementation including application of required mitigation measures and management requirements. Tables can be used to track commercial timber harvest units. Another table can track post-harvest treatments such as reforestation, non-commercial density management, etc. Another table can track the other activities such as temporary and unclassified road construction and decommissioning, wildlife habitat improvement activities, etc.

Timber sale activities will also use the Timber Information Manager System (TIMS) (Forest Service Manual 2493 and Forest Service Handbook 2409.14) for tracking and reporting. Implementation monitoring is part of the regular program of work and as such, it is fully funded through the life of each of the projects. Vegetation management treatments are entered into the Forest Service Activities Tracking System (FACTS), a corporate database for recording activities accomplished on the ground.

c. Effectiveness Monitoring

Effectiveness monitoring will determine if the project activities were effective in achieving the stated goals and objectives based on comparison of pre (baseline) and post project conditions. Effectiveness monitoring asks, "Were the result of the project as we had planned?" Effectiveness monitoring is closely tied to baseline monitoring.

Baseline data will be collected prior to project implementation to characterize the existing conditions specifically for comparison to post project conditions and will provide a basis for effectiveness monitoring.

1) Soil Conditions

Detrimental soil conditions can be expected to occur as a result of implementing the Eden Ridge Timber Sales Project. The degree, extent, and duration of resultant detrimental soil conditions within each activity area influence the magnitude of productivity loss associated with any alternative. Degree refers to the magnitude of change in soil properties such as increase in bulk density or decrease in macroporosity and the depth to which those changes occur. Extent refers to the area affected by such changes. Duration refers to the length of time such changes may persist on a site.

The Pacific Northwest Region (R6) has developed several policy standards for permitted amounts of detrimental soil conditions within activity areas. The policy standards are contained in Forest Service Manual 2500 – R6 Supplement, 2500-98-1 and include definitions for what constitutes soil damage and how to assess quality conditions and trends.

Evaluation Questions
How effective was project design, including mitigation measures, in minimizing soil impacts and meeting Forest Plan Standards and Guidelines for soil protection?

Approach
A Soil Scientist or Hydrologist, in cooperation with the Contract Administrator, will monitor activities during implementation and document observations. Specialists will coordinate monitoring of post-activity soil conditions on all units harvested with ground-based logging systems.

2) Water Quality, Hydrologic Function, and Aquatic Resources

The greatest concern for impacting water quality, hydrologic function, and aquatic habitat is associated with accelerating erosion and sedimentation to streams. Ground disturbing activities associated with planned activities will increase the potential for surface erosion and sediment production during and for 1 to 2 years following implementation of each project. The potential for increased sedimentation will taper off once ground cover and vegetation is reestablished.

Project design elements and mitigation measures are required during project implementation to avoid impacts altogether or minimize potential impacts to water quality, hydrologic function and aquatic resources. Implementation monitoring described above will track the implementation of mitigation measures, while this Section is designed for monitoring the site-specific effectiveness of mitigation as it is implemented.

Evaluation Questions
How effective was project design, including mitigation measures, in minimizing impacts to water quality and meeting Forest Plan Standards and Guidelines for water quality?

How effective are Best Management Practices in providing protection to riparian areas and minimizing impacts to aquatic systems?

Approach
In conjunction with site visits by contract administrators and resource specialists, conduct photo monitoring to document on site application of mitigation measures. Monitoring described above under Soil Conditions will determine the effectiveness of the project design in maintaining protective soil cover. The monitoring that occurs during implementation by the Contract Administrator is funded as part of the project.

D. ALTERNATIVES AND ELEMENTS 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). Interdisciplinary discussions and public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the Purpose and Need. Some of these alternatives or alternative elements were determined to be outside the scope of the Purpose and Need, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives or alternative elements were considered, but dismissed from detailed consideration for reasons summarized below.

Potentially, there are several forest management tools available that could successfully decrease the number of trees growing within overly dense stands. For example, instead of tree cutting or logging, there are other methods that could be used to reduce tree density within a stand. As a substitute for partial cutting with saws, two other practical methods could be used to eliminate some trees in a stand while leaving other trees free to grow. Instead of tree cutting, fire (a prescribed underburn) or herbicide application could be used to kill a portion of live trees within a stand. Treatments that would kill unwanted conifers, but not remove them from the site would create an additional and unacceptable fuel loading and associated fire risk. The use of herbicides would additionally introduce unacceptable social and resource effects, especially as associated with Riparian Reserves.

While these methods have some desirable characteristics (such as leaving a stand with a more natural appearance), use of these methods certainly would entail distinctive risks related to lack of tree selectivity (in the case of fire use) or introduction of human-made chemicals into the environment (in the case of herbicide use). Moreover, some of the objectives identified for the Proposed Action would not be fulfilled, such as extraction of wood useful for lumber and other products or use of timber (stumpage) receipts to pay for thinning. Therefore, the use of partial cut logging is the primary approach included in this environmental analysis to accomplish stand density reductions being considered as part of the analysis in this EIS. The other Action Alternatives are based on the Proposed Action, with modifications that reflect physical and biological resource concerns.

The following alternatives or component actions within alternatives were considered but have been eliminated from detailed study for the reasons stated and/or because they did not meet the Purpose and Need for this project.

1. OPTIONAL SILVICULTURAL HARVEST SYSTEMS

As discussed in the 1989 SNF LRMP Appendix G, the selection of silvicultural systems is a key element in the management of the Forest. The systems used will strongly influence forest conditions and the ability to provide the outputs desired by society. This facet of forest management has received considerable public attention, particularly in the form of concern over clearcutting and the application of even-aged systems in general. This controversy escalated to a national issue, and Congress expressed that even-aged systems will be used only where determined to be appropriate to meet the Objectives and requirements of the relevant plan, and more specifically, that clearcutting will be used only where determined to be the optimum method (Public Law 94-588).

No single silvicultural system is applicable throughout the mixed conifer forests (Minore and Kingsley, 1983). In addition, adherence to the criteria for vegetative manipulation in the regulations (36 CFR 21 9 27(b)) will lead to selection of different systems for specific combinations of management objectives, site characteristics, and stand conditions. In other words, the land itself often provides the best clues as to its appropriate management (LRMP 1989). Due to the particular combinations of environmental conditions and management objectives, even-aged systems will be the most commonly used, with clearcutting the most common method of regeneration in this group.

The discussion presented in LRMP Appendix G provides much of the rationale for the frequent selection of clearcutting as the optimum method. Although many factors influence this decision, some have been overemphasized. "Economics often bears the brunt of arguments for conversion to clear-cut systems. In fact, these decisions originate in the practice of the art of forestry" (Brodie 1981).

Silvicultural systems fall into two categories: even-aged, and uneven-aged. With even-aged systems, all the trees in the stand are approximately the same age throughout most of the life of the stand. Stand development and management options are strongly influenced by regeneration cutting.

The major silvicultural systems are known by the type of regeneration cutting employed; clearcutting, shelterwood, and seed tree are methods of regeneration within the even-aged system, single-tree selection and group selection are uneven-aged systems. Each of these systems includes regeneration cutting, establishment of new seedlings or sprouts, and intermediate cutting or stand improvement treatments (commercial and pre-commercial thinning) as needed to encourage the stand characteristics desired to achieve management objectives. The classification of silvicultural systems presented here is after Burns (1983) with additional descriptive information from Smith (1962).

Clearcutting involves harvesting of all the merchantable trees in a stand or large part of a stand to clear the way for the establishment of a new even-aged stand. The complete cycle of one generation from seedlings to final harvest is termed a rotation. Virtually all of the trees are removed except those designated to fulfill resource needs or those which are unmerchantable and deemed not a hindrance to the establishment and growth of the new stand. The new stand could be created by natural or artificial seeding, planting of seedlings, or sprouting from stumps or roots of cut trees.

Uneven-aged systems produce stands with no beginning or end points in time, the trees within the stand are of distinctly different ages with at least three classes present.

Regeneration Harvest Systems
Clearcutting under the even age management system was considered for Eden Ridge Timber Sales. Clearcutting is a legitimate option under General Forest allocation under the LRMP. Although most stands with the Eden Ridge Planning Area are currently 80 years of age or less, regeneration clearcutting is a viable option for this area considering its location, its climate and its growing site, and is extensively practiced on adjacent privately managed forest lands.

Although considered, regeneration clearcutting at this time was not considered in detail due to several reasons.

1) The amount of new road construction needed for regeneration harvest would be greater than that proposed under the Action Alternatives. This is because of the increased amount of volume that would have to be yarded and hauled from the Planning Area, and increased use of the roads that would be needed. This increase in road density would likely add to an increased (and potentially unacceptable) risk of direct, indirect and cumulative effects considering hydrology and soils.

2) According to LRMP standard and guideline 6-5; "Timber stands shall not be scheduled for final harvest before stand age has reached *or* surpassed the age of 95 percent of culmination of mean annual increment (CMAI) in cubic feet. Exceptions may be made where special resource considerations require earlier harvest, or where small inclusions of young stands in harvest units that otherwise meet this requirement will result in more logical management units allowing greater efficiency or less resource impacts. The age of 95 percent of culmination shall be taken from the managed yield table used in the planning analysis (Craig 1984) for the appropriate prescription and intensity unless site-specific yield projections are made as part of the silvicultural prescription; in which case the more specific data may be used for this determination." While some stands are currently close to CMAI, most of the Planning Area has not reached this threshold according to current silvicultural projections.

3) The 1994 Northwest Forest Plan allocated the Planning Area primarily to the Matrix land allocation; however regeneration harvest as envisioned in the 1989 LRMP would not likely be supported under the management emphasis of today. Further, extensive clearcutting would not likely be supported by many factions of the general public.

4) The current levels of clear-cut regeneration harvest on adjacent private lands have already created a high road density and overall risk for adverse cumulative effects. Additional regeneration clear-cutting would add to this potential for adverse risk.

Uneven-aged Systems
According to direction in the LRMP, uneven-aged management may be used on specific sites where analysis indicates it would meet certain resource objectives. Examples of where this could be appropriate are: to meet objectives for streamside, visual management, or biological diversity to provide for slope stability, or for timber management where the natural stand has an uneven-aged structure.

Uneven-aged systems were not considered id detail for Eden Ridge because of the existing current condition of relatively stable even-aged stands having been created around the same time with regeneration harvests associated with historical railroad logging. Further, most of the Planning Area is allocated to General Forest and Matrix, where even-aged systems are anticipated to obtain scheduled commodity outputs.

The intermediate treatment of variable density thinning of stands 80 years of age and younger is the preferred course of action. This type of treatment would not preclude future additional density management treatments or regeneration harvest and some point in time.

2. EXCLUSION OF CERTAIN AREAS

During the Proposed Action development process, there were portions of some stands that were considered, determined to be in need of density management treatments, but were later dropped because of the environmental or economic costs of accessing them. Examples include stands that would require high road building costs, potentially crossing streams to access relatively small areas (2-20 acres) of potential commercial thinning, areas that would require extremely long skyline cable spans (over 1,300 feet) for thinning treatments, or downhill cable settings. While excluded from consideration with this Proposed Action, these uneconomical, impractical and/or unreachable areas may be a part of potential future management actions, e.g., for future regeneration harvests.

Consideration was given to **total Exclusion of Riparian Reserve treatments** within one or more Action Alternatives. This option was not pursued in detail because most of the Riparian Reserve areas proposed for treatment would greatly benefit for treatments. The need for tree harvest in Riparian Reserves is primarily for aquatic and wildlife habitat enhancement. Silvicultural practices would be applied to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives. Total exclusion of this option was not considered a good management practice at this time. In addition, there has been support for this type of treatment with other proposals involving density management of younger stands.

Consideration was given to **total exclusions of portions of the inner gorges** associated with the large perennial stream. Total exclusion was not pursued because extensive field reconnaissance determined that some of these areas would benefit and treatments are needed to attain ACS objectives. Treatments are proposed only where this benefit would occur. Further, total exclusion would not change the overall concern for hydrologic for peak flow, which would not change by excluding treatments (i.e., no gain).

Consideration was given to partial or total exclusion of proposed units with the Coal Creek sub-watershed. Although the Coal Creek sub-watershed is rated as the highest risk, a majority of the project is within this watershed. Total exclusion would severely detract from attainment of Purpose and Need, i.e., would not leave much for a project. Further, the Proposed Action of density management thinning and associated connected actions is not project to increase the current risks. Therefore this exclusion was not considered in detail.

3. OTHER CONNECTED OR ASSOCIATED ACTIONS

Consideration was given to **pre-commercial thinning** within stands in the Eden Ridge Planning Area. Pre-commercial thinning by definition usually occurs when stands are 15-25 yrs old. There are few stands of this age within the Planning Area, almost all having been clear-cut at approximately the same time, 60-80 years ago. Therefore pre-commercial thinning, as associated with previous manages stands is not being proposed. However, some overly dense stands were identified for various non-commercial treatments to improve forest health or to accelerate habitat development (refer to Section C, 2. D.).

Consideration was given to **gap creation for** the purpose of creating big game early seral habitat (e.g., **forage**). While some small gaps are being proposed, extensive gap treatment on Forest Service managed lands for the purpose of creating big game forage was not pursued. This is primarily because of the current condition of adjacent private lands, extensively already in early seral vegetative stages and providing big game forage.

E. COMPARISON OF ALTERNATIVES

This Section compares the alternatives considered in detail, based on information presented in this Chapter, as well as environmental consequences presented in Chapter III. Table II-25 summarizes the alternatives; Table II-26 contains a comparison of some of the indicators relevant to the Significant Issues for the environmental consequences, and Table II-27 contains a comparison of the alternatives for the environmental consequences on Other Issues.

1. DESCRIPTION OF THE ALTERNATIVES CONSIDERED IN DETAIL

The following table summarizes the alternatives.

Table II-25. Alternative Comparison

	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Commercial Treatments				
Number of Units	0	75	65	53
Total Acres	0	3,314	3,240	3,058
Matrix Acres	0	2,217	2,187	2,093
Riparian Reserve Acres	0	1,097	1,053	965
Total Est. Volume MMBF	0	53	52	49
Activity Fuels Treatment Acres	0	1,600	1,145	1,300
Predicted Harvest Method				
Ground based Acres	0	2,119	1,786	1,441
Skyline Acres	0	1,195	941	457
Helicopter Acres	0	0	513	1,160
Non-Commercial Treatments	None	363 Acres	363 Acres	363 Acres
Roads				
New Classified (system) Road Construction Miles	0	10.81	4.45	0.25
Temporary Road Construction & Decommissioning Miles	0	0.29	0.03	0
Classified Road Use Miles	0	31.03	31.03	32.03
Classified Road Use & Maintenance Miles	0	5.50	5.50	5.50
Classified Road Use w/ Reconstruction Miles	0	6.07	4.09	1.74
Other Actions				
	None	All Action Alternatives include: Snag creation, Native grass/forb seeding, Meadow restoration, Stream enhancement, Nest boxes		

Table II-26. Comparison of Alternatives - Significant Issues

Significant Issues	Indicator	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)		Alternative 3		Alternative 4	
1 Hydrologic Conditions	**Thinning Acres by Subwatershed and Percent of Subwatershed Affected**							
	Coal Creek (9,952 acres)	0 / 0	1,760	(18%)	1,615	(16%)	1,427	(14%)
	Headwaters SF Coquille (40,233 acres)	0 / 0	585	(1.5%)	637	(1.6%)	642	(1.6%)
	Mill Creek (13,935)	0 / 0	33	(<1%)	33	(<1%)	33	(<1%)
	Myrtle Creek (20,028 acres)	0 / 0	172	(1%)	172	(1%)	172	(1%)
	Lower Rock Creek (25,544 acres)	0 / 0	765	(3%)	783	(3%)	783	(3%)
	Road Construction Miles by Subwatershed: Permanent System/Temporary							
	Coal Creek	0 / 0	6.61	0.29	1.87	0.03	0.25	0.0
	Headwaters SF Coquille	0 / 0	2.27	0.0	1.31	0.0	0.0	0.0
	Mill Creek	0 / 0	0	0.0	0.0	0.0	0.0	0.0
	Myrtle Creek	0 / 0	0.78	0.0	0.54	0.0	0.0	0.0
	Lower Rock Creek	0 / 0	1.15	0.0	0.68	0.0	0.0	0.0
	Road Density Increase by Subwatershed: (mi/sq mi)	***Existing***						
	Coal Creek	4.19	0.43		0.12		0.00	
	Headwaters SF Coquille	4.25	0.04		0.02		0.00	
	Mill Creek	3.94	0.00		0.00		0.00	
	Myrtle Creek	4.12	0.02		0.02		0.00	
	Lower Rock Creek	4.68	0.03		0.02		0.00	
	Permanent System Roads Crossing Riparian Reserve (Miles)	0.00	1.58		1.5		0.25	
	Temporary Roads Crossing Riparian Reserve (Miles)	0.00	0.17		0.03		0.00	
	Percent of Subwatershed Affected by Ground Based Yarding							
	Coal Creek	N/A	12 %		9.5 %		6.5 %	
	Headwaters SF Coquille	N/A	0.5 %		0.5 %		0.4 %	
	Mill Creek	N/A	<0.1 %		<0.1 %		<0.1 %	
	Myrtle Creek	N/A	0.3 %		0.2 %		0.2 %	
	Lower Rock Creek	N/A	2.5 %		2.3 %		2.3 %	
	Units (and roads) of Concern	N/A	214 acres within Coal Creek; Units 301, 302, 303, 304, 306, 307, 308, 309, 312, 315, 321, 338		149 acres within Coal Creek; Units 301, 302, 303, 306, 309, 312, 315, 321, 329		0 acres; Units 312 & 315 are helicopter	

Significant Issues	Indicator	Alternative 1 (No-Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
2 Water Quality	**Water Temperature Increase**	No Change	• All of the road crossings are located on first and second order streams. These channels are only a few feet wide and have small discharges. • Sun exposure would be 100% blocked as water flows through the culvert. Exposure upstream and downstream of the culvert would occur over a few linear feet and would be reduced by adjacent forest canopy; this limited exposure is not enough to cause a measureable change in water temperature. • The largest watershed area above these crossings totals approximately 60 acres. Others are 30 acres or less. This presents very little drainage area to collect surface water to these crossings. Stream discharge from such small drainage basins is low, especially during the summer when ground water levels are lowest. • Skyline corridors would remove minor amounts of canopy in the primary shade zone where the corridor crosses perennial streams. Skyline corridors that cross Riparian Reserves are required to be 12 feet or less in width, and no less than 150' apart, and be utilized with full log suspension. Surrounding trees and understory would make shade loss resulting from these gaps in the canopy negligible.		
	Sediment Production/Increase in Turbidity	No Change	• Thinning would leave sufficient forest canopy to prevent large increases in storm runoff or snowmelt. • Minimally disturbed soils and understory vegetations would recover and anchor surface soils. • Thinning activities would occur in areas where streams and runoff amounts are both small. Units located along Coal Creek that are exceptions to these conditions have site specific mitigating measures designed to prevent or capture activity generated sediment. • No cut buffers in the stream bank protection zone and primary shade zone would act as capture and retention areas between stream courses and activity-generated, localized sediment sources. • Wet weather conditions would preclude hauling as per design criteria; road-generated sediment during wet conditions is the primary source of logging activity-generated sediment. • Less than 12% of the total harvest area is within Riparian Reserve. 7% of the Proposed Action harvest area is located in sensitive areas of the Coal Creek subwatershed; 5% of Alternative 3. All sensitive areas are excluded or harvested by helicopter under Alternative 4.		
3 Cumulative Watershed Effects	**Overall Risk of Adverse Cumulative Effects**	***Current Risk Rating (USDA 1993)***			
	Headwaters SF Coquille	Low	The Proposed Action would present no measureable increase in risk for adverse cumulative watershed effects in the Headwaters SF Coquille, Mill Creek, Myrtle Creek or Lower Rock Creek subwatersheds. This is due to: • The minor involvement of these subwatersheds in the Action Alternatives. • The location of units/roads at or near ridges and watershed divides where effects would be minimal.		
	Mill Creek	Moderate			
	Myrtle Creek	High			
	Lower Rock Creek	High			

3 Cumulative Watershed Effects	**Coal Creek**	Risk of adverse cumulative watershed effects in the Coal Creek subwatershed is currently High since the main channel is already in a degraded condition.	The addition of the proposed harvest acreage and road construction within this degraded subwatershed may contribute to additional risk of adverse effects; however, limited stand management could be conducted without increasing risk because the impacts would be limited to the site scale. The following conditions would allow containment of impacts to the local or unit level (site scale): • NFS lands contain hydrologically mature stands with large in-stream and upland wood present; this provides vegetative buffers that would counter increased runoff or sediment transport. • NFS lands are located mainly in the uplands where streams are small and discharges are low; risk of hydrologic impact from this portion of watershed is low. • The majority of the proposed units are located thousands of feet away from the main channel. • Proposed thinning is designed to enhance the growth and vigor of the stand by removing intermediate and suppressed trees. • Stream buffers and equipment limitations are designed to eliminate off-site impacts. Some proposed units are located in areas that have a greater potential for hydrologic impacts (see above). Their combined acreage is relatively small; however these units would present more risk of measurable impact than the rest of the project.		
4 Soils, Geology & Site Productivity	**Risk of Slope Failure**				
	Miles of New Classified and Temporary Road that Crosses Concern Areas	N/A	4.74	0.32	0.0
	Soil Productivity				
	Acres Taken Out of Productivity (Range Based on Est. Road Widths)	N/A	78 - 104	63 - 84	60 - 80
	Long-Term Opportunity For Erosion: Miles of System Road (New Construct/Reconstruct)	N/A	53.4	43.1	40.5
	Detrimental Disturbance (Acres)				
	Ground-based harvest system (est. 15%)	N/A	318	268	216
	Skyline harvest system (est. 5%)	N/A	60	47	23
	Aerial harvest system (est. 2%)	N/A	0	10	23
	Pile & Burn (est. 2%)	N/A	21	16	12
	Totals	N/A	399	341	274
5 Economics	**Volume by Logging System (MBF)**				
	Ground Based	0	33,933	28,718	23,170
	Skyline	0	19,197	15,102	7,350
	Helicopter	0	0	8,208	18,655
	Total Yarding Costs (Dollars)	0	$11,925,200	$13,622,788	$15,377,775
	Total Roading Costs (Dollars)	$62,000	$4,268,291	$3,508,096	$1,616,479
	Present Net Value (Dollars)	$-62,000	$322,501	$-957,615	$-1,707,714
	Benefit Cost Ratio	N/A	1.02	0.94	0.90

Table II-27. Comparison of Alternatives - Other Issues

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
1 Aquatic Conservation Strategy	**Response to NWFP S&Gs for Riparian Reserves (TM-1)**	N/A	The Purpose and Need is based on employment of silvicultural practices that are designed to control stocking, and acquire desired vegetation characteristics	Alternative 3 would treat Riparian Reserves in a similar manner as Alternative 2, on slightly less acres.	Alternative 4 would treat the fewest acres of Riparian Reserves. Stocking control would occur and desired vegetation characteristics would improve but not within untreated areas.
	Response to NWFP S&Gs for Riparian Reserves (RF 2-7)	N/A	Alternative 2 includes some new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may also be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has the most new road construction and has the greatest risk, based on the amount and location of certain roads.	Alternative 3 includes some new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may also be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has less new road construction and has minimal risk, based on the amount and location of proposed roads.	Alternative 4 does not include new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has the least risk, based on its design.
	Consistency with Aquatic Conservation Strategy Objectives	N/A	All Action Alternatives would be consistent with the 9 Aquatic Conservation Strategy Objectives and would not prevent attainment of Aquatic Conservation Strategy at the site, watershed or landscape scales.		
	Response to Key Watershed S&G (NWFP B-19) South Fork Coquille 5th Field	No Change	Alternative 2 would result no net increase in miles of roads within Key Watershed in compliance with this NWFP Standard and Guideline, due to the "road bank" of decommissioned road miles.	Alternative 3 has less new roads and would result no net increase in the miles of roads within Key Watershed due to the "road bank" of decommissioned road miles.	Alternative 4 has no new roads and would result no change in the miles of roads within Key Watershed.
2 Fire/Fuels	**Change in Fuel Loading and Fire Hazard**	No Change	All Action Alternatives would generate a short-term increase in fuels loading and the associated fire hazard within the units as created from activity-generated slash for approximately 5 years from date of harvest. Fuels treatment methods would include hand piling fuels concentrations, yarding of tops, and piling and burning landing slash. The long-term effect would be a return to natural conditions and improvement of defensible space along system roads.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
3 Air Quality	**Smoke Production**	N/A	The Action Alternatives could generate as much as 7.3 tons of PM, 5.4 tons of PM10, and 4.6 tons of PM2.5 per year, well below the thresholds defined in the National Ambient Air Quality Standards.		
	Impact on Coos Bay Area or Kalmiopsis Wilderness (Class 1 Airshed)	N/A	Burning would not take place within 38 miles of the Coos Bay area or within 30 miles of the Kalmiopsis Wilderness (Class I Area). Burning would not take place during the visibility protection period of July 1 to September 15. Therefore there are no expected adverse effects to air quality in either the Coos Bay area or Class I Area.		
4 Botanical Resources	**Effects to Threatened or Endangered Species**	N/A	There are no populations, nor is there any habitat for any federally listed Threatened or Endangered plant or fungi species within the Project Area. (No Effect)		
	Effects on FS Sensitive Species: Oregon Bensonia	No Change	For all Action Alternatives, avoidance of the bensonia populations is proposed so that direct and indirect effects are minimized to insignificant. (May impact individuals or habitat, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species)		
	Effects on FS Sensitive Fungi	No Change	Based on existing data and the regional Interagency Special Status and Sensitive Species Program (ISSSSP), Sensitive fungi may be present within the Project Areas but according to protocol, surveys were deemed impractical. (May impact individuals or habitat of Sensitive fungi, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to any population or species within its range)		
5 Invasive Plants	**Potential for Spread**	No Change	Project Design Criteria and Mitigation Measures are developed to avoid or mitigate the introduction and/or spread of invasive species; effects would be minimized to insignificant for all Action Alternatives.		
6 Port-Orford-cedar Root Disease	**Potential for Spread of *Phytophthora lateralis***	No Change	In areas proposed for timber harvest and road building, management practices and mitigation measures would be required for all Action Alternatives as described in the POC Risk Key assessment (EIS Appendix B, Port-Orford-cedar Report), consistent with the 2004 SEIS analysis and Forest Plan Amendment.		
7 Threatened Terrestrial Wildlife Species and Critical Habitat	**Effects to Late-successional or Old-Growth Forest or Spotted Owl Nesting, Roosting, Foraging Habitat (NRF)**	No change	There is an estimated 3,300 acres of proposed treatment acres that are best represented by the mature (21-32" dbh) forest habitat type, however these "mature" stands do not contain large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees, and are not considered late-successional forest. Further, based on historical records and stand examination, these stands are currently less than 80 years old. Any stand with a potential suitable habitat (remnant late-successional tree) component would be further assessed and if a late successional component is confirmed, that portion of the stand (or the entire stand) would be excluded from treatments. All Action Alternatives would not affect (or reduce) the current condition regarding late-successional or old-growth forest, in conformance with Standard and Guideline at Northwest Forest Plan C-44. A primary spotted owl recovery goal of the Revised Recovery Plan (USFWS 2011) is to conserve older stands that are either occupied or contain high-value spotted owl habitat. Stands meeting the definition for Recovery Action 32, as well as suitable Nesting, Roosting, Foraging (NRF) habitat within the Planning Area have been excluded from treatments.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
7 Threatened Terrestrial Wildlife Species and Critical Habitat	**Effects to Spotted Owl or Marbled Murrelet Critical Habitat Unit**	N/A	Critical habitat for the northern spotted owl was designated on 1 January 1992 (USDI FWS 1992). A revised designation of critical habitat was published in the Federal Register in August 2008 (USDI FWS 2008). Critical habitat for the northern spotted owl corresponds closely with those areas designated as Late-Successional Reserve in the Northwest Forest Plan. There is no Northern Spotted Owl Critical Habitat within the Eden Ridge Planning or Analysis Areas. (No Effect) Critical habitat for the marbled murrelet was designated in May 1996 (61 FR 102:26256-26320). The Eden Ridge Planning Area is within the known range (Area A) of the marbled murrelet; however, there is no designated marbled murrelet critical habitat within the Planning or Analysis Areas. (No Effect)		
	Effects to Spotted Owl Dispersal Habitat	No Change	The Action Alternatives would commercially treat and maintain up to 3,314 acres of spotted owl dispersal habitat and non-commercially treat up to 363 acres The resultant canopy closure (40-50%) and residual tree structure (the larger tree component) is likely to maintain the dispersal function of the treated stands. Because of the potential for disturbance to spotted owls, the Eden Ridge Timber Sales Project is considered "may affect, not likely to adversely affect" for the northern spotted owl (NLAA).		
	Effects to Marbled Murrelet	No Change	Marbled murrelet habitat would not be removed or degraded by the proposed activities under all Action Alternatives. Project Design Criteria would assure that no habitat would be removed. Because of the potential for disturbance to nesting marbled murrelets from implementation activities to unknown sites, a "may affect, not likely to adversely affect" determination is made for the marbled murrelet (NLAA).		
8 Forest Service Sensitive Terrestrial Wildlife Species & Habitats	**Effects to Sensitive Species within Range of Analysis Area**	No Change	All Action Alternatives would have "No Impact" for bald eagle, harlequin duck, Lewis' woodpecker, Townsend's big-eared bat, northwestern pond turtle, foothill yellow-legged frog, mardon skipper, and coronis fritillary because although within the species range, suitable habitat does not exist or species would not be affected by proposed actions.		
	Effects to Sensitive Species from Project Actions	No Change	All Action Alternatives "may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide" for the American peregrine falcon due to the potential for disturbance to individuals and potential limited adverse effects to prey species from treatments; for Pacific fisher because it could result in a reduction of denning, resting and foraging habitat; for fringed myotis because there may be some impacts to existing snags or trees with cavities; and for Johnson's hairstreak due to the removal of trees with mistletoe.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
9 Management Indicator Species	**Effect to MIS Species & Habitats: 1989 Forest Plan (pages IV-10 and 11)**	No Change	MIS and habitats include bald eagle (habitat along major rivers), osprey (habitat along large rivers), spotted owl (late-successional forest), pileated woodpecker and American marten (mature/interior forest), black-tailed deer and Roosevelt elk (early successional forest stages, and woodpeckers/cavity nesters (wildlife trees [snags]). Bald eagle and spotted owl are analyzed as Sensitive species. For the Action Alternatives, it is unlikely that potential nest trees would be removed or impacted. Therefore, a "No Impact" determination for osprey is made. This project is expected to have M - minimal impacts to pileated woodpecker but there is the potential that an occasional existing snag or tree with cavities may be impacted. The woodpecker group includes acorn, black-backed, downy, hairy, Lewis', and white-headed woodpeckers, as well as northern flickers and red-breasted sapsuckers. These species are generally associated with oak woodland, mixed forest, and/or grassland habitat types. Woodpeckers excavate nests in snags and trees. This project is expected to have M - minimal impacts to these species, but there is the potential that an occasional existing snag or tree with cavities may be impacted. Remnant trees, snags and down wood suitable for denning & resting would be retained, however some may be felled and retained. The project is considered M –"may affect some individuals or some habitat but effect is minimal" for American marten The Action Alternatives are considered M – "may affect some individuals or some habitat but effect is minimal" for blacktail deer and Roosevelt elk because of loss of thermal cover and adverse effects due to potential increased harassment from new and temporary roads. The increase in available forage would provide a beneficial effect.		
10 Rare and Uncommon Wildlife Species	**Survey and Manage**	No Change	The Eden Ridge Timber Sales Project meets 2006 Pechman Exemption a. because it entails no regeneration harvest and entails thinning only in stands less than 80 years old (USDI and USDA 2011) and do not require Survey and Manage surveys. The Eden Ridge Timber Sales Project applies the Survey and Manage species list in the 2001 ROD. There are 46 known Del Norte Salamander locations within the proposed units and one within a proposed non-commercial unit. All historical locations would be identified and given a protection buffer. All Action Alternatives are considered M –may affect some individuals or some habitat but effect is minimal. All Action Alternatives are considered M –may affect some individuals or some habitat but effect is minimal for Oregon red tree vole due to effects to potential red tree vole habitat. This project will have NI – No Impact to great gray owl because suitable nesting/foraging habitat does not occur within or near the Project or Planning Areas.		
	Protection Buffer Species	No Change	Species potentially in the Project Area include bats that use caves, mines, and abandoned wooden bridges and buildings. The project does not affect caves, mines, wooden bridges, or buildings, however a few large snags may be felled with this project (i.e., hazard trees). All Action Alternatives are M –may affect some individuals or some habitat but effect is minimal.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
11 Neo-tropical Migratory birds	**Effects to neo-tropical migratory birds/land bird focal species identified by Partners in Flight (PIF): Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington**	No Change	Effects to these species from the Action Alternatives are variable depending on the habitat associations of the individual species. Impacts to habitat for some species may occur from commercial thinning of mature and younger forests, hazard tree felling, landing clearing/temporary road construction. However, due to the limited amount of area affected by these projects, relative to the availability of habitats within the watersheds and forest, effects to neo-tropical migratory birds is expected to be (M) minimal.		
12 Aquatic Species & Habitats	**Effects to OC Coho and/or Critical Habitat (Essential Fish Habitat)**	No Change	The indirect and cumulative effects from the Action Alternatives would result in an overall non-measureable adverse sediment effect to Oregon Coast (OC) coho salmon and its critical habitat and OC steelhead on the Powers Ranger District. Thus, a "May Affect, Not Likely to Adversely Affect" determination is rendered for OC coho salmon, "No Effect" determination to OC coho salmon critical habitat, "Will Not Adversely Affect Essential Fish Habitat" for coho salmon or Chinook salmon and "May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species" for OC steelhead trout due to the non-measureable sediment delivery of the hauling and road maintenance activities.		
	Effects to Other Sensitive Aquatic Species	No Change	Action Alternatives would have "No Impact" to other Sensitive species including Pacific Coast chum salmon, inland redband trout, pit sculpin, western ridged mussel, Klamath rim pebblesnail, highcap lanx, scale lanx, robust walker, pacific walker, or the pristine springsnail because these species are not known to occur or have suitable habitat within proximity to any of the proposed activities.		
13 Thinning Shock & Windthrow	**Thinning Shock & Windthrow Potential**	N/A	Under all Action Alternatives, treatments include an overriding objective of leaving the larger residual stems within the entire stand; these trees would most likely be the healthiest and wind-firm. Thinning shock and windthrow are not expected to be a substantial concern due to consideration for feathering and special treatments along the edges of stands, leaving all hardwoods where possible, and thinning to a higher relative density as necessary to allow residual trees to become more wind firm.		
14 Other Undeveloped Areas	**Effects to Other Undeveloped Areas**	N/A	Analysis determined that there are no "unroaded areas" that contain roadless characteristics similar to inventoried roadless areas. Since there are no undeveloped areas, there is no cause/effect relationship that can occur regarding this issue.		
15 Heritage	**Effects to Historic Properties**	No Change	The three Action Alternatives all propose to convert some of the railroad grades to classified roads. Alternative 2 proposes to convert the most railroad grade to road with four miles reconstructed as road. Alternative 3 proposes three miles of railroad grade to be reconstructed as road. Alternative 4 proposes one mile of railroad grade to be reconstructed as road. Project area inventories and consultation under *Section 106 of the NHPA* will be completed prior to project implementation. Under all Action Alternatives, where avoidance of a significant cultural resource site is not possible, measures are developed to mitigate or limit the effects of the project. Where the loss of the site, or a portion of the site will occur, the loss can mitigated by data recovery or interpretation of the history of the site.		

Other Issues	Indicator	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
16 Recreation/Human Safety	**Effects to Human Safety**	No Change	All Action Alternatives may affect recreationists during the short-term implementation phase from temporary road closures (for safety reasons), noise (chain saws, heavy equipment, and/or helicopters), smoke, and increased vehicle traffic. These effects would be mitigated and managed, and would not result in any long-term adverse effects.		
	Effects From Increased OHV Use	No change	OHV use has been limited to specific areas due to the nature of favorable conditions. New roads would not have the potential to develop a "loop system" as the roads would be constructed to access landing locations. These roads would be closed and rehabilitated after use (Maintenance Level 1 status); this status would not allow for OHV access. Mitigation measures would include: construction of water bars, scarification, scattering of slash and debris within disturbed areas, seeding and permanently barricading/closing the road entrance with native materials.		
	Attainment of Visual Quality Objectives	No change	All Action Alternatives would create a slight change in the visual character along many roads. Currently dense tree stands would be opened up through cutting and removal of generally small diameter trees resulting in a more open forest. All treatments and connected actions would be in compliance with Forest Plan Visual Quality Objectives for the allocations affected.		
17 Climate Change	**Effect on Climate Change from Project**	N/A	All Action alternatives were identified to have minor cause-effect relationships to greenhouse gas emissions or the carbon cycle, and were determined to be of such a minor scale at the global or even regional scale, that the effects would be meaningless to a reasoned choice among alternatives.		
	Effect on Project from Climate Change		No specific forest management recommendations have been published regarding global climate change and the impacts climate change may have on the desired outcomes of, and the potential impacts from, this project.		

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III. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

This Chapter describes consequences and environmental effects linked with implementing the alternatives considered and analyzed in detail. Section B includes a discussion on the consequences regarding attainment of the Purpose and Need. Section C discusses and is organized by the Significant Issues and Section D discusses and is organized by the Other Issues identified in Chapter I. Also included is a discussion of the attainment of Purposed and Need, and discussions on Other Effects, Laws, Regulations and Executive Orders.

The following sections portray affected environments and outcomes for each alternative in terms predicted physical, biological, economic, and social direct, indirect and cumulative effects on the environment. Within each sub-section, the affected environment (Background) is described first, followed by the effects of the No-Action Alternative that provides a baseline for evaluation and comparison of the Action Alternatives. The terms **Project Area** and **analysis areas** are used throughout this chapter. The following defines each term:

> The terms **Project Area,** or treatment area, are used interchangeably to describe where action would occur, such as units where forest thinning is proposed and where road use, road construction and/or road improvements are proposed.
>
> **Analysis areas** vary by resource or issue and include those areas that could potentially be affected by the alternatives. In some cases the analysis area is confined to the Project Area and in others the analysis area extends to the Planning Area or beyond.

The term **Planning Area** was introduced in Chapter I and is used to describe the overall area of consideration that was reviewed for the development of treatment opportunities. Project Areas vary by Action Alternative and are a portion of the larger Planning Area (where actions are proposed).

Mitigation Measures for all ground disturbing activities are required by the Forest Plan. Additional site-specific design elements (Project Design Criteria) and Mitigation Measures are described in Chapter II. The following assessment of effects assumes the application of these elements and measures. It provides the decision maker with information needed to compare alternatives and select an appropriate course of action.

It should be noted the depiction of effects varies, based on the context in which they were analyzed. Therefore, if pertinent, environmental consequences are presented in context of multiple scales, over various timeframes. In presenting consequence discussions, the following terms are used to describe relevant spatial and temporal effects:

> **Short-term effects** *address environmental, social or economic consequences, which could occur during operations, and/or that arise within two-years post operations.*
>
> **Long-term effects** *address environmental, social or economic consequences, which are delayed, periodic, and/or arise two-years after operations are completed.*
>
> **Direct effects** *refer to consequences caused by the activities themselves, occurring concurrently and in the same location.*

Indirect effects *include consequences, occurring later in time or are farther removed in distance from the point of contact, but are still reasonably foreseeable.*

Cumulative effects *address incremental environmental consequences resultant of multiple, past, present, and reasonably foreseeable future actions, regardless of land ownership, or which agency, or person initiated the action (40 CFR 1508.7).*

This analysis of environmental effects for each alternative is based on the recognition of Federal laws, National policies, regional Standards and Guidelines, and compliance with the Siskiyou National Forest LRMP, as amended by the Northwest Forest Plan. A Forest Service Interdisciplinary Team has conducted analyses and has disclosed environmental consequences for all alternatives considered in detail.

1. CONSIDERATION OF PAST, ONGOING, & REASONABLY FORESEEABLE ACTIONS IN EFFECTS ANALYSIS

The current condition of the lands affected by the proposed action is the result from a multitude of natural processes and human actions that have taken place over many decades. 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 costly to obtain at the scale of the entire affected fifth-field watersheds (or larger). Current conditions have been impacted by many 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 action over the last century that has contributed to current conditions. By looking at current conditions, the residual effects of past human actions and natural events can be recognized, regardless of which particular action or event contributed those effects.

Cumulative effects are analyzed in accordance with 40 CFR 1508.7 and relevant guidance issued by the Council on Environmental Quality (CEQ). Cumulative effects analysis is also consistent with Forest Service NEPA Regulations (36 CFR 220.4, July 24, 2008). As the CEQ, in guidance issued on June 24, 2005, points out, the "environmental analysis required under NEPA is forward-looking," and review of past actions is required only "to the extent that this review informs agency decision-making regarding the proposed action." Use of information on the effects on past action may be useful in two ways according to the CEQ guidance. One is for consideration of the proposed action's cumulative effects, and secondly as a basis for identifying the proposed action's direct and indirect effects.

The CEQ stated in this guidance that "[g]enerally, 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." This is because a description of the current state of the environment inherently includes the effects of past actions. The CEQ guidance specifies that the "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions." The importance of "past actions" is to set the context for understanding the incremental effects of the proposed action. This context is determined by combining the current conditions with available information on the expected effects of other present and reasonably foreseeable future actions.

Watershed analysis, a component of the Aquatic Conservation Strategy developed under the Northwest Forest Plan and incorporated into the Siskiyou National Forest LRMP, is a useful analysis for gaining an understanding of ecological processes and how those processes are functioning within a given watershed.

A watershed analysis characterizes the human, aquatic, riparian and terrestrial features, conditions, processes, and interactions within a watershed including the effects of past and ongoing actions. Knowledge gained through watershed analysis enhances the agency's ability to estimate direct, indirect, and cumulative effects of management activities (Federal Agency Guide to Watershed Analysis p. 1).

The analysis of the effects of other present and reasonably foreseeable actions relevant to the effects of the proposed action is necessary. How each resource analysis uses information concerning other ongoing or reasonably foreseeable activities is, however, dependent on the geographic scale of concern, spatial and temporal boundaries, and the attributes considered for each resource analysis.

B. ATTAINMENT OF PURPOSE AND NEED

The overall *Purpose* of this project is to implement direction from the 1989 Land and Resource Management Plan for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan. The majority of the Eden Ridge Timber Sales proposal is on lands allocated to Matrix which emphasizes obtaining a full yield of timber within the capability of the land. Most scheduled timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands (NW Forest Plan, page C-39). Specifically for the Eden Ridge Timber Sales project, ***Needs*** include:

Improvement of Overall Forest Vigor and Resiliency **-** There is a need for tree stocking level control to reduce stand densities through intermediate harvest thinning treatments to sustain or increase tree growth and improve forest vigor and resiliency. Density management would release remaining trees from inter-tree competition for sunlight, water and soil nutrients when compared to untreated areas. Minor portions of the Planning Area infected with root diseases would be managed to harvest trees predisposed to pathogen infection and retain or plant resistant tree species to improve forest health.

Older legacy (remnant) trees, minor conifer tree species (in portions of stands uninfected with root disease), hardwoods, existing snags and coarse woody material would be retained where feasible to maintain or improve forest diversity. Post-treatment objectives are to develop a sustainable forest resilient to drought, wind, insects, disease, fire and other natural disturbances.

Contribution of Commercial Timber to the Probable Sale Quantity **-** Proposed candidate stands are primarily allocated to Matrix and contribute to the Rogue River-Siskiyou National Forest Probable Sale Quantity (PSQ). PSQ is the estimated output of commercial timber and other commodities assigned to the Forest under the 1994 Northwest Forest Plan.

The ***Purpose*** of this action is to respond to the stated Needs. Specific stand management objectives associated with the Purpose and Need for this proposal include:

- Maintenance or improvement of forest health and diversity within Matrix and Riparian Reserve land allocations through density management treatments; This typically means individual tree and overall stand diameter growth, crown development, vigor and overall stand health, improved root strength on residual trees;
- Improve habitat conditions for wildlife and fish. This means increasing vegetative and structural diversity and species; maintained or improved shading capability of streams; improved large wood retention and large wood recruitment, and providing suitable amounts of snags and/or replacement habitat for dependent species;
- Reduce the risk of effects from insect and disease infestations;
- Minimize or reduce the potential for high severity, stand replacement wildfires;
- Increase riparian vegetation quality, health and vigor; and
- Contribute to a predictable and sustainable level of timber commodities with human and economic dimensions.

Discussion
Tree stocking level control was not implemented during the early stages of stand development on candidate stands in the Eden Ridge Planning Area. Tree growth and associated vegetative competition between trees has steadily increased since the stands were regenerated in the 1930s and 1940s.

Candidate stands are currently in the stem exclusion stage of stand development (Oliver, Larson, 1996). Tree crowns recede and diameter growth slows as available growing space in a forest stand becomes occupied and inter-tree competition increases. As trees grow larger and biomass accumulates, tree crowns differentiate in height and the taller trees outcompete lower crown position trees for site resources. The reduced growing space of a suppressed tree forces it to put less of its reduced photosynthate into growth and tree mortality eventually occurs.

Relative Density
Relative Density (RD) index is used for determining thinning treatment thresholds for candidate stands. RD is calculated using quadratic mean diameter and stand basal area (Curtis 1982) or by dividing a stand‘s existing Stand Density Index (SDI) (Reineke 1933) by a maximum SDI characteristic of the stand‘s species composition (Woodall 2009). The SDI maximum for Douglas-fir in Oregon (Larsen, 2001) was used for Eden Ridge. Calculated RD numbers describe stand competition as follows (Ellen 1984):

Table III-1. Stand Competition from Calculated Relative Density

70%+	Grossly overstocked (unmanaged mature stands)
60%	Approximate “normal” stocking
50-70%	Stand density sufficient to cause competition-related mortality
35-50%	Stand vigor and growth are maximized
<35%	Individual tree growth maximized

Previous environmental analysis of similar stands on Powers and Gold Beach Ranger Districts identified a RD of 50% as a threshold of undesirable competition-related tree mortality (USDA 2007). This RD threshold is used for determining treatment needs on Eden Ridge.

Preliminary stand exam information indicates most candidate stands exceed the 50% RD threshold. Stands recently field visited exhibit significant inter-tree competition as evidenced by receding tree crowns, decreasing diameter increment growth and down wood created from tree mortality caused by stand self-thinning. The compelling need for the Forest Service is to implement stocking level control through density management treatments to meet the project needs stated above.

1. ATTAINMENT OF PURPOSE AND NEED BY ALTERNATIVE

a. Alternative 1 – No-Action

The No-Action Alternative is required by Council of Environmental Quality regulations (4O CFR 1502.14(d)). The No-Action Alternative forms the basis for a comparison between meeting the project needs and not meeting the project needs. This alternative provides benchmark information for understanding changes associated with the Proposed Action and expected environmental responses as a result of past management actions. For Eden Ridge Timber Sales, this alternative constitutes that:

- Dense stands would rely on natural succession to control stocking and develop mature forests;
- Candidate stands would not be thinned to sustain or improve tree growth and contribute commercial timber commodities to the Forest‘s assigned PSQ;

- Areas infected with forest pathogens would continue to infect susceptible host trees and expand in size decreasing forest health from current conditions; and
- Existing Forest system roads would be retained with minimal changes to current conditions (e.g., road maintenance).

Under the No-Action alternative, candidate stands would continue to grow over time though inter-tree competition would increase for limited resources, especially light. Trees would grow taller as they strive to obtain sufficient sunlight, but diameter growth would slow in response to loss of crown and growing space. Trees would become less stable as they become more dependent on neighboring trees for support, increasing tree height to diameter ratios. Small diameter down wood would increase from stand self-thinning. Correlations between living tree biomass and deadwood biomass emerge when stands exceed 75% RD (Woodall 2009).

Untreated forest stands infected with laminated root rot, (*Phellinus weirii*) would become more susceptible to root disease infection due to the high percentage of host trees in candidate stands. This root disease extensively decays roots of susceptible host trees and either causes windthrow or mortality by destroying the tree‘s ability to take up water and nutrients (Hadfield et al., 1986). Windthrow is more common with laminated root rot than other root pathogens. Laminated root rot spreads by root contact between uninfected trees when living roots penetrate infected roots. In pole-sized and larger trees, the root disease can spread outwards an average rate of one (1) foot per year. This pathogen can live saprophytically in infected dead roots for fifty (50) years or more. Tree species present in candidate stands are listed as follows in decreasing order of susceptibility:

Douglas-fir and white fir> western hemlock > Port-Orford-cedar. All hardwoods are immune.

Although timber volume losses caused by laminated root rot are most conspicuous as mortality or windthrow, tree growth may also be reduced for several years before tree death (Bloomberg and Reynolds 1985, Thies 1983). For commercial forest land in Oregon, reduction in wood volume is estimated to be 40-70% on areas affected (Goheen and Hansen, 1993).

Landscape-level Port-Orford-cedar (POC) distribution is expected to decline as surrounding private timber company land is being managed for Douglas-fir regeneration. Dead and dying POC seedlings and saplings are present in roadside ditches and drainages. Infection by the exotic pathogen, *Phytophthora lateralis*, which causes POC root disease, is present on Eden Ridge. Restoring Port-Orford-cedar within its natural range by planting disease resistant POC seedlings in low risk areas for POC root disease and treated laminated root rot pockets would not occur.

b. Action Alternatives

Candidate stands within Eden Ridge Timber Sales Project have been altered by historical railroad logging, tree planting and fire suppression. Proposed silvicultural treatments under the Action Alternatives would focus on stands with the greatest potential for treatment response and sustainable growth while avoiding lower site class and unsuitable areas, hardwood patches, and sites functioning as late-successional habitat.

The Action Alternatives (Alternatives 2, 3 and 4), all would have similar attainment of the Purpose and Need; the difference between these alternatives is the amount of area treated. Alternative 2 (the Proposed Action) would treat the most acres (3,314). Alternative 3 would treat slightly less acres (3,240), and Alternative 4 would treat the least acres (3,058).

Accelerating the growth and sustainability of candidate stands through density management and forest health treatments to meet LRMP goals for lands allocated to Matrix is the primary objective for Eden Ridge Timber Sales. By accomplishing this objective, opportunities to meet other resource objectives may also be met (e.g., developing shade cover in riparian areas, providing habitat diversity for wildlife, etc.).

Silvicultural Objectives
The primary silvicultural objective for ER is to control existing dense tree stocking conditions within commercial stands to develop more sustainable, full yield timber production on suitable lands while harvesting projected density and disease-related tree mortality in support of the Forest's Probable Sale Quantity.

A secondary objective is to treat subordinate amounts of root disease infection to improve forest health and sustain or increase tree growth and vigor by retaining or planting non-host tree species. Riparian Reserve treatments would be designed to protect or improve riparian stand conditions to meet Aquatic Conservation Strategy objectives stated in the NW Forest Plan.

Expected Results of Treatments
Although these previously managed candidate stands are the result of regeneration harvest in the 1930s and 1940s, there is still a range of ages and conditions between stands. In general, these stands are overstocked and predisposed to tree mortality from inter-tree competition, disease and insects.

Integrated silvicultural treatments are designed to facilitate sustainable tree growth, live crown development, resilience to disease and disturbance, enhance stand variability and species diversity. The following treatment strategies would provide a range of vegetative conditions across the Project Areas associated with candidate stands:

- Thinning prescriptions would emphasize variable density thinning to achieve stand growth and stocking objectives. Clumping trees, leaving untreated areas (skips), wide spacing around desirable trees (wide thin gaps), and creating openings to treat root disease (gaps) would be used in combination to develop site-specific silvicultural prescriptions. Retention of minor conifer species, hardwood species, unique trees having desirable characteristics (e.g., large branches, etc.) existing snags and down wood would also be incorporated.

- Portions of almost every candidate stand would not be thinned and harvested. Areas within the stands that would not be thinned and harvested would be identified on the ground during the layout process. The majority of the areas not treated would be stream buffers in accordance with Riparian Reserve Project Design Criteria, areas of geologic instability, inaccessible stands, and those portions of stands where the current health, vigor, and variable spacing of the conifer and hardwood vegetation is on a suitable trajectory toward attaining overall forest vigor and resiliency without the need for treatment.

- Post-harvest stand variability may be enhanced through the creation of snags and large woody material, and Port-Orford-cedar tree planting. Tree planting in created openings and underneath tree canopies of candidate stands would restore healthy, disease-resistant Port-Orford-cedar into the landscape and enhance structural and species diversity over the long term.

- Stand variability would also be enhanced by natural regeneration of conifers, hardwoods and brush species within and adjacent to treated stands.

Stand growth attributes were projected with Forest Vegetation Simulator (USDA FS: Dixon 2002; Keyser 2008 (revised October 4, 2011) on existing vegetation polygons within candidate stands proposed for commercial thinning treatments. Stand #199 (ER Units 2/201), Stand #604 (ER Units 320/324), and Stand #802 (ER Units 307) are presented in EIS Appendix B (Preliminary Silvicultural Diagnosis)(incorporated by reference) as examples of the outputs of this model.

The model calculates stand data for trees >= 6" dbh from simulations for no treatment and thinning from treatments to 35% and 45% RD respectively. Stand Visualization System (McGaughey, 1997*)* was used to visually display (see Appendix B) no harvest and harvest treatments (i.e., no treatment and 35% RD treatment).

Simulated Treatments Discussion
FVS simulated treatments display higher tree mortality, lower tree diameter (QMD) growth and slower basal area growth projected over the next 50 years for the no treatment scenarios compared to thinning treatments to control stocking density. Tree mortality from dense stand conditions could otherwise be captured as timber harvest volume during thinning treatments that would release growing space to retained trees to grow into larger trees more quickly as displayed in the 50 year stand parameters.

Relatively stable stocking with low tree mortality after thinning treatments over the simulated timeframe meets the primary objective of sustainable harvest on lands allocated to Matrix. RD stays within the target 35-50% RD range for the thinning treatment to 35% RD and ranges 45-62% RD for the 45% RD treatment. A second thinning treatment opportunity is projected in 20 years for the 45% RD treatment when the stand again exceeds 50% RD.

Residual tree stocking from active treatments falls within the ‗heavy thin' category (50-90 tpa). Treatments to medium or light thin tree stocking conditions to retain more trees may be done in Riparian Reserves, stands with high height to diameter ratios (particularly plantations) or on landform positions susceptible to windthrow. Retained trees would be managed for future harvests, seed source, stand structure and creation of large diameter snags/down wood to meet habitat and soil productivity standards and guidelines. These stands are projected to produce high quality timber product while providing for multiple-resource benefits.

A precautionary note, FVS simulated treatments generate numbers that should not be considered absolute values for stand parameters. These simulations are more valuable for displaying the relative differences between treatment scenarios. More refined number would be determined during collection of more extensive stand exam information and during the development of site-specific silvicultural prescriptions to determine actual thinning intensity.

Potential for High Severity, Stand Replacement Wildfire
Research indicates that to keep a surface fire on the surface, breaking the ladder fuel chain, while concurrently raising the crown base height (with emphasis on raising crown base height), must be accomplished. The general recognized practice to accomplish this is to reduce stand density (thin) (Peterson et al., 2005, Omi and Martinson 2002, and Agee and Skinner 2005). These papers also suggest fuels created by any harvest operations must be reduced to the point where surface fire intensity will be low enough to prevent mortality of residual trees by crown fire initiation (keep the fire on the ground), as well as minimizing any lethal amounts of heat being applied to the base of tree.

Fire can spread from crown to crown through heat transfer, via two mechanisms. Pre-heating of the crowns by an advancing surface fire would allow a passive crown fire (torching) to escalate to an active crown fire, and propagate in the direction of fire spread, so long as the surface fuels allow this pre-heating to occur (notwithstanding the thorough treatment of surface fuels), and by the continuity of the crowns which allow for the aerial spread of the fire.

Combinations of steeper slopes, drier/hotter conditions, and the influence of wind can exacerbate this problem; and could lead to an independent crown fire, spreading through the crowns without the need of pre-heating by burning surface fuels, and regardless of the crown base height.

Reducing the crown densities is one goal of this project. Given the proper degree of crown bulk density reduction, this chain can effectively be broken, causing the fire to drop back to the surface. Activity-generated fuels would be treated to result in at least pre-pre-treatment levels. All treatments would retain the largest of the specimens in the stands. Larger trees are more fire resistant in nature because of their thicker bark and higher crown base height. All Action Alternatives would effectively reduce the potential for high severity, stand replacement wildfire.

C. ENVIRONMENTAL CONSEQUENCES: SIGNIFICANT ISSUES

Significant Issues were used to design specific elements of the alternatives and proposals, mitigation measures, and/or facilitate the display of important (and/or variable) environmental consequences. NEPA requires Federal agencies to focus analysis and documentation on the Significant Issues related to an action.

These issues (presented in Chapter I) have been determined to be significant because of the extent of their geographic distribution, the context of associated consequences, the duration of the effects, or the intensity of interest or resource conflict. Under the No-Action Alternative, there would be no change from the current conditions (unless otherwise noted).

1. HYDROLOGIC CONDITIONS

Effects of variable density management (thinning) treatments and other connected actions on hydrologic conditions, including channel morphology, large woody material, sediment delivery, or peak flows.

This sub-section of the EIS provides a summary of conditions and effects on the sub-watersheds that have been analyzed for this project. These subwatersheds are analyzed because they represent those watersheds where actions are being proposed to occur that would potentially affect current or future conditions. EIS Appendix C (incorporated by reference) includes more detail on current watershed conditions, characteristics, and risks for adverse effects.

This hydrologic condition issue focuses on potential changes to channel morphology, large woody material, sediment delivery, and peak flows. Effects on water quality (i.e., temperature, turbidity, and water quality (303(d) listed waterbodies) is discussed within the next Issue (sub-section 2). The overall contribution to the risk for adverse cumulative watershed effects is discussed in sub-section 3.

a. Introduction

The Eden Ridge Timber Sales Project focuses on forest stands clear-cut harvested in the 1920s and 1930s utilizing a railroad access system that is now overgrown (railroad grades) or in ruins (trestle stream crossings). This system has been largely replaced on both private and public timber lands by roaded access. Some National Forest System lands in the Planning Area that were previously harvested by railroad systems remain inaccessible by roads.

The Planning Area is located within a block of National Forest System lands that are surrounded by intensively managed, privately owned, timber production lands. The Forest Plan designates the majority of the Planning Area as ~~"~~Matrix", where timber production is an expected use. The Powers Ranger District is proposing timber harvest and road construction that would result in commercial harvesting in the area over the next 5 years.

The Planning Area falls within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds (see MAP I-2 and/or Map C-1, Appendix C). Two watershed analyses have been completed that cover the Planning Area and contain a synthesis of scientific knowledge about watershed trends and conditions at watershed scales as well as by smaller sub-watersheds. The South Fork Coquille River is listed by the State as impaired for summer water temperature exceedences. Solar load allocation for water temperature increases from human sources has been completed for the South Fork of the Coquille River by the State of Oregon. The Forest Service has also completed a plan for aquatic restoration specific to the South Fork Coquille River. These documents are listed below along with the subwatersheds that contain the Planning Area:

- Myrtlewood Resource Area, Coos Bay District, Bureau of Land Management, 1994. ***Middle Fork Coquille Analytical Watershed***.

(Lower) Rock Creek and Myrtle Creek subwatersheds

- Powers Ranger District, Siskiyou National Forest, USDA Forest Service, 1995. ***South Fork Coquille Watershed Analysis*.**

Coal Creek, Headwaters South Fork Coquille (Wooden Rock Creek), and Mill Creek subwatersheds

- Oregon Department of Environmental Quality, 2001. ***South Fork Coquille River Total Maximum Daily Load Allocation and Water Quality Management Plan.***

- Powers Ranger District, Rogue River-Siskiyou National Forest, USDA Forest Service, 2007. ***Aquatic Restoration Plan, South Fork Coquille Watershed.*** This document includes summary information from both the SF Coquille Watershed Analysis and the Water Quality Management Plan.

b. Background

The Coquille River, formed by the confluence of its north and south forks, begins at the town of Myrtle Point. The South Fork, 62.8 miles (101.1 km) long, rises in southern Coos County, and flows generally north. It receives the Middle Fork, 40.3 miles (64.9 km) long, then joins the North Fork from the south at Myrtle Point. The combined river meanders generally west, past Coquille. It enters the Pacific at Bandon, about 20 miles (32 km) north of Cape Blanco (Wikipedia web site).

The nearest weather data collection station is located in Powers at an elevation of 286 feet. Weather in the coast range is moderated by the Pacific Ocean, especially in the summer when temperatures regularly drop to the 45 to 55 degree range. Average annual rainfall at Powers is about 61 inches with only a couple of these arriving as snow (Wikipedia Website). The Planning Area occurs along the ridgeline of mountains south of Powers at elevations ranging from 2,580 to 3,540 feet above sea level. The Planning Area receives annual precipitation ranging from 100-150" dominantly as rain (Oregon Climate Service, PRISM; Oregon Dept. of Forestry LocatOR website).

Although snow is common in the Planning Area, a persistent snowpack is unusual. The Planning Area is generally in a weather zone referred to as the ~~"t~~ransient snow zone" (TSZ), characterized by both rain and snow. Rain-on-snow events are common during the winter and early spring and can result in sudden spikes in stream flow as rain and melting snow combine into runoff.

Management Direction

The Siskiyou National Forest Land and Resource Plan (LRMP) provides standards and guidelines for soil and water resources on pages IV-44 through VI-48. Management prescriptions for Riparian areas are provided on pages IV-124 through IV-128. LRMP riparian areas extend at least 100 feet to either side of perennial channels; 150 feet is recommended for Class I and II streams. This would be less than the buffer widths provided by the Northwest Forest Plan of one to two site potential tree heights (175 feet and 350 feet, respectively) and its additional buffer of one site potential tree height for ephemeral channels.

The Siskiyou National Forest typically utilizes a standard site potential tree height of 175 feet for analysis purposes. For the Project Area, a stream network was generated from a digital elevation model. A mapped perennial channel is initiated when a collection area reaches 25 acres. Field work verifying the presence of ephemeral or perennial channels was used to confirm the model was accurate. Mapping used for analysis of the alternatives displays the following riparian buffer widths:

Class I Streams: perennial, fish habitat	350 feet
Class II Streams: perennial, non-fish bearing	175 feet
Class III Streams: ephemeral or intermittent	175 feet

The Siskiyou LRMP prescribes that vegetation on lands in the S.F. Coquille River Basin be managed to maintain water temperature. Oregon state Total Maximum Daily Load (TMDL) allocations require streams to meet state temperature standards. Since the South Fork Coquille River exceeds temperature standards, the state has determined that no water temperature increases from anthropogenic sources is allowable (refer to Water Quality sub-section).

c. Current Channel Conditions & Morphology

Detailed descriptions of existing condition of the Planning Area may be found in watershed and water quality analyses cited above. Stream surveys were also conducted for Coal and Wooden Rock Creeks in 1991 and 1992, and are cited by the watershed analyses and the restoration plan. An additional stream survey was completed for Coal Creek in 2010. Information relevant to current condition in the Planning Area has been extracted and/or paraphrased from these documents and presented in more detail in EIS Appendix C. Notable conditions are summarized below in descriptions of existing condition.

Aquatic Restoration Plan - South Fork Coquille
The South Fork Coquille (SFC) is a Tier 1 Key Watershed as defined by the Northwest Forest Plan (1994) and is approximately 108,300 acres (169 sq. miles) in size. In 2005, the Rogue River-Siskiyou National Forest engaged in an Integrated Work Planning process. As part of that process, fifth-field watersheds across the Forest were prioritized for resource value and restoration potential. The South Fork Coquille ranked as number 1 on the Forest for fisheries, water, and wildlife values.

Past management activities on NFS land have increased upstream sediment delivery and depleted large wood recruitment into the streams. The primary limiting factors within the South Fork Coquille Watershed are:

- loss of mature forest within the Riparian Reserve;
- higher than optimum stream temperatures;
- in-stream fish habitat below potential condition;
- excessive fine sediment in stream channels; and
- obstructions at road crossings that inhibit upstream movement of fish and movement of large woody material to fish-bearing stream reaches.

Excess bedload is most evident where it is stored in unconstrained reaches. Aerial photo interpretation illustrates aggradation has buried large boulders and created wide gravel bars, literally filling pools and covering riparian vegetation. Fish habitat in all sub-watersheds within the South Fork Coquille Basin were identified as being adversely impacted by high stream temperatures and lack of large woody debris. Bankfull width-depth measures in several streams are indicative of channel widening. Channel widening increases solar radiation on surface waters and decreases depths available for fish. (Restoration Plan - Executive Summary)

Change in late seral successional stage in Riparian Reserves from 100 years ago was found to be substantial in all subwatersheds. For Wooden Rock Creek drainage (upper portion of Headwaters SF Coquille subwatershed), late seral successional stage has declined from 89% 100 years ago to a present level of 1%. Coal Creek subwatershed is similar with a decline from 85% to 1%. (Original data from South Fork Coquille Watershed Analysis, Iteration 1.1, September 1995)

Wooden Rock flows over both Tyee and Flounoy Formations that are dominated by sandstones. Weathering and erosion of these formations yields sand and gravel-sized substrate to the channel. The low gradient channel provides the best existing resident trout habitat above the Coquille River falls. Summer flows at its mouth have been determined to be roughly twice the volume as the mainstem South Fork Coquille, which makes Wooden Rock a significant tributary. The lower 2.5 miles flows into a wide valley floor located on the gently dipping bedrock surface.

Wooden Rock has the highest densities of both trout and large wood in the upper basin (Chen 1991). Three large wood jams exist in the lower 2.5 miles of habitat. One jam has been estimated to contain over 50,000 cubic feet of wood. Increased trout densities appear to be related to increased amounts of cover. Three distinct reaches are separated by a series of barrier falls (at the 2.5-mile and 4.0-mile marks) in a stair step formation that prohibits upstream migration (Stream Survey, Summer 1992).

Coal Creek is a key cold water contributor to the South Fork Coquille River. A dual-pipe culvert just upstream of the confluence with the South Fork Coquille River creates a partial barrier to anadromous adult salmonids and a full barrier to lamprey. A project is currently planned to remove the two culverts and replace them with a bridge. There are no other proposed restoration projects identified anywhere within Coal Creek or the rest of the Planning Area. The Aquatic Restoration Plan states (p. 20) that little timber harvest had occurred in Wooden Rock, Coal, or Hayes Creek subwatersheds, therefore that plan concentrated recommendations on other areas.

South Fork Coquille Watershed Analysis (1995)
The Upper South Fork Coquille Watershed straddles the Klamath/Siskiyou province which is separated by the Coquille River Fault Zone (Dott 1971) from the Coast Range province. Both geologies weather rapidly and produce fine grain sediments that are transported to stream channels. Therefore, sediment inputs are naturally high. (Page 9)

Soils on the steep Tyee sandstones have a tendency to fail as debris flows which scour streams to bedrock and deposit sediment and large wood at tributary junctions. Rockfall is common where Tyee bluffs overlie softer formations.

Turbidity, or water clarity, affects fish habitat and recreational uses such as fishing and sightseeing making it a critical component of the river value. Water samples in the analysis area were rated as first, second and third lowest in turbidity (highest quality) of all samples (DEQ, 1993) from Coquille (River Mile [RM] 24.5) to above Rock Creek (RM 81.0).

The water of the South Fork is clear most of the year except during winter storms when sediment from banks and slides can cloud the water for short periods. During these higher flows, it has been observed that streams flowing through the Klamath Province rocks (Sucker, Johnson, and Rock Creeks) are less turbid than streams on the Coast Range rocks (Yager 1995).

An exception to this tendency is the turbidity contributed by slides and surface erosion from road construction, timber harvest, and natural landslides. Without historical turbidity measurements, water clarity changes can only be pieced together by anecdotal accounts from long time residents and historical sediment delivery estimates.

Coal Creek flows westward into the mainstem of the South Fork Coquille approximately one mile upstream of the Forest Boundary. Coal Creek derives its name from short-lived coal mining operations that existed there. It is unknown what effect these activities may have had on the stream channel. The relatively steep, confined character of the channel has high energy and debris transport capabilities and is very stable. Its sensitivity to disturbance is considered very low and recovery potential excellent. This accounts for fairly quick recovery from repeated past large disturbances.

The Coal Creek watershed has a broad upper flat and is steeply incised into the Tyee sandstones. A series of falls at the 1.4 RM mark create an anadromous barrier for salmonids (Stream Surveys, 1989, 1992). Resident cutthroat and rainbow are present above this barrier.

The lower reach flows through a narrow confined canyon with substrates dominated by bedrock with boulders. The gradient for the most part is steep exceeding 4 percent. Deep plunge pools, cascades, and high gradient riffles are abundant. Cover for fish is provided in the way of depth, surface turbulence, and bed roughness elements (Chen 1991). A few large wood accumulations are present, but average only two pieces of large wood per mile. The remaining wood is composed of smaller pieces resulting from logging (Stream Survey1992).

In the upper portion of the surveyed reach, Coal Creek enters a wider valley floor which changes the gradient, wood accumulations, and habitat composition. There are deep pools created by large wood, cascades, low gradient glides, slower riffle habitat, and complex side channels (Chen 1991). Streambed substrate changes from dominantly bedrock, to gravel and cobble. The channel is no longer confined and floodplains appear. The channel sensitivity to disturbance increases and its recovery potential decreases in this area. The lower gradient, variety of habitat types, density of juveniles, and deep holding pools indicate this section is key spawning and rearing area for winter steelhead.

Summer temperatures are 55^{o} to 62 ^{o}F., which are cooler than the mainstem. When the mainstem's summer temperatures approach 70 ^{o}F., juvenile salmonids congregate in Coal Creek. Debris flows from Coal Creek have deposited a large fan in the South Fork Coquille. Numerous juvenile steelhead were observed in summer 1994 in the pools just below the culverts on Forest Road #33 (USDA, 1994).

Over the years, many wood jams were removed for merchantable timber and firewood, or to aid fish passage. A debris flow that swept down the channel from a debris avalanche in the gorge was triggered by a 1974 storm, a 25-year storm event. The channel was scoured down to bedrock in many places. This event destroyed riparian vegetation up to 200 feet laterally along the channel, allowing alder to become established and dominate the riparian area. The absence of historical stream survey records make it difficult to determine how the channel has changed as the result of the debris flow; however, the channel appears to have recovered from both the natural and human disturbances. The debris flow may have altered the channel shape and substrate composition by creating more bedrock reaches.

Coal Creek differs somewhat from the other tributary watersheds in having extensive harvest in sensitive areas which contributed to sediment and loss of large wood. Coal Creek is the highest at 17% (amount of subwatershed harvested in sensitive areas), Wooden Rock Creek is second highest at 10% within a range of 4 to17%.

Coal Creek Level II Stream Survey, August 2010

Geomorphology of the Coal Creek watershed ranges from broad gently sloped mountain tops (Eden Ridge) to steeply sloped and incised canyons and inner gorges. Also observed were small sections of unconfined flat-bottomed alluviated channels featuring mild stream gradients, wood jams, stored sediments, elevated terraces, side channels, and minor floodplain development.

The stream survey extended 6.14 river miles from the mouth of Coal Creek and describes four reaches based on changes in stream flow and canyon morphology (see Map C-2, Appendix C, Hydrology Report). The majority of the survey is located on private lands with the exception of Reach 4. Tributary streams were generally moderate to high gradient, V-notched, and incised. Generally canyon widths were narrow and vary between 40 feet in Reach 4 to 80 feet in Reach 3. Channel sinuosity was low (1.02 – 1.09).

Stream Survey conclusions regarding large wood recruitment are as follows: large woody material, particularly medium and large class pieces are not common in Coal Creek, almost certainly as a result of past logging of the riparian forest and instream salvage logging. Large woody material (LWM) densities increase on the portions of Coal Creek that flow across Forest Service land. On portions flowing across private timberland, instream LWM is not common. Likewise, the riparian forest on publicly managed land is generally in a mid seral stage, regenerating from past logging but in most areas had matured to the point of providing small class LWM. Conversely, the riparian forest on private corporate land is in an early and pioneer seral stage and incapable of providing instream LWM.

d. Channel Morphology & Large Wood

Middle Fork Coquille
About 25% of the Planning Area lies within the Middle Fork Coquille watershed, along the watershed divide. Streams in this portion of the Planning Area flow northward and are first and second order streams, non-fish bearing, and dominantly ephemeral. Topography along the divide includes broad gentle slopes that give way abruptly to steep, often raveling, slopes and benches that dominate the upper Myrtle Creek subwatershed. This reflects the structural control of the Tyee sandstones (see Figure C-1, Appendix C, Hydrology Report). Cliffs formed where the bedding is exposed readily erode into steep ravines that bottom in a bench formed by a more resistant sedimentary layer. Most of this rugged topography is outside the Forest boundary. Channel substrate is generally fine grained sediment generated by eroding Tyee Formation sandstones or exposed weathered bedrock. Field examinations on NFS lands found well developed understory vegetation and woody material sufficient to provide structural elements to small channels characteristic of the area. Large, well decayed wood is present as cull wood left by historical logging.

Benched topography supports shallow ponds or swampy areas, but true floodplains are scarce. Channels would be classified as Rosgen type A or B with substrates ranging from fine to small gravel, or bedrock where durable outcrops are exposed. In the Lower Rock subwatershed the watershed divide is broader and cliff-forming elements of the Tyee are more subtle. Streams in this area also drain a steep headwater area, but do not cut through nick points formed by prominent topographic benches (Figure C-2, Hydrology Report). Channel morphology is similar to that described above, with the exception of a single third order stream (Shields Creek).

South Fork Coquille
The Coal Creek and Headwaters SF Coquille sub-watersheds of the South Fork of the Coquille River contain about 75% of the Planning Area. They are underlain by the Tyee sandstone and contain topography that is formed by the even, sloping surface of sedimentary bedrock. Streams are typically deeply incised with substrates that vary from sand and gravel to sandstone bedrock. These channels steeply join the prominent canyon confining the lower half of Coal Creek. This canyon cuts the Tyee formation deeply--canyon walls extend up to 700 vertical feet--and contains numerous bedrock nick points and waterfalls.

Stream morphology along Coal Creek is dictated primarily by the bedrock of the canyon walls and bottom. The 2010 Stream Survey reports Coal Creek is steep and dominated by coarse gravel, boulders and bedrock in confined reaches. Also reported are two old log jams composed of large but decayed wood.

Watershed analysis (1995) documents a powerful debris flow that scoured lower Coal Creek of sediment, wood, and vegetation. Log jams composed of large wood are capable of resisting the high flows of Coal Creek, as is evidenced by the remaining structures. It is likely that Coal Creek contained a series of such jams when "old-growth" trees were the dominant vegetation.

Large wood is a common structural component in the Pacific Northwest that dissipates the energy of high flows and increases the retention time and quantity of sediment deposits. Large wood resulting from recruitment from late seral forests into streams forms a structural network that can trap sediment to depths of many feet. Removal of the structural wood results in erosion of the gravel deposits to bedrock. This was likely the case for confined reaches of Coal Creek. Older log jams are likely to eventually fail as a result of decay; any sediment retained by these structures would be transported to the South Fork Coquille.

There is no large wood data available from private timber lands; NFS lands currently supply small size class woody material; however most of these lands are not in close proximity to Coal Creek. Little or no source of medium and large class woody material are currently available, therefore confined portions of Coal Creek will remain high gradient, bedrock channels that transport sediment and small wood to the S.F. Coquille. The alluvial fan at the mouth of Coal Creek bears witness to this mode of sediment transport and deposition. Functionally, Coal Creek would be considered in degraded condition since its ability to trap and retain sediment has been compromised by the loss of both in-stream and recruitable large wood. The current decayed condition of existing wood jams suggests that these structures will eventually fail and be transported downstream. Regeneration harvest activity on private land along Coal Creek is ongoing. Opportunities for recruitment of large wood into Coal Creek are expected to remain low for the foreseeable future.

The Planning Area includes approximately four miles of Wooden Rock Creek along its eastern edge. The headwaters of Wooden Rock Creek are located on rounded, gently to steeply sloping topography. The main channel has a low gradient and a sinuous pattern with well developed floodplains. No stream survey information is available for this portion of the channel. Field examination of tributary channels near proposed units reveal that they are confined in V- or U-shaped valleys with low gradients allowing for the formation of small floodplains in some locations. Channel substrates include sand and gravel. Tributaries near proposed units wind through heavy vegetation and remnant large wood from historical logging. Large wood is present both as slope cover and as buried structural elements in the stream. Existing trees are large enough and in sufficient quantities to provide continued recruitment to the tributary channel.

e. Hydrologic Effects Mechanisms & Analysis Framework

Hydrologic issues are examined by describing the mechanisms for environmental effects as they relate to the Proposed Action and alternatives; followed by a description of the effect at the local and subwatershed scales. This provides a context for effects by documenting levels of existing disturbance, discussing thresholds for watershed disturbance, and describing cumulative impacts that are based on the Action Alternatives in combination with reasonably foreseeable actions.

Channel Morphology and Large Wood

Streams where treatments are proposed under the Eden Ridge Timber Sales are located on steep hillslopes and on more gentle uplands adjacent to subwatershed ridges. Field examination revealed channel substrates with exposures of resistant bedrock strata, or sand and gravel weathering products of less durable layers of the formation. The Planning Area contains numerous small streams (only a few feet wide) that are first and second order channels, are intermittent or ephemeral, and may include boggy areas and seeps. Stream valleys are often V-shaped and the active channel less than ten feet wide. Small wood and vegetation are sufficient to provide channel and slope stability. Wood falling into the channel cannot travel downstream due to the lack of streamflow and topographic confinement.

Sediment transport in these small channels is moderated by the presence of heavy vegetation in the form of both trees and shrubs, and by wood present in the channel and on adjacent steep slopes. Wood falling directly into small channels contributes to their sediment capture and holding capacity. NFS lands in the Planning Area have little opportunity to provide large wood to the main stems of Coal Creek or Wooden Rock Creek since the majority is located in the uplands away from the channel. Proposed Units 308, 309 and 315 are close enough to provide wood to Coal Creek. Units 202, 209, 212, 213, and 214 are close enough to provide wood to Wooden Rock Creek. The remaining project units are too far away from large or mainstem channels to be an instream wood source, and/or are not drained by streams large enough to transport large wood.

All proposed units have been harvested in the past; the largest diameter trees commonly observed in Riparian Reserves associated with proposed units was approximately 24"; the majority are 6" to 18" diameter. In-channel large woody material in Region 6 is defined as a minimum of 50 feet long with a dbh of 36 inches at the small end. Currently, none of the trees within Riparian Reserves of the Planning Area meet this criterion, with the exception of downed cull logs left by historical harvest activity. The role of LWM as a structural element is critical in the larger channels of Wooden Rock Creek and Coal Creek. Both these channels transport large amounts of sand and gravel since these are the weathering products of the surrounding sandstone. Wooden Rock Creek is dominated by low gradient reaches with floodplains that can easily store fine sediment with moderate amounts of instream wood. Debris dams composed of smaller wood also provides for effective sediment trapping and retention. Such is not the case for Coal Creek, a steep, confined, bedrock channel with low sinuousity and no floodplain. Coal Creek is dependent on large wood distributed throughout the mainstem channel to dissipate the force of storm events and to provide durable wood material for large log jams that can form sediment dams.

Project activities could destabilize slopes and receiving streams by generating runoff from compacted roads and trails, and by intercepting and concentrating surface and subsurface water into erosive flows. Changes in flow and sediment load over time are primary forces in alteration of channel morphology. Road construction in subwatersheds that exceed generally accepted thresholds for road density is a concern, particularly if it occurs in mid- or lower slope positions where water is naturally more concentrated. New road construction or reconstruction on previously forested alignments (such as railroad grades) needs to be evaluated in terms of its ability to intercept and channel water both on upland slopes and at channel crossings.

Sediment Delivery

Reduced canopy cover following timber harvest can allow more direct raindrop impact on the soil surface, increase the amount of rain reaching the soil, and change the accumulation and melting pattern of snow. Thinning activities can induce changes in soil properties that can accelerate natural rates of erosion and sediment delivery to streams.

Fine sediment-- especially clays that remain suspended except in very still water-- reduces water clarity, thus affecting water quality. Coarser sediment may bury stream gravels and pools or, change channel shape and flow in cases of high sediment input such as debris flows. Sediment delivery to the South Fork Coquille is a concern since this channel is critical habitat for coho salmon (below the town of Powers). Coal Creek and Wooden Rock Creek drain the Planning Area and are two major tributaries of the SF Coquille that provide cooler water. Debris flow activity has been documented in Coal Creek Canyon, and an alluvial fan at the mouth is a display of debris deposits. Watershed Analysis documents a severe debris flow in 1974 that resulted from a 25 year recurrence level storm event. The Powers Ranger District has had to clear the 33 Road of debris delivered at the mouth of Coal Creek repeatedly, in spite of two nine foot diameter culverts.

A reduced canopy cover could contribute to quicker runoff, which could increase sheet and rill and gully erosion as well as increase the erosive power of receiving streams. Compacted soils resulting from road/trail construction and the use of heavy equipment also contribute to increased runoff. Rapid re-growth of the understory after thinning typically balances removal of the canopy except where soil compaction discourages moisture infiltration and new growth. Harvest operations may trigger accelerated erosion in unstable areas if the combination of canopy removal, road reconstruction, and new road construction generates enough cumulative impact to result in increased or concentrated runoff. High risk areas include steep slopes associated with riparian reserves of higher order channels (3rd order and higher) within the transient snow zone.

Roads intercept runoff from upslope areas, so both existing and increased road density is a concern. The intercepted runoff and rain falling directly on the surface of the road is collected in a drainage ditch on the uphill side of the road. Roads also intercept near-surface groundwater flowing through the slope. The flow in the drainage ditch is periodically discharged underneath the road through a culvert to prevent excessive road erosion and flooding. This effectively concentrates flow on the hillside at the point the flow discharges from underneath the road. This concentrated flow often causes a channel to form which, during storm events, transports flow to streams more rapidly than prior to road construction. This has the effect of increasing the drainage network, thereby increasing peak flow and runoff speed. Roads, by increasing the drainage network, have the potential to increase peak flows through concentration of runoff and more rapid routing to stream channels (Wemple 1996). The increased energy of peak flows results in elevated rates of erosion and sediment transport. Roads create unprotected ditches, cut slopes and fills that can contribute sediment to streams. Elevated sediment is either stored or transported downstream and may contribute to morphological changes (filling of pools, channel widening) and/or degraded water quality.

Road density may be used as an indicator of the potential for channel network expansion to increase peak flows. Densities under 2 miles per square mile are considered low; over 3 miles per square mile suggest a concern for sediment. Subwatersheds containing the Planning Area have road densities well over 4 miles per square mile (Watershed Analysis).

Slope distance of roads and road culvert discharge points from surface channels are also important. For example, a road near the top of a slope and far from a natural channel will intercept the storm water it receives directly and whatever flows to it from the small slope area uphill. By contrast, a road in a midslope or lower slope position will intercept runoff from a much larger upslope area, as well as subsurface flow penetrated by the roadcut, that will be concentrated in ditches and released into existing channels via culverts. Existing and proposed roads can have long term adverse effects on water and sediment transport that must be considered and mitigated during thinning treatment. Roads can also increase sedimentation through structural failure. Road structural failure is most commonly caused by culvert embankment failure and slope failure.

Water Yield (Peak Flows)

Stream response to storms and runoff is generally measured in terms of increased water flow volume and velocity. Precipitation and snowmelt increase stream flow until a peak is reached and stream flow declines toward ground-water supported levels. The speed and duration of stream response is a function of the size and drainage network configuration of the watershed, topographic and vegetative watershed characteristics, and storm/runoff event size and duration. Peak flows are categorized in terms of their return interval, that is, the estimated time interval between specified flood events. The two year return interval generally determines basic stream morphology since it occurs regularly over the long term and thus distributes the bulk of the long term sediment load (Rosgen 1994). Data for this interval is also more readily available than for longer intervals. Uncertainty regarding peak flow behavior increases with increasing recurrence interval because data is lacking for larger more infrequent storm events.

Uncertainty also increases with size of the drainage basin because of increasing variability, especially from human induced watershed effects (i.e., reservoirs, urban development, water use) (Grant et al. 2008). In forest management, peak flow increases are considered a primary contributor to increased risk of cumulative watershed effects (CWE). If project analysis demonstrates that no peak flow increases would be generated, or reasonably anticipated, direction to avoid CWE contained in the LRMP and NWFP are satisfied.

For the past several decades, watershed response to forest harvest has been studied quantitatively through paired watershed studies in small drainages. Streamflow response to primarily clear-cut harvest and road construction has been measured and reported over a wide range of forested landscapes with an equally wide range of results (Moore and Wondzell, 2005). In a recent State-of-the-Science review (2008) Gordon Grant of Oregon State University presented conclusions based on a review of paired watershed studies. Grant selected studies that occurred primarily in the Pacific Northwest region and within the rain-on-snow hydrologic regime. Of particular interest is the stated goal of Grant's study to anticipate impacts resulting from current thinning forest practices based on results from past forest regeneration harvest practices. Grant's (2008) analysis presents the following generally accepted conclusions regarding the change in peak flows resulting from forest harvest in small basins:

Canopy removal increases peak flow as follows:

- During the fall season, through reduced evapotranspiration
- During the winter and spring through increased snow accumulation and melt
- During all seasons through reduced rain/snow interception

Canopy removal decreases peak flow:

- During all seasons by reducing fog drip.

Grant et al. (2008) observed that flows altering stream morphology are those with recurrence intervals greater than one year. Rosgen (1996) has shown that floodplain morphology is shaped by bankfull flows that correspond to the one to two year recurrence interval. Grant et al. (2008) places the upper limit of detection for changes in peak flow at the six year recurrence interval. Study data consistently shows that as storm events become larger, the increase in peak flow change decreases and the significance of the change becomes undetectable.

Storm events become increasingly rare as magnitude increases; there are practical limits to the length of time stream flow has been recorded and to the accuracy of measurement of very large events. All of these factors contribute to the six year detection limit. With these limitations in mind, Grant et al. displayed how peak flow change measured within the rain-on-snow regime changes with the percent of area harvested. There is a general trend for peak flow increases to decline as harvest area drops. Once harvest acreage drops below the 15% level (for transient snow zone), peak flow changes are undetectable. For the rain dominated areas the harvest level generating detectable peak flow increases is about 29%.

Grant proposed two classes of stream channel that are most susceptible to peak flow changes resulting from flows in the one to five year range of recurrence interval: gravel bed channels and sand bed channels. These are generally higher order streams (3rd order and up). In the Planning Area these would be Coal Creek and Wooden Rock Creek. First and second order mountain streams typically are shaped by storm events with 10+ year recurrence intervals.

Grant (2008) provides a general guideline for assessing harvest peak flow effects in the table reproduced below. Roads play a leading role in the generation of increased peak flows at the small basin scale. This is due to their ability to intercept and concentrate subsurface and surface water. Road networks combine with stream networks to accelerate water drainage from the land. Note also that thinning would be expected to generate a low risk of increased peak flows as compared to equivalent timber removal in large patches.

Cumulative Watershed Effects (CWE) analysis for the alternatives was performed by comparing the percent of (sixth field) subwatersheds affected by proposed activities with the thresholds provided by Grant et al. (2008). Comparisons included consideration of existing watershed condition, road density, and reduced hydrologic recovery in managed stands harvested less than 30 years previously.

Figure III-1. Potential Considerations for Peak Flow Increases

Likelyhood of peak flow increase (High ← → Low)			Potential considerations
High	Moderate	Low	Road density
All or most	Some	Few or none	Road connectivity
Fast	Moderate	Slow	Drainage efficiency
Large	Small	Thinned	Patch size
Absent	Narrow	Wide	Riparian buffers

From Grant (2008)

e. Direct and Indirect Effects of Alternatives

No Action Alternative
Under this alternative, no direct effects from harvest or thinning activities would occur on National Forest System lands in the Planning Area. There would be no potential for changes to channel morphology, large woody material, sediment delivery, and peak flows as a result of NFS land management activities in the Planning Area.

Action Alternatives - Direct and Indirect Effects of Road Construction
The Proposed Action includes almost 11 miles of new permanent road construction and a third of a mile of temporary road. Road density is used as an indicator for increased risk of cumulative watershed effects. Road density increases are minor in all subwatersheds except for Coal Creek where density would increase by approximately 0.43 miles/square mile to a total of 4.62 mi./sq. mi. refer to Cumulative Watershed Effects sub-section). This number suggests that road density is a concern and that road placement and design should avoid high risk areas.

Proposed new system roads would cross approximately 1.6 miles of Riparian Reserve. Proposed temporary roads would cross approximately 0.25 miles of Riparian Reserve. These disturbances would cause localized impacts associated with vegetation removal and surface disturbance within the road construction zone.

For proposed system roads this loss of vegetation would be permanent, as would the routing of streams through culverts and modification of both surface and subsurface slope runoff water flow.

Field examinations along the railroad grades proposed for conversion indicate that subsurface slope flows in the area are minimal. The grade has cuts that expose up to 15 vertical feet of cut bank. Few seeps were observed and the grade retains water at only a few locations within its 3.5 mile length. Proposed system road construction would occur primarily along watershed divides and secondary ridgelines. Perennial channels are less than 10 feet wide (three feet or less of active channel is typical) except for the unnamed tributary bordering Unit 338. This tributary contains a channel with a relatively wide and saturated valley bottom of about 40 feet in the proposed crossing location.

Proposed roads located in tractor Units 303, 307, 308 and 309 are also exceptions to the description above in that they are located at the midpoint of the Coal Creek watershed near the main channel. Road Q1 crosses approximately 0.11 miles of private land, and would require a steep gradient (estimated at about 20%) for approximately 500 feet. Units 303, 307, 308, and 309 are located in an area that is considered sensitive to hydrologic impacts; slope position and distance to Coal Creek are low. Sediment and runoff generated by road construction on these units could reach Coal Creek. The temporary road and its two crossings present surface disturbance that could shed sediment both during construction and during crossing removal and rehabilitation. The following mitigating measures are recommended for these units:

- Unit 309: Harvest treatment should be excluded from the zone between the south bank of Coal Creek and the slope break. This would avoid disturbance of oversteepened slopes that would shed sediment directly into Coal Creek.
- Units 303, 307, 308 and 309: Sediment transport would be monitored by the sale administrator. Any visible sediment input to Coal Creek originating from these units would require implementation of mitigating measures that would capture/prevent sediment transport recommended by a soil scientist, hydrologist, or engineer.

The haul route for the proposed project would utilize existing NFS and private system roads. Hauling to support the proposed sales would occur only during the dry season and during dry conditions. Haul roads would all be engineered for effective drainage and armored with rock to provide an all-weather surface. It is unlikely that sediment generated from use of haul roads under these conditions would exceed background levels. Field examination of the haul route indicates that fine sand and silt originate mainly from road cuts and ditches. Slope failures, visible rills and gullies are rare, occurring sporadically on oversteepened colluvial slopes or fills. Best Management Practices for road maintenance would be sufficient to capture sediment that may be generated by proposed hauling.

Table III-2. Proposed Road Construction by Subwatersheds

Subwatershed	New Road Construction (miles)			Temp Road construction (miles)		
	Alt.2	Alt 3	Alt.4*	Alt.2	Alt.3	Alt. 4
Coal Creek	6.61	1.87	0.25	0.29	.03	0
Headwaters SF Coquille	2.27	1.31	0	0	0	0
Mill Creek	0	0	0	0	0	0
Myrtle Creek	0.78	0.54	0	0	0	0
Lower Rock Ck	1.15	0.68	0	0	0	0
Total	10.81	4.4	0.25	0.29	0.03	0
***Reconstruction along 3 rail grades includes new road construction where stream crossings replace rail trestle bridges.**						

Table III-3. Road Density Increase by Subwatershed

Subwatershed (Square Miles)	Existing Road Density (miles/sq.mi.)	New Road Construction Density Increase (Mi/sq. mi)			Temporary Road Density Increase		
		Proposed Action-Alt.2	Alt. 3 Reduced Roads	Alt. 4 No New Roads	Proposed Action-Alt.2	Alt. 3 Low Risk Units & Roads	Alt. 4 No New Roads
Coal Creek (15.55)	4.19	0.43	0.12	0	0.02	<0.01	0
Headwaters SF Coquille (62.86)	4.25	0.04	0.02	0	0	0	0
Mill Creek (21.77)	3.94	0	0	0	0	0	0
Myrtle Creek (31.29)	4.12	0.02	0.02	0	0	0	0
Lower Rock Creek (39.91)	4.68	0.03	0.02	0	0	0	0

Action Alternatives - Direct and Indirect Effects of Harvest Thinning
Table III-4 displays areas proposed for commercial thinning and the percent of the subwatershed they would affect. Figures are low for all of the subwatersheds except Coal Creek. As shown in Table III-4, 41% of the subwatershed has been regeneration harvested in the last 30 years. Proposed commercial thinning presents stand impacts that are less severe than regeneration harvest (Grant et al., 2008); however, quantitative data is scant. Grant et al. (2008, Figure III-1) provide a generalized guide to impact levels on peak flows. Watershed impacts tend to be low for both rain-dominated and transient snow zone regimes up to about 40% harvest levels. Impacts rise to moderate in for the 40 to 80% harvested range and jump to high at 100% harvest levels. Moore and Wondzell (2005) found that harvest effects on peak flows generally recover within 10 to 20 years. These figures are for regeneration harvest not for thinning.

Based on these crude guidelines, the proposed commercial thinning would introduce at most, a moderate risk of increasing or altering peak flow response in the Coal Creek subwatershed, and would introduce no detectable risk in the other project subwatersheds. Based on the discussion below, it is likely that the proposed thinning would have a low risk of increasing peak flows in Coal Creek.

The Action Alternatives contains elements that lower the potential risk of peak flow increases as follows:

- Harvest treatment would be a variable density thin. This would leave an intact and growing forest canopy to attenuate storm events.
- Avoidance of the primary shade zone--provides undisturbed buffer between harvest areas and stream channels.
- Limitation on canopy removal in Riparian Reserve of 50%--provides a shaded buffer between harvest areas and stream channels.
- Limitation of equipment use in Riparian Reserve—prevents compaction that may reduce water infiltration within 100‘ of stream channels.
- Limitation of skid trail impacts—reduces potential for compaction that may cause increased runoff from storm events/snowmelt.
- Wet weather/seasonal use restrictions—prevents compaction of wet/saturated materials and displacement that could result in concentrated surface runoff.
- Harvest is concentrated in upper portions of watersheds where stream discharges are low.

Table III-4. Harvest Thinning by Subwatershed

Subwatershed	Subwatershed Acreage	Acres of Proposed Commercial Thin Harvest			% of Subwatershed Affected by Proposed Commercial Thinning		
		Alt. 2	Alt. 3	Alt. 4	Alt. 2	Alt. 3	Alt. 4
Coal Creek	9,952	1,760	1,615	1,427	18%	16%	14%
Headwaters SF Coquille	40,233	585	637	642	1.5%	1.6%	1.6%
Milll Creek	13,935	33	33	33	<1%	<1%	<1%
Myrtle Creek	20,028	172	172	172	1%	1%	1%
Lower Rock Creek	25,544	765	783	783	3%	3%	3%

Action Alternatives - Direct and Indirect Effects of Yarding Activities and Landing Construction
Proposed yarding activities include those conducted by ground based heavy equipment (“tractors”) and those conducted by skyline cable equipment operating from a landing. Surface disturbance resulting from ground-based equipment utilizing limited skid trails can be limited to approximately 15% of the area. Skyline yarding typically disturbs approximately 5% of the surface area; helicopter operations are estimated at 2%. Direct surface impacts are discussed in the Soils Report for this project (Appendix D).

Hydrologic impacts resulting from tractor use would be low due to the design constraints of the project. Tractor units are limited to areas where slopes are less than 35% and equipment would not travel closer than 100‘ to any stream channel. This effectively limits heavy equipment use to upland areas. Under the Proposed Action, tractor units account for approximately 2,119 acres (64%) of the total harvest acreage. Under LRMP standards and guidelines, a maximum of 15% or 318 acres could incur direct surface disturbance from heavy equipment use. This number includes past disturbances within an activity area.

Table III-5. Project Acreages by Logging System for Action Alternatives

Logging System	Proposed Action Alternative 2	Alternative 3	Alternative 4
Ground Based	2,119	1,786	1,441
Skyline	1,195	941	457
Helicopter	0	513	1160
Total Acres	**3,314**	**3,240**	**3,058**

Table III-6. Percent of Subwatershed Affected by Ground Based Equipment

Subwatershed	Subwatershed Acreage	Acres of Proposed Ground Based Commercial Thin Harvest			% of Subwatershed Affected By Ground Based Commercial Thinning		
		Alt.2	Alt.3	Alt.4	Alt.2	Alt.3	Alt.4
Coal Creek	9,952	1,189	947	654	12%	9.5%	6.5%
Headwaters SF Coquille	40,233	225	209	170	.5%	.5%	.4%
Mill Creek	13,935	8	8	8	<.1%	<.1%	<.1%
Myrtle Creek	20,028	65	46	33	.3%	.2%	.2%
Lower Rock Ck	25,544	632	576	576	2.5%	2.3%	2.3%

Proposed tractor acres contain approximately 255 acres of Riparian Reserve. Harvest would occur within the Riparian Treatment Zone which is approximately 2/3 of the total defined Riparian Reserve (one site potential tree height from the stream channel), excluding the Primary Shade Zone. This would be about 170 acres occurring mainly along first and second order channels. Units 307, 308 and 309 are the only exceptions in that they border the main channel of Coal Creek. These units are located in a hydrologically sensitive area due to their proximity to Coal Creek. Refer to mitigating measures recommended under the *Direct and Indirect Effects of Road Construction* discussion, above.

Skyline units have the same 15% LRMP soil disturbance limitation. Skyline yarding is capable of accomplishing harvest with surface disturbance of 5% of the activity area; equivalent to roughly 60 acres out of the 1,195 acres of skyline units.

Project design eliminates most equipment use near Riparian Reserves. Skyline corridors that cross Riparian Reserves are required to be 12 feet or less in width, and no less than 150‘ apart, and be utilized with full log suspension. Harvest near perennial streams stops at the primary shade zone. Riparian Reserve within skyline units is estimated to total 201 acres. Approximately one third of this area would be occupied by the primary shade zone; thus, of the total 1,195 acres of skyline units, about 135 acres would be included in the skyline harvest area (Table III-7). Hydrologic impacts from skyline yarding are expected to be low since the overwhelming majority of the activity occurs in the uplands where stream widths are narrow.

Table III-7. Project-wide Riparian* Logging System Comparison by Action Alternative

Alternative	Ground Based Yarding		Skyline Yarding		Helicopter Yarding		Total Riparian Harvest Acres	Coal Creek Subwatershed Only
	Total Acres	Riparian Acres	Total Acres	Riparian Acres	Total Acres	Riparian Acres		
Proposed Action Alt. 2	2,119	255	1,195	134	0	0	389	182
Alt. 3	1,786	157	941	173	513	56	386	161
Alt. 4	1,441	77	457	97	1,160	203	377	103
***actual riparian harvest; does not include primary shade zone**								

Under the Proposed Action (Alternative 2), some proposed units are located in areas that have a greater potential for hydrologic impacts. These units are listed in Table III-8. Their combined acreage is relatively small; however these units are would present more risk of measurable impact than the rest of the project.

Table III-8. Units Located in Sensitive Watershed Areas – Proposed Action

Unit Number	Logging System	Acres	Concern for Elevated Resource Damage
301, 302, 304, 305, 306	Skyline	49	Proximity to Coal Creek; location within Coal Creek canyon on steep slopes; requires new road construction
303, 307, 308, 309	Tractor	63	
312, 315, 321, 338	Skyline	104	Steep slopes adjacent to major tributaries of Coal Creek
Total Acres		**214**	

Direct and Indirect Effects of Alternative 3

The direct effects of Alternative 3 are similar to those described for the Proposed Action except for those areas where harvest and/or road construction has been eliminated, or where the logging system has been changed to "helicopter".

Table III-7 shows the change in harvest acreage and road construction under all alternatives. Approximately 1.5 miles of new system road would be constructed within the defined Riparian Reserve; temporary road would be about 0.03 mile. Harvested acreage would not change except within the Coal Creek and Headwaters S.F. Coquille subwatersheds. The only substantial change is for the Coal Creek subwatershed where about 363 acres would be eliminated from proposed harvest; and about 361 acres would be harvested by helicopter.

Under Alternative 3, tractor units contain approximately 100 acres of Riparian Reserve. Harvest would occur on approximately 2/3 of the total defined width of Riparian Reserve (one site potential tree height from the stream channel), excluding the primary shade zone. Actual harvest would occur on about 67 acres, mainly along first and second order channels. Units 307, 308 and 309 are the only exceptions in that they border the main channel of Coal Creek. Mitigation for units located along Coal Creek is the same as that recommended for the Proposed Action.

Alternative 3 includes 260 acres within skyline units, and 84 acres within helicopter units. Actual harvest within Riparian Reserve would be approximately 173 and 56 acres, respectively. Total actual harvest within the Riparian Reserve under Alternative 3 would be approximately 386 acres (refer to Table III-7). There is little change in the acres of Riparian Reserve harvest between the Proposed Action and Alternative 3; however, the logging system utilized shifts more toward skyline and helicopter systems as shown in Table III-7.

Helicopter logging eliminates the ground disturbance associated with tractor logging and eliminates yarding corridors resulting from skyline yarding. Helicopter landings require larger areas (one to two acres) than log decks to accommodate landing clearances, fueling, and support vehicle parking. Most of the units converted to helicopter logging under this alternative are in the upland areas that would be logged with tractors under the Proposed Action. As described under the Proposed Action, these areas would sustain direct effects of the logging system used but are not considered "sensitive" to disturbance.

Some of the units located in sensitive areas of the subwatershed described under the Proposed Action (Table III-8) are eliminated, or the logging system changed, under this alternative. Units 304 and 338 are eliminated; Units 307 and 308 would be harvested by helicopter instead of utilizing tractors supported by construction of Roads Q1-Q4 (1.4 mi.). Table III-8 information has been modified to reflect these changes and is presented in Table III-9 below.

Table III-9. Units Located in Sensitive Watershed Areas – Alternative 3

Unit Number	Logging System	Acres	Concern for Elevated Resource Damage
301, 302, 305, 306	Skyline	43	Proximity to Coal Creek; location within Coal Creek canyon on steep slopes
303, 309	Tractor	26	
312, 315, 321	Skyline	80	Steep slopes adjacent to major tributaries of Coal Creek
Total Acres		**149**	

Road construction/reconstruction mileage is substantially reduced under this alternative. Most of the reductions are to roads located in areas with low hydrologic impact sensitivity: upland areas near the watershed divide and along ridgelines. Road Q, as identified above, is an exception. Under Alternative 3 this road construction would be excluded, removing the most likely project-generated sediment source into Coal Creek.

Direct and Indirect Effects of Alternative 4

Alternative 4 would eliminate new system road construction and reduce reconstruction to 1.3 miles. Reconstruction includes 0.7 miles on an existing railroad grade; therefore, new road segments may need to be constructed at up to three first or second order streams that had previously been crossed with rail trestle bridges. This would result in loss of approximately one acre of the Riparian Reserve to permanent stream crossings. These crossings account for approximately 0.25 miles of new construction in the Coal Creek subwatershed, but would not substantially add to the existing road density (Table III-3). In the other project subwatersheds there would be no increase in road density over existing levels. Site-scale surface disturbance and indirect effects resulting from road construction or reconstruction (refer to discussion under the Proposed Action) would be eliminated except at the three stream crossings discussed above; and, except for road surfacing and removal of trees/vegetation on the existing road/rail templates.

Many upland units would be harvested using helicopter methods and some would be eliminated (refer to project alternative maps in EIS Chapter II). All of the units identified as being located in areas with high hydrologic resource sensitivity under Alternatives 2 and 3 would be eliminated from the harvest except for Units 312 and 315. Both of these units would be harvested by helicopters under this alternative, removing harvest disturbance associated with skyline logging on these units under Alternatives 2 and 3.

In the upland units, direct disturbance would be avoided, except for landings, on 1,160 acres that would be helicopter harvested. Helicopter landings would account for approximately 20 to 40 acres with each landing being one to two acres in size. Landings would not be located in the Riparian Reserve and are generally on ridgelines or divides; they represent a minor, scattered surface disturbance that would have little to no hydrologic impact.

Alternative 4 contains the least Riparian Reserve harvest and utilizes skyline and helicopter loggings systems most (refer to Table III-7). The remaining ground-based harvest of 1,441 acres would be limited by the LRMP standard and guide to 15% of the activity area subject to detrimental soil condition (refer to Soils Report for additional detail).

This represents roughly 216 acres of the "tractor" ground under Alternative 4. Harvest by thinning rather than by regeneration represents a further reduction in surface disturbance simply by cutting and removing fewer trees and generating less slash.

Restoration Projects
The Eden Ridge Project proposes to place 150 large trees in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Live and dead trees may be removed from riparian areas to provide wood for enhancement projects, under special conditions described in the Project Design Criteria. These actions would involve the use of log trucks and dump trucks for transport and excavator-type machinery, spyders, cable yarders, draft horses, or helicopters for placement. Environmental effects, plans and designs would be consistent with Forest Plan direction, K-V opportunities, and watershed restoration plans (e.g., USDA FS 2006).

Cumulative Effects
As noted above, this hydrologic condition issue focuses on potential changes to channel morphology, large woody material, sediment delivery, and peak flows. Effects on water quality (i.e., temperature, turbidity, and water quality (303(d) listed waterbodies) is discussed within the next Issue (sub-section 2). The overall contribution to the risk for adverse cumulative watershed effects is discussed in sub-section 3.

2. WATER QUALITY

Effects of variable density management (thinning) treatments and other connected actions on water quality; stream temperature, turbidity, or water quality (303(d) listed waterbodies).

This hydrologic issue focuses on potential effects on water quality (i.e., temperature, turbidity, and water quality (Clean Water Act Section 303(d) listed waterbodies). Potential changes to channel morphology, large woody material, sediment delivery, and peak flows are discussed within the previous Issue (sub-section 1). The overall contribution to the risk for adverse cumulative watershed effects is discussed in sub-section 3. EIS Appendix C (incorporated by reference) includes more detail on current watershed and water quality conditions, characteristics, and risks for adverse effects.

Changes in water quality and the effect on listed waterbodies are potential issues because these changes can affect the beneficial uses of water, and are controlled by State and Federal regulations pursuant to the Clean Water Act of 1972 (as amended 1977 and 1987). Changes in erosional processes, hillslope vegetation, hillslope soil properties, condition, type, and amount of roads and, riparian shade are the primary factors affecting temperature and turbidity.

a. Background

Water quality in Oregon is managed in compliance with Section 303(d) of the 1972 Federal Clean Water Act by the Oregon Department of Environmental Quality (ODEQ) and the U.S. Environmental Protection Agency (EPA). ODEQ is responsible for designating streams and water bodies that require effluent limitations, and, for developing Total Maximum Daily Load (TMDL) allocations that will ensure water quality standards are met. The most recent listing of impaired waters is available on a DEQ website as "Oregon's 2004/2006 Integrated Report Database" (www.deq.state.or.us/wq/assessment/rpt0406).

The Coquille Subbasin has a completed TMDL that covers most of the Rogue River-Siskiyou N.F. occurring in that Subbasin. In order to implement the State's waste load allocations, federal land management agencies develop Water Quality Management Plans (WQMP) in cooperation with DEQ. A WQMP for the South Fork Coquille River above the Forest Boundary was completed in the year 2000; it addresses lands of all ownerships in this part of the watershed. On National Forest System lands, water temperature is the water quality parameter of most concern in this area.

Water quality standards are established to protect beneficial uses of the State's waters. Beneficial uses are assigned by basin in the Oregon Administrative Rules for water quality. The Planning Area occurs in the South Coast Basin which has beneficial uses listed below (Oregon Administrative Rule 340-041-0300; adopted by the Oregon Environmental Quality Commission, 2003).

Public Domestic Water Supply	*Private Domestic Water Supply*	*Industrial Water Supply*
Irrigation	*Livestock Watering*	*Fish and Aquatic Life*
Wildlife and Hunting	*Fishing*	*Boating, Water Contact Recreation*
Aesthetic Quality	*Hydro Power*	

The state adopted new stream temperature standards in 2004 (OAR 340-041-0028). For stream temperature, the state has defined the following categories:

- **Core cold water habitat**: streams where temperatures are maintained within the range considered optimal for salmon and steelhead rearing. Temperature in these waters should maintain a seven-day average maximum no higher than 16°C (60.8°F).
- **Salmon and trout rearing and migration:** These waters are expected to maintain a seven-day average maximum no higher than 18°C (64.8°F), except during times & places of salmonid spawning.
- **Migration corridors:** Some major rivers in Oregon are designated as being migration corridors only, and the seven-day average maximum temperature should be no higher than 20°C (68°F).
- **Spawning:** During places and times of spawning, the seven day average maximum temperatures are expected to be no greater than 13°C (55.4°F).

All streams in the South Fork Coquille drainage above the Forest boundary are designated "Core Cold-Water Habitat." Streams that drain northward from the Planning Area into the Middle Fork Coquille River are designated "Salmon and Trout Rearing and Migration." No additional criteria for spawning have been applied to streams within the Planning Area. This information is available to the public on DEQ's website (refer to Fish Use Maps, figures 300a and 300b). Information regarding streams listed by the State as impaired is provided in Table III-10 with updated water quality standards for temperature.

The Oregon Dept. of Environmental Quality and its partners prepared a *Total Maximum Daily Load* assessment and *Water Quality Management Plan* (TMDL/WQMP) for the Upper South Fork Coquille watershed in 2001. The assessment addressed temperature exceedences in 303(d) listed streams and many of their tributaries, and concluded that "no thermal loads are available for allocation to anthropogenic sources in this system." For the purposes of the Planning Area, this means that any increases in stream water temperature resulting from land management activities would be a violation of state water quality standards.

The Middle Fork Coquille River is listed as impaired for both dissolved oxygen (river mile 0 to 11.2) and temperature (river mile 0 to 39.6) and a TMDL is needed. None has been prepared as of this time.

Table III-10. Status of Impaired Stream Listings

Stream Name and River Miles	Parameter for listing	Season	Water Quality Standard	Beneficial Use protected by Standard	Status
South Fork Coquille Watershed					
Coal Creek 0 to 6.5 miles	Temperature	Summer	Rearing temperature 16°C (60.8°F)	Anadromous fish passage; Salmonid fish rearing	Attaining: some pollutant standards are met
Wooden Rock Creek 0 to 7.9	Temperature	Summer	Rearing temperature 16°C (60.8°F)	Anadromous fish passage; Salmonid fish rearing	Attaining: some pollutant standards are met
Hayes Creek 0 to 3.2	Temperature	Summer	Rearing temperature 16°C (60.8°F)	Anadromous fish passage; Salmonid fish rearing	Attaining: some pollutant standards are met
Middle Fork Coquille Watershed					
Myrtle Creek 0 to 17	Sedimentation	Undefined	The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed.	Resident fish and aquatic life Salmonid fish rearing Salmonid fish spawning	Insufficient data to determine whether a standard is met.
Rock Creek 0 to 14.8 miles.	Phosphate Phosphorus	Summer	Total phosphates as phosphorus (P): Benchmark 50 ug/L in streams to control excessive aquatic growths	Aquatic Life	Insufficient data
Rock Creek 0 to 14.8 miles.	Sedimentation	Undefined	The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed.	Resident fish and aquatic life Salmonid fish rearing' Salmonid fish spawning	Insufficient data

Table III-11, extracted from the WQMP, shows that stream temperatures in the mainstem South Fork Coquille exceed state standards and increase dramatically after flowing out of the Forest. Table III-10 indicates that none of the measured tributaries meet the current water quality standard for temperature. A stream survey of Coal Creek completed in August of 2010 reported stream temperatures ranging from 10°C to 16°C. The data provides confirmation that summer water temperature near the mouth of Coal creek hovers near the temperature standard; however, water in the most upstream reach of the survey is cooler than the temperature standard. The 2010 stream survey also measured the temperature of 11 tributaries to Coal Creek. Temperatures of these tributaries ranged from 11° to 16°C with all but one tributary cooler than 16°C.

Many factors can affect water temperature, and it is difficult to relate forest management activities directly to water temperature changes. It has become standard practice in the Pacific Northwest to utilize stream shading as a surrogate measure and predictor of long term water temperature changes. Effective shade from the forest canopy screens the water‘s surface from direct rays of the sun. Highly shaded streams typically have cooler stream temperatures due to reduced input of solar energy (Brown 1972, Beschta et al. 1987).

ODEQ has assigned limits to solar radiation reaching streams by utilizing effective shade as a surrogate target for solar loading. For the South Fork Coquille Subbasin, ODEQ has adopted a target of at least 82% effective shade. Percent effective shade can be linked to specific areas and, thus, to management actions needed to solve problems that cause water temperature increases (Park 1993). Table III-12 lists existing and potential stream shade values, as well as other beneficial management goals contained in the WQMP (DEQ, 2001).

Table III-11. Average Seven-day-Maximum Temperature Measurements

Site No.	Location	Years of Record	Min 7-day of record	Max 7-day of record	Avg 7-day of record	Avg Delta T of record	Data Source
	Mainstem South Fork Coquille						
*	at Gaylord	1994 - 95	72.4 F	79.4 F	76.0 F	13.4 F	USFS
1	at fish trap	1994 - 95, 97	78.5 F	82.3 F	80.6 F	12.3 F	USFS
2	at Forest Boundary	1990 - 98	68.8 F	70.8 F	69.8 F	5.9 F	USFS
3	above Coal Creek	1995	67.3 F	67.3 F	67.3 F	14.1 F	USFS
4	at Sand Rock Flat	1997 - 98	72.6 F	75.4 F	74.0 F	9.3 F	USFS
5	above Rock Creek	1992, 1994 - 98	65.6 F	69.2 F	67.4 F	7.1 F	USFS
6	at Lockhart Bridge	1994 - 95, 97-98	69.9 F	74.7 F	72.1 F	11.6 F	USFS
7	below Buck Creek	1990 - 98	64.7 F	68.5 F	67.0 F	7.7 F	USFS
8	above Wooden Rock	1995 - 98	69.5 F	73.8 F	72.2 F	12.7 F	USFS
9	at Eden Valley Bridge	1995 -98	55.9 F	60.4 F	58.7 F	3.5 F	USFS
	Tributaries to South Fork						
10	Coal Creek at Mouth	1994			60.9 F	5.0 F	The Timber Co., USFS
11	Johnson Creek at Mouth	1990 - 98	63.4 F	67.9 F	66.0 F	8.4 F	USFS
12	Sucker Creek at Mouth	1998	67.3 F	67.3 F	67.3 F	9.6 F	USFS
13	Johnson Creek above Sucker	1998	61.8 F	61.8 F	61.8 F	7.0 F	USFS
14	Rock Creek at Mouth	1990 - 98	65.7 F	70.9 F	68.6 F	9.5 F	USFS
15	Rock Creek at Bridge	1991	68.3 F	68.3 F	68.3 F	11.9 F	USFS
16	Lockhart Creek at Mouth	1998	57.2 F	57.2 F	57.2 F	2.8 F	USFS
17	Wooden Rock Crk at Mouth	1994			68.7 F	10.6 F	USFS
18	Clear Creek at Mouth	1995 - 96	58.6 F	61.5 F	60.1 F	5.5 F	The Timber Co., USFS
19	Foggy Creek at Mouth	1994 - 98	64.8 F	69.0 F	66.6 F	8.0 F	USFS

Table III-12. Average Existing and Potential Shade by Subwatershed

Element (Factor)	Location	Current Condition	Projected Value, Based on Lack of Disturbance	Time Frame	Resp. Party
Temperature-Shade	Mainstem*	Shade = 49 %	Shade = 75 %	120 years	USFS/PRVT
	Coal Creek*	Shade = 64 %	Shade = 82 %	60 years	USFS/PRVT
	Johnson Creek	Shade = 72 %	Shade = 84 %	60 years	USFS
	Rock Creek	Shade = 65 %	Shade = 83 %	120 years	USFS
	Squaw Creek*	Shade = 75 %	Shade = 86 %	55 years	USFS/PRVT
	Panther Creek*	Shade = 70 %	Shade = 85 %	55 years	USFS/PRVT
	Wooden Rock*	Shade = 66 %	Shade = 83 %	85 years	USFS/PRVT
	Clear Creek*	Shade = 77 %	Shade = 87 %	60 years	USFS/PRVT
	Foggy Creek*	Shade = 67 %	Shade = 85 %	80 years	USFS/PRVT
Temperature-Channel Form	Basin Wide, esp. Rock Crk	Mgmt Related Sed input in lrg Storms	Reduced Mgmt Related Sed. Input	20 years	USFS
	Basin Wide	Roads in High Sensitivity Areas	Upgrade/Eliminate These Roads	20 years	USFS
	Basin Wide	High Risk Stream Crossings	Upgraded Crossings w/o Diversion Pot.	10 years	USFS

***Private timber companies own land in these drainages**

Stream shade provided by forest canopy is generally sufficient on small streams on NFS land within the Planning Area. Maps C-3 and C-4 in Appendix C display existing shade values for the Planning Area generated by the RAPID model. NFS riparian zones in the Planning Area are dominated by shade in the 85-100% category with scattered areas in the 65-84% shade category. Occasional spots in lower categories appear; many of these are adjacent to the Forest Boundary and probably reflect map/photo boundary location errors. Regeneration harvests present in 1996 are readily detected in Maps C-3 and C-4 as abrupt changes in existing shade from green to red/orange at the Forest Boundary. Existing vegetation was derived from aerial photography from 1996; therefore it does not reflect more recent regeneration harvests that have occurred on private timber lands adjacent to the Planning Area. For a more recent assessment of harvest activity and road density, refer to the discussion in the cumulative watershed effects sub-section of this EIS.

b. Effects Mechanisms and Analysis Framework

Temperature

Stream temperature is an expression of heat energy per unit volume, which in turn is an indication of the rate of heat exchange between a stream and its environment. The heat transfer processes that control stream temperature include solar radiation, longwave radiation, convection, evaporation and bed conduction (Wunderlich, 1972; Jobson and Keefer, 1979; Beschta and Weatherred, 1984; Sinokrot and Stefan, 1993; Boyd, 1996). With the exception of solar radiation, which only delivers heat energy, these processes are capable of both introducing and removing heat from a stream.

Anthropogenic increase in heat energy is derived from solar radiation as increased levels of sunlight reach the stream surface and raises water temperature. The pollutant (solar heat energy) is a source of stream temperature increase that is within management measures and is targeted in the TMDL.

Table III-13. Factors that Influence Stream Surface Shade

Description	Measure
Season	Date
Stream characteristics	Aspect, Bankfull Width
Geographic Position	Latitude, Longitude
Vegetative Characteristics	Buffer Height, Buffer width, buffer Density
Solar Position	Solar Altitude, Solar Azimuth

Over the years, the term shade has been used in several contexts, including its components such as shade angle or shade density. For purposes of this TMDL, shade is defined as the percent reduction of potential solar radiation load delivered to the water surface. Thus, the role of effective shade in this TMDL is to prevent or reduce heating by solar radiation and serve as a linear translator to the solar loading capacities.

The percent effective shade is perhaps one of the easiest and straightforward stream parameters to monitor/calculate and is most helpful in directing water quality management and recovery efforts. Using solar tables or mathematical simulations, the *potential daily solar load* can be quantified. The *measured solar load at the streams surface* can easily be measured with a Solar Pathfinder or estimated using mathematical shade simulation computer programs (Boyd, 1996 and USFS, 1993).

Changes in water temperature are most likely to be caused by changes in riparian vegetation and sediment delivery processes. Though much less likely to be significant under current forest practices, changes in runoff timing and water yield can also affect water temperature.

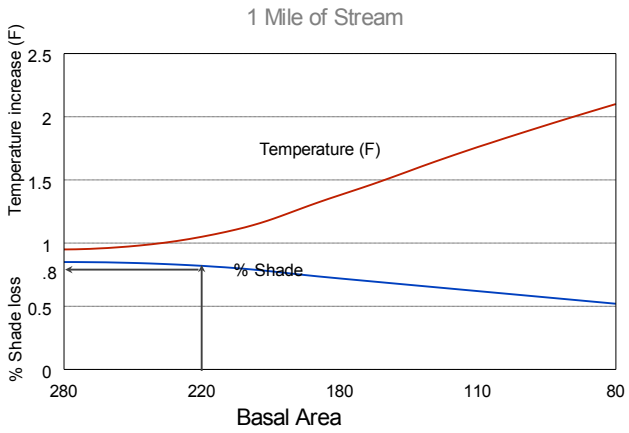
Stream temperature is affected by many variables. Energy exchange may involve solar radiation, long wave radiation, evaporative heat transfer, convective heat transfer, conduction, and advection (Beschta 1984). With the exception of solar radiation, which only delivers heat energy, these processes are capable of both introducing and removing heat from a stream. Solar radiation is the most important radiant energy source for the stream heating during the daytime (Brown, 1983; Beschta et al., 1987). Reduced riparian vegetation can increase solar radiation, and stream temperature.

Density management and connected actions associated with timber harvest can affect stream temperatures through increased summer stream exposure. When a stream is exposed to solar radiation, heat is delivered to the stream system (Beschta et al. 1987). Some solar radiation would reflect off the stream surface, depending on the sun's elevation. All solar radiation outside the visible spectrum (0.36µ to 0.76µ) is absorbed within the first meter of stream depth; only visible light penetrates deeper (Wunderlich 1972). Sellers (1965) reported that 50% of solar energy passing through the stream surface is absorbed in the first 10 cm of the water column.

Removal of riparian vegetation, and the shade it provides, contributes to elevated stream temperatures (Rishel et al. 1982; Brown 1983; Beschta et al. 1987). Exposure to direct solar radiation will often cause a dramatic increase in stream temperatures. When shaded throughout the entire day, far less heat energy would be transferred to the stream. The ability of riparian vegetation to shade the stream depends on vegetation height, density, stream width and position relative to the stream.

Thinning can affect stream temperature by removing shade trees. The amount of shade lost depends on stream width, tree height and stream orientation. The following figure displays effects of thinning for one mile of stream.

Figure III-2. Effects of Thinning on Stream Shade and Temperature



Most daily solar radiation occurs between 10 am and 2 pm. Trees that provide stream shade during this time are considered "primary shade trees." Primary shade trees should not be removed if stream shade is a priority.

Buffer width is a function of angular canopy density for mature trees. At some point, the shade density increases very little as the sun's angle decreases or the sun gets lower in the sky. This is the secondary shade zone. The primary shade tree zone for mature trees varies from 50 to 60 feet in width. Very little additional shade is gained when the sun is low enough to intercept the secondary shade trees. Therefore, in dense stands such as the plantations proposed for treatment, trees outside the "Primary Shade Zone" can be thinned with no effect on stream shade.

Turbidity
Changes in hillslope soil properties can affect water quality and channel morphology by changing runoff timing and hillslope sediment delivery rates. Turbidity results from increased suspended sediment that reduces water clarity. Coarse materials such as gravels, cobbles and coarse sands, settle out and do not contribute to turbidity. Material finer than 0.4 mm can become suspended in the water and reduce clarity. Slope failures in riparian areas can introduce fine sediment into the stream and increase turbidity. Also see sediment delivery discussion in the Hydrologic Condition issue, above.

c. Direct and Indirect Effects of Alternatives

Temperature

No-Action Alternative
No short term or direct effects on shading would result from No-Action, however, over the long term, overly dense conditions may allow insects, disease or fire to reduce the canopy shading, suggesting higher risk of increased temperature than with density management.

Proposed Action/Action Alternatives
Under the Proposed Action and Action Alternatives, thinning treatments utilizing the specially designed Riparian Reserve Project Design Criteria, would not adversely affect downstream water temperatures during critical periods. Trees in the primary shade zone would not be removed except where skyline corridors cross perennial channels and where road/stream crossings are constructed or reconstructed. New road construction occurs mainly in the uppermost areas of the watershed where streams are first and second order. During the summer months, surface discharge from these channels drops to less than a few gallons per minute and may be intermittently subsurface. Constructed stream crossings would occur on proposed new permanent roads and on existing railroad grades proposed for conversion to permanent road. These roads and crossings would not be anticipated to result in measureable increases to water temperature for the following reasons:

- All of the crossings are located on first and second order streams. These channels are only a few feet wide and have small discharges.
- Sun exposure would be 100% blocked as the water flows through the culvert. Exposure upstream and downstream of the culvert would occur over a few linear feet and would be reduced by adjacent forest canopy; this limited exposure is not enough to cause a measureable change in water temperature.
- The largest watershed area above these crossings totals approximately 60 acres. Others are 30 acres or less. This presents very little drainage area to collect surface water to these crossings. Stream discharge from such small drainage basins is low, especially during the summer when ground water levels are lowest.
- Skyline corridors would remove minor amounts of canopy in the primary shade zone where the corridor crosses perennial streams. Skyline corridors that cross Riparian Reserves are required to be 12 feet or less in width, and no less than 150‘ apart, and be utilized with full log suspension. Surrounding trees and understory would make shade loss resulting from these gaps in the canopy negligible. The open area would be occupied by the growth of neighboring trees within a few years. No measureable increase in water temperature is anticipated at corridor locations.

Turbidity

No-Action Alternative
Under No-Action, no direct effects would result from this alternative.

Proposed Action/Action Alternatives
Application of special Project Design Criteria as part of the Action alternatives and mitigating measures would prevent the generation of sediment that could create turbidity that could reach perennial streams. NFS land within the Planning Area is dominantly gently sloping with mature forest and well developed understory. Steeper areas with slopes greater than 35% would be thinned by either skyline or helicopter methods. Sediment production resulting from thinning activities is expected to be minimal and localized for the following reasons:

- Thinning would leave sufficient forest canopy to prevent large increases in storm runoff or snowmelt.
- Minimally disturbed soils and understory vegetations would recover and anchor surface soils.
- Thinning activities would occur in areas where streams and runoff amounts are both small. Units located along Coal Creek that are exceptions to these conditions have site specific mitigating measures designed to prevent or capture activity generated sediment.
- No cut buffers in the stream bank protection zone and primary shade zone would act as capture and retention areas between stream courses and activity-generated, localized sediment sources.
- Wet weather conditions would preclude hauling as per design criteria; road-generated sediment during wet conditions is the primary source of logging activity-generated sediment.
- Less than 12% of the total harvest area is within the Riparian Reserve. 7% of the Proposed Action harvest area is located in sensitive areas of the Coal Creek subwatershed; 5% of Alternative 3. All sensitive areas are excluded or harvested by helicopter under Alternative 4.

d. Cumulative Effects

The water quality cumulative effects analysis is primarily discussed under the Cumulative Watershed Effects section, below.

Treatments under the Proposed Action would likely not occur within a given watershed all in one year, treatments would likely be spread over a 5 year period. This would reduce the risk of adverse effects by spreading surface disturbance over time. It is also highly likely that the total extent of acres within candidate stands would not be treated, because of the potential for areas to be excluded with application of the Project Design Criteria, as well as the fact that some stands or portions thereof may not be overly dense and in need of density management at this time.

The Proposed Action and Action Alternatives would not create adverse effects detectable at the sixth field scale, even though the acreage and subwatershed existing condition suggest that risk of cumulative watershed effects would increase. Action alternatives are designed to avoid or mitigate impacts in sensitive watershed areas and could be implemented without increasing sediment loads that would contribute to existing degraded watershed condition.

3. CUMULATIVE WATERSHED EFFECTS

Effects of variable density management (thinning) treatments and other connected actions on the risk for adverse cumulative watershed impacts.

Past activities are considered part of the existing condition. To understand the contribution of past actions to the cumulative effects of the Proposed Action, 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 future cumulative effects. EIS Appendix C (incorporated by reference) includes more detail on current watershed and water quality conditions, characteristics, and risks for adverse cumulative watershed effects.

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 costly to obtain at the scale of the entire Forest. Current conditions have been impacted by many 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.

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 action over the last century that has contributed to current conditions. By looking at current conditions, the residual effects of past human actions and natural events can be recognized, regardless of which particular action or event contributed those effects.

On BLM-managed lands and private lands current harvest practices would be expected to continue. On BLM lands there would continue to be a focus on thinning and prescribed fire. Thus, no new young stands would be created. On private lands, harvest levels are expected to be maintained at the current intensity and rotation. In general, if private lands are harvested on a 40-50 year rotation, there would continue to be young stands on private land about half of the time.

a. Background and Analysis Framework

The project Planning Area is surrounded by private timber production lands that have been, and continue to be, harvested by regeneration methods. Existing watershed disturbance as of 2009 was analyzed for both private and NFS lands in project subwatersheds in order to provide a realistic context for the contributions of the Action Alternatives to cumulative watershed effects.

For most of the Planning Area, risk for adverse CWE is at the moderate/high threshold level. Risk analysis utilized a process developed for the Pacific Northwest in response to a request from the National Marine Fisheries Service regarding determination of the cumulative effects to fish populations protected under the Endangered Species Act of 1973. The process is documented as *Determining the Risk of Cumulative Watershed Effects Resulting from Multiple Activities* (USDA, Forest Service, 1993). This process was developed by Forest Service fish biologists and hydrologists from Regions 1, 4 and 6, and reviewed by forest industry, National Marine Fisheries Service, and tribal representatives.

Evaluation of peak flow data in Oregon and Washington was conducted by Grant et al. (2008) in a publication titled *Effects of Forest Practices on Peak Flows and Consequent Channel Response: A State-of- Science Report for Western Oregon and Washington*. Discussions and conclusions in the Grant et al. report are relevant to, and update, the analysis process developed in 1993 because peak flow changes are an indicator of watershed response to management actions and represent a host of indirect effects. Grant et al. states:

―In general, the magnitude of channel morphologic changes because of peak flow increases alone are likely to be much less significant than other impacts associated with forest harvest activities. Effects of deforestation on landslides, debris flows, and surface erosion are well documented (e.g., Reid 1993, Sakals et al. 2006, Sidle et al. 1985) and these are likely to have far more direct effects on channel structure than peak flows alone, as these processes typically involve direct introduction of sediment into stream channels. In particular, accelerated geomorphic processes associated with forest roads are likely to have some of the most pronounced effects on forest streams (e.g., Wemple et al. 2001)."

This section describes the indicators used for the assessment of existing watershed condition as of 2009, including modifications based on information provided in Grant et al. (2008) and based on the author's professional judgment.

The 1993 USDA/USFS protocol provides a means of assessing the relative risk of incurring adverse cumulative effects from actions which, individually, would be ―not likely to adversely affect" fish production. For the Planning Area, this protocol is used to assess the existing condition resulting from past and recent timber management on both National Forest System and privately owned lands.

Grant et al. (2008) concluded that watershed studies at the scale of larger drainage areas (more than approximately four square miles) are rare, and that variables specific to a particular watershed could influence study results more than timber harvest (for example basin condition and vegetation types). For this reason, 6th field subwatershed boundaries were used for analysis rather than the 5th field watershed boundary. In this case, the subwatersheds involved have a similar management history, geology, and soil characteristics (refer to Watershed Analyses, USFS 1995 and BLM, 1994). The Planning Area is contained in five subwatersheds that experience rain, fog and transient snow associated with a marine influenced climate (USFS Watershed Analysis, 1995). The Planning Area is dominantly in a precipitation regime dominated by rain, with rain-on-snow occurring at the highest elevations.

Watershed condition and channel condition rating factors used for this analysis are described below:

- **Hydrologic Maturity** (forest canopy recovery) -- A coarse filter for ―immature vegetation" that is often used is the percent of clear-cut (regeneration harvest) forested stands less than 30 years old. Watersheds with more than 30% of such stands are at high risk (USDA 1993). Likewise, Grant et al. (2008) predicted peak flow changes would become detectable when stands less than 30 years old occupy more than 29% of the area in rain-dominated zones, and more than 15% in the transient snow zone.

- **Road Density** -- areas that exceed 3.6 mi/sq.mi. in high relief watersheds, and that exceed 4.6 mi/sq.mi. in low relief watersheds are considered to be at high risk of adversely impacting water quality and water yield (USDA 1993).

- **Temperature** -- used as an indicator of habitat and channel condition (USDA 1993); stream temperature should not exceed fish tolerance or state thresholds.

- **Large Woody Material** -- used as an indicator of habitat and channel condition (USDA 1993).

b. Hydrologic Maturity Assessment for Planning Area

Forest canopy cover was assessed by inventorying stands less than 30 years old in the affected subwatersheds up to the year 2009 (see Attachment 1 of Appendix C for methodology). This assessment captures private timber land harvest activity as well as that on BLM and NFS lands. Table III-14 summarizes this assessment as percent of each subwatershed harvested and provides a risk rating. Harvest from 2005 to 2009 is provided to show where the most recent activity has occurred.

Table III-14. Regeneration Harvest as Percent of Subwatershed

Subwatershed	Total Regeneration Harvest 1977-2009	Regeneration Harvest 2005-2009	Risk Rating (USDA, 1993)
Coal Creek	41%	11%	High
Headwaters SF Coquille	10%	2%	Low
Mill Creek	23%	2%	Moderate
Myrtle Creek	32%	8%	High
Lower Rock Creek	40%	12%	High

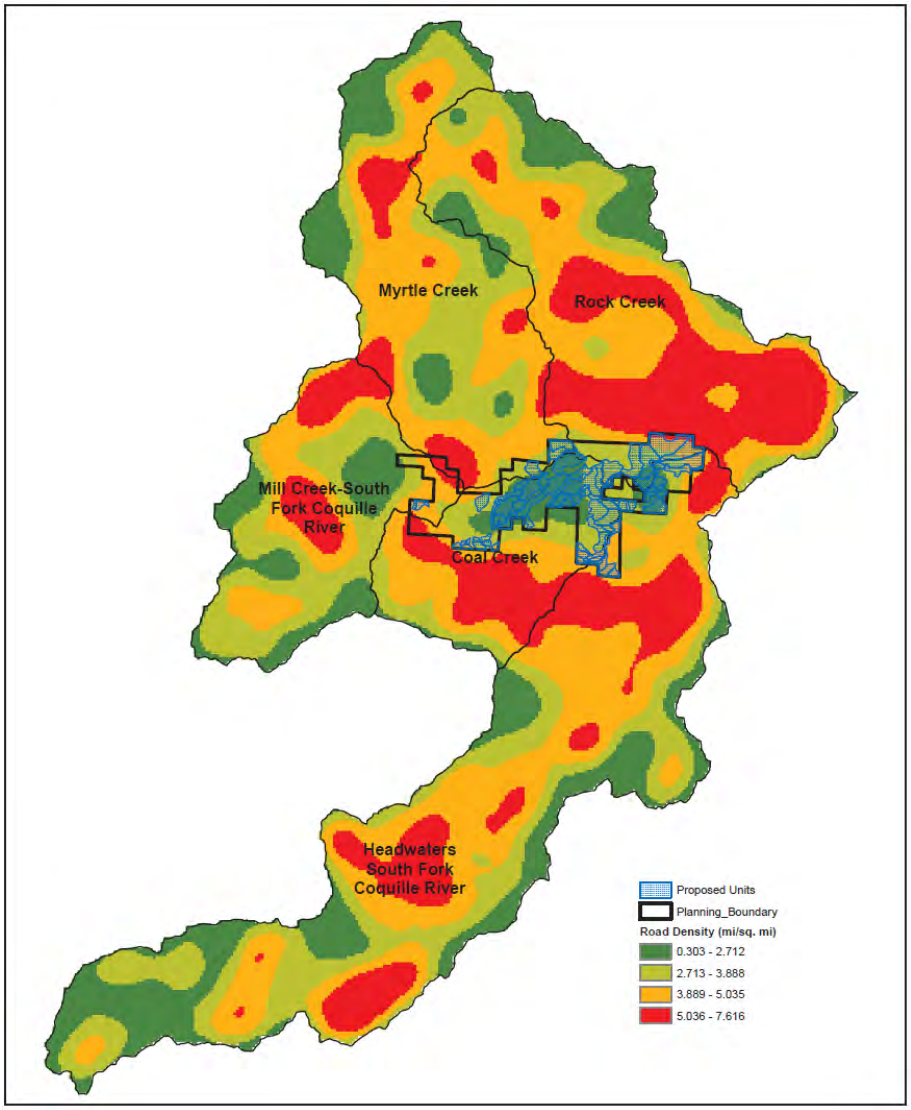
c. Road Density Assessment for Planning Area

Subwatersheds in the Planning Area would be classified as "low relief" for the purposes of road density threshold comparison. Table III-13 shows that except for Lower Rock Creek subwatershed, existing road density for the project subwatersheds is at the moderate risk levels for low relief watersheds (below 4.6 mi./sq. mi). Lower Rock Creek subwatershed is in the "high risk" category.

Road density, expressed as miles/square mile is an easily calculated index of watershed disturbance and a useful coarse filter for determining current watershed condition as a basis for risk of cumulative watershed effects (USDA, 1993). Road density information has been updated to 2009 specifically for the subwatersheds in the Planning Area (see Attachment 1 for methodology).

MAP III-1 depicts road densities that include state/county and classified (BLM/FS) roads, but do not include temporary roads or skid trails (no data). High risk ratings begin at 4.6 miles/sq. mi. (USDA, 1993). The map below shows that most NFS lands in the Planning Area have densities less than 3.8 miles/sq. mile. NFS lands along the edges of the Forest/private land boundary have road densities higher than 3.8 miles/sq. mile. Subwatersheds that include the Planning Area would be rated "moderate" or "high risk" for watershed effects associated with roads.

MAP III-1. Subwatershed Road Density



d. Large Woody Material Assessment for Planning Area

Coal Creek subwatershed forms the core of the Action Alternatives in that it contains the majority of the harvest units, proposed road construction, and haul routes. Other subwatersheds are peripherally involved along subwatershed divides. The 2010 Stream Survey for Coal Creek found little or no medium or large size class woody material and little potential for future recruitment (refer to detailed information under Existing Environment section of this report). Coal Creek would be rated "Poor" for large woody material, as an indicator of habitat and channel condition (USDA 1993) based on the condition of the main channel. According to watershed analyses and stream surveys, quantities of large woody material in stream channels, and quantities available for recruitment to stream channels, are low throughout the affected watersheds.

Watershed Analysis for the Middle Fork Coquille River states that within the last 100 years, standing and downed conifers were removed from, and roads were built along, the majority of riparian areas in the Middle Fork Coquille River basin. Since red alder responds to heavy disturbance activities such as logging and road building, the riparian areas were converted from mixed conifer stands with a hardwood understory to red alder-dominated stands with a shrub understory.

"The entire length of the Middle Fork Coquille River and portions of nearly every tributary stream are constrained by roads. In general, the drainage has a deficit of in-stream structure (large woody debris) and channel complexity, with the exception of a few isolated stretches on some tributaries." (2010 Stream survey)

e. Overall Risk of Adverse Cumulative Watershed Effects

Table III-15 summarizes the existing condition information **as of 2009** and provides an overall risk rating for detectable watershed effects for each subwatershed in the Planning Area. Note that for all but the Headwaters S.F. Coquille subwatershed, the risk is currrently "High".

Table III-15. Summary of Risk of Adverse Watershed Effects

Subwatershed	Hydrologic Maturity Risk Factor	Road Density Risk Factor	Temperature Effective Stream Shade Increase Needed	Large Woody Material	Overall risk of Adverse Watershed Effects
Coal Creek	High	Moderate	18%	Poor	High
Headwaters SF Coquille	Low	Moderate	16%	Fair	Moderate
Mill Creek	Moderate	Moderate	(no data)	Poor*	High
Myrtle Creek	High	Moderate	(no data)	Poor*	High
Lower Rock Ck	High	High	(no data)	Poor*	High
*condition based on generalized description/history from watershed analysis					

Table III-16 shows that private land holdings dominate each of the project subwatersheds, except for the Headwaters SF Coquille. Ongoing regeneration harvest on private lands is expected to continue. The risk for adverse cumulative watershed impacts (i.e., peak flow increases, channel morphology shifts), as assessed above, would remain at or somewhat above current levels. Based on recent harvest activity levels, it would be reasonable to assume that the risk of adverse watershed effects in the Headwaters SF Coquille subwatershed would remain at moderate levels when averaged over the entire subwatershed. Within the Headwaters subwatershed, private timber production land dominates the Wooden Rock Creek drainage.

The S.F. Coquille Watershed Analysis identifies Wooden Rock Creek as an important tributary to the S.F. Coquille within the Headwaters subwatershed. Wooden Rock Creek discharge is twice that of the main stem at the confluence and provides low temperature water into the temperature-sensitive S.F. Coquille. Increasing risk of adverse watershed effects resulting from continuing regeneration harvest on private lands is anticipated for the Wooden Rock Creek drainage (refer to Existing Shade Maps, showing low stream canopy along Wooden Rock Creek, and Oblique Views showing regeneration harvests; in Appendix C, Hydrology Report). For this portion of the Headwaters subwatershed, risk of stream water temperature increases and risk of peak flow increases would be high.

Table III-16. Private Ownership by Subwatershed

Subwatershed	Acres in Private Ownership	% of Subwatershed	% of Subwatershed Harvested in the Last 30 Years	% of Private Subwatershed Acreage Estimated to be Available for Future Harvest
Coal Creek	6,000	60	41	19
Headwaters SF Coquille	9,904	25	10	15
Mill Creek	10,966	79	23	56
Myrtle Creek	17,918	89	32	57
Lower Rock Creek	21,481	84	40	44

Risk of adverse watershed effects in the remaining subwatersheds are at high levels and are likely to remain at high risk levels as a result of continuing regeneration harvest on private lands. Table III-14 indicates that large portions of the project subwatersheds have been regeneration harvested over the last 30 years, and much is still available. All but a few percent of the harvested acreage over the last 30 years have occurred on private timberlands. Private lands still available for harvest could maintain the risk for adverse watershed effect at a high level for decades. The mainstem of Coal Creek has lost structural elements and is currently degraded in its ability to trap and store sediment. No substantial recovery of this condition is anticipated. Likewise, substantial improvements in water temperature in the SF Coquille River downstream of the Forest Boundary are unlikely given the lack of existing shade along the river and the current harvest trends on the private uplands.

f. Risk Of Adverse Cumulative Watershed Effects - Action Alternatives

Cumulative Effects Risk for Alternative 2 (Proposed Action)
The Proposed Action would present no measureable increase in risk for adverse cumulative watershed effects in the Headwaters SF Coquille, Mill Creek, Myrtle Creek or Lower Rock Creek subwatersheds.

This is due to:

- The minor involvement of these subwatersheds in the Proposed Action (see Table III-4, above).
- The location of units/roads at or near ridges and watershed divides where effects would be minimal.

Risk of adverse cumulative watershed effects in the Coal Creek subwatershed is currently high since the main channel is already in a degraded condition. The addition of the proposed harvest acreage and road construction within this degraded subwatershed may contribute to additional risk of adverse effects; however, limited stand management could be conducted without increasing risk if the impacts could be limited to the site scale. The following conditions would allow containment of impacts to the local or unit level (site scale):

- NFS lands contain hydrologically mature stands with large in-stream and upland wood present; this provides vegetative buffers that would counter increased runoff or sediment transport.
- NFS lands are located mainly in the uplands where streams are small and discharges are low; risk of hydrologic impact from this portion of watershed is low.
- The majority of the proposed units are located thousands of feet away from the main channel.
- Proposed thinning is designed to enhance the growth and vigor of the stand by removing intermediate and suppressed trees.
- Stream buffers and equipment limitations are designed to eliminate off-site impacts.

Some proposed units are located in areas that have a greater potential for hydrologic impacts. These units are listed in Table III-8 (above). Their combined acreage is relatively small; however these units would present more risk of measurable impact than the rest of the project.

Cumulative Effects Risk for Alternative 3
Under Alternative 3, the risk for cumulative adverse watershed effects remains small for all subwatersheds, except Coal Creek. Risk levels for the Coal Creek subwatershed are less than those in the Proposed Action due mainly to the reduction of road construction (refer to Table III-2 and III-3, above). Road density would be elevated slightly over existing levels but would remain in the ~~"~~moderate" range for this risk factor. The relatively small reduction in harvest is not likely to have an impact on cumulative effect risk since tree removal is limited to thinning (see discussion under the Proposed Action) and since the acreage involved is less than 4% of the subwatershed.

Cumulative Effects Risk for Alternative 4
Alternative 4 presents the least ground disturbance of all of the Action Alternatives. Harvest acreage reductions between alternatives are low. Table III-5 shows the distribution of logging systems by harvest acres and shows only a 6% decrease between the Proposed Action and Alternative 4. Reductions in surface disturbance are gained by eliminating road construction and increasing use of helicopter logging systems.

Alternative 4, like the other Action Alternatives, presents no risk of adverse watershed effects in any subwatershed other than Coal Creek. Ground based equipment harvest would include 15% of the subwatershed. Surface impact due to harvest by skyline and helicopter yarding would be a minor contribution to overall watershed disturbance.

Coal Creek subwatershed has been 40% regeneration harvested in the last 30 years, therefore Alternative 4 could still contribute to the risk of adverse cumulative watershed effects. Grant et al. (2008) suggested that harvest alone is relatively benign in increasing peak flows except at levels above 80% harvest. Roads are responsible for the bulk of peak flow increases. Since Alternative 4 avoids new road construction and any substantial contribution to subwatershed road density, it is unlikely that peak flow increases from NFS land in Coal Creek would occur.

4. SOILS, GEOLOGY AND SITE PRODUCTIVITY

Effects of variable density management (thinning) treatments and other connected actions on soils, geologic stability, or site productivity through detrimental soil disturbance, erosion, or effects on woody material.

This issue will describe background geology and analyze effects to existing soil resources within the Eden Ridge Timber Sales Planning Area, more specifically, soil productivity and slope stability. EIS Appendix D (incorporated by reference) includes more detail on current soils and geologic conditions, characteristics, and risks for adverse effects. Strongly associated resources are described and analyzed in the hydrologic issues and Hydrology Report (EIS Appendix C), and the Preliminary Silvicultural Diagnosis (EIS Appendix B); both incorporated by reference.

a. Background and Analysis Framework

Management Direction
The authorities governing Forest Service soil management are outlined in Forest Service Manual (FSM) 2550 – Soil Management (WO Amendment 2500-2010-1, Effective November 23, 2010). Regional direction for maintaining and protecting the soil resource from detrimental disturbance to soil productivity is given in FSM 2500 – Watershed Protection and Management, Region 6 Supplement No. 2500-9801.

The Siskiyou National Forest (SNF) LRMP provides standards and guidelines (S&Gs) for soil and water resources on pages IV-44 through IV-48. In regard to soils and geology, included are S&Gs for detrimental soil conditions, soil erosion, mass movement, and large woody material.

Detrimental soil conditions include compaction, displacement, puddling, and severely burned soil conditions. Detrimental soil conditions are further defined in FSM 2500, Region 6 Supplement No. 2500-98-1. On the Siskiyou National Forest, the total area of detrimental soil conditions should not exceed 15 percent of the total acreage within the activity area, including roads and landings (Siskiyou National Forest, 1989).

Surface organic matter (duff, litter) is vital for protecting surface soils from erosion. Mineral soil exposure (loss of duff and litter) should not exceed the following limits (ibid.):

- 40% mineral soil exposed on soils classed low-to-moderate erosion hazard;
- 30% mineral soil exposed on soils classed high erosion hazard;
- 15% mineral soil exposed on soils classed very high erosion hazard.

Standards and Guidelines for large woody material stress the importance of addressing site-specific needs. In general, five to twenty pieces of large woody material per acre should remain on each site; material should be from a range of decomposition classes; each piece should be at least 20 inches in diameter at the large end and contain at least 40 cubic feet volume (ibid.). To better guide site-specific needs, additional tools based on Plant Association Groups (PAGs), and down wood information collected with stand exam data, are used to refine the large woody material prescriptions. Because the Forest‘s PAG data is at a finer scale, the Forest is currently using plant series data from new PAG classifications, delineated by geographical regions (Cascades, Siskiyous, Coast), for determining snag and down wood objectives on the Rogue River-Siskiyou National Forest (refer to the Silvicultural Diagnosis, Appendix B, for more detail).

In addition, the Northwest Forest Plan requires that all unstable areas and potentially unstable areas be managed as Riparian Reserve.

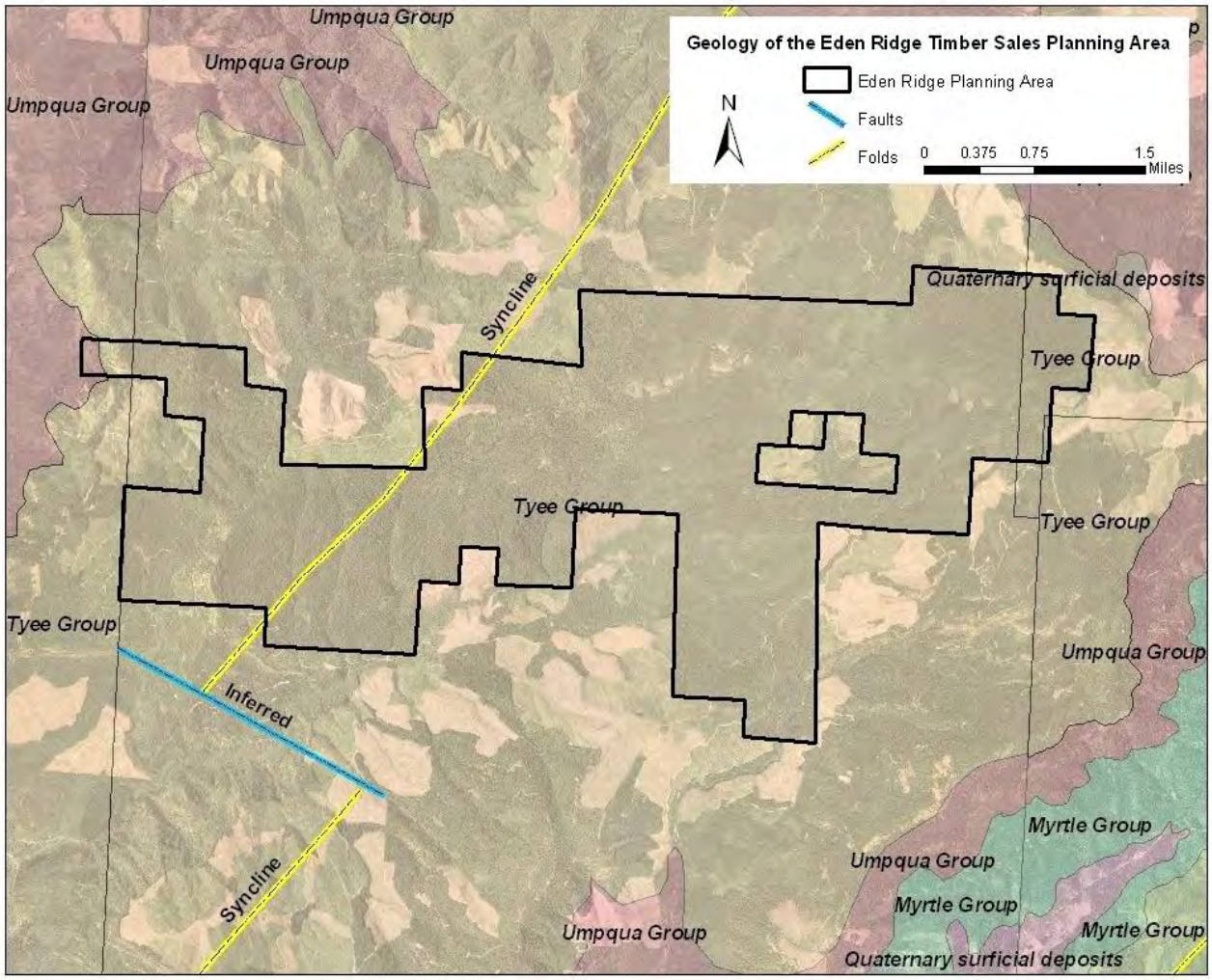
Geology
The South Fork Coquille River forms the boundary between two major physiographic provinces, the Coast Range Province to the north and the Klamath Mountain Province to the south (USDI Bureau of Land Management, 1994). The Eden Ridge Planning Area is just within the south end of the Coast Range Province. The Planning Area is almost entirely overlying the Tyee Formation. A small sliver of the Umpqua Formation is within the very northwest corner of the Planning Area; however no activities are proposed in this area in any of the alternatives, therefore it will not be discussed further.

The Tyee Formation is prominent along the Central Oregon coast from approximately Salem southward to Myrtle Point (Beaulieu, 1971). South of Myrtle Point, isolated outcrops cap various ridge tops along the axis of a major syncline fold (ibid.), and the Eden Ridge Planning Area is an example of this (see MAP III-2).

The Tyee Formation is of middle Eocene age (approximately 49 million years), and is made up of thick marine sediments deposited in a forearc basin from rivers with watersheds that extended into the interior of Idaho (Orr et al., 1992). Tyee sandstone is considered ~~–ar~~kosic", or rich in white mica, quartz, and potassium feldspar, and matches the minerals of the Idaho batholith (Orr et al., 1992).

It is composed of thick rhythmically bedded, cliff-forming, buff to greenish-gray sandstone with thin interbedded dark colored mudstone; the sandstone is composed of medium to coarse-grained, micaceous, arkosic, and lithic wacke (Beaulieu, 1971; Meyer & Amaranthus, 1979). Some conglomerates of andesite, quartzite, chert, and basalt as well as local coal beds are also located in this formation (ibid.).

MAP III-2. Geology of the Eden Ridge Timber Sales Planning Area



(*data from* **DOGAMI, 2009)**

Slope Stability

The Tyee Formation exhibits northerly strikes and dips gently, meaning that it has not been as greatly folded and faulted as, for example, much of the Umpqua Formation it overlies (Beaulieu, 1971). This is exhibited in the relatively gently sloping topography of Eden Ridge over the majority of the Planning Area. Very steep slopes and cliffs are found bordering the gently sloping sandstone slabs, and are associated with fluvial processes where drainage systems have downcut through the resistant sandstone layers as the landmass has been subjected to tectonic uplift, which is still occurring. Soils on these steep slopes have a tendency to fail as debris flows (USDA Forest Service, 1995).

Where Tyee bluffs overlie softer siltstones, rock fall is common, and benches within the bluffs often result from large naturally-occurring deep-seated slumps and transitional failures (ibid.). An example of this can be seen in Figure C-2 within the Hydrology Report, which shows an oblique view of eroding bluffs and benches on the northern side of the Planning Area in the Myrtle Creek subwatershed.

The slopes to the north of and going below the 448 Road in Section 18 were examined for slope instability based on the indication this area is a deep seated slump (Meyer and Amaranthus, 1979). Benchy terrain was encountered with locations of very small seeps/sag ponds towards the western end. No evidence of current instability was found however, and a review of the recently clearcut private lands to the north, downslope and within the same headwaters of Myrtle Creek, indicate this is not an active area of instability, though ancient movement gives the terrain its current shape.

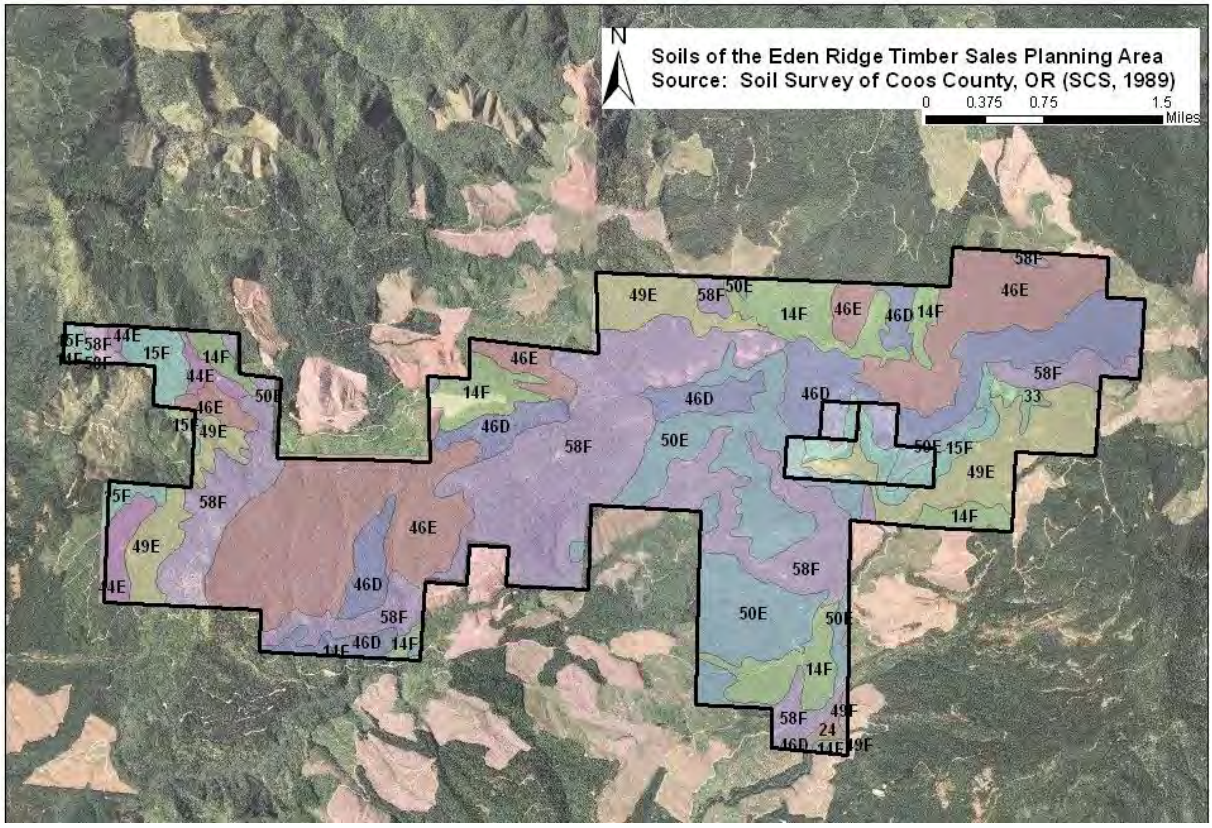
An example of inner gorge instability is found along first order streams within the Planning Area on the southwest end (section 26, area of proposed action Units 307, 308), where streams are flowing through steep, V-shaped inner gorge systems. Flows are regularly cutting the toe slopes of these steep walls, resulting in localized bank failures and slumping, and trees tipping into and across the channel. A review of the forest landslide layer has no records of landslides on the forest in the Planning Area, and none were found during field reviews.

Soils

Soils in the Planning Area are developing from Tyee sandstone. Elevations range from approximately 2,080 to 3,540 feet, with average annual precipitation ranging from 100 to 150 inches, predominantly as rain in the winter. A strong maritime influence results in typically moderate year-round temperatures.

MAP III-3 displays the soil map units within the Planning Area, and Table III-17 lists these map units with some soil characteristics (USDA SCS, 1989).

MAP III-3. Soils of the Eden Ridge Timber Sales Planning Area



(*data from* **USDA SCS, 1989)**

Table III-17. Soil Characteristics of Soil Map Units within the Eden Ridge Planning Area

Map Unit	Map Unit Name	Soil Characteristics
14F	Digger-Preacher-Umpcoos association, 50-80% slopes	**Digger (30%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on side slopes. **Preacher (30%):** Deep; well drained; surface – loam/14" depth; subsoil – clay loam; located on ridgetops & side slopes. **Umpcoos (25%):** Shallow; well drained; surface – v. gravelly sandy loam/3" depth; subsoil – v. gravelly sandy loam; located on very narrow ridgetops & steep side slopes along drainageways.
15F	Digger-Umpcoos-Rock outcrop association; 50-90% slopes	**Digger (30%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on concave side slopes. **Umpcoos (25%):** Shallow; well drained; surface – v. gravelly sandy loam/3" depth; subsoil – v. gravelly sandy loam; located on convex side slopes above rock outcrop & narrow ridgetops. **Rock outcrop (25%):** Hard, fractured sandstone located on precipitous side slopes along drainageways & on very narrow ridgetops.
24	Gardiner sandy loam; 0-3% slopes	**Gardiner (85%):** Deep; well drained; surface – sandy loam/9" depth; subsoil – loamy fine sand; located on floodplains.
33	Kirkendall silt loam; 0-3% slopes	**Kirkendall (80%):** Deep; well drained; surface – silt loam/7"depth; subsoil – silt loam; located on floodplains.
44E	Preacher-Blachly association; 30-60% slopes	**Preacher (60%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on broad ridgetops and benches of mountains. **Blachly (25%):** Deep; well drained; surface – silty clay loam/7" depth; subsoil – silty clay; located on broad ridgetops and benches of mountains.
46D	Preacher-Bohannon loams; 3-30% slopes	**Preacher (50%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on concave areas on benches, side slopes and broad ridgetops. **Bohannon (30%):** Moderately deep; well drained; surface – loam and gravelly loam/11" depth; subsoil – gravelly loam; located on convex side slopes.
46E	Preacher-Bohannon loams; 30-60% slopes	**Preacher (40%):** Deep; well drained; surface – loam/14" depth; subsoil – clay loam; located on concave side slopes. **Bohannon (30%):** Moderately deep; well drained; surface – loam and gravelly loam/11" depth; subsoil – gravelly loam; located on ridgetops and convex side slopes.
49E	Remote loam; 30-50% slopes	**Remote (75%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on side slopes of mountains.
49F	Remote loam; 50-75% slopes	**Remote (75%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on side slopes of mountains.
50D	Remote-Digger-Preacher complex; 12-30% slopes	**Remote (35%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on narrow ridgetops & steeper side slopes. **Digger (30%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on narrow ridgetops & steeper side slopes. **Preacher (25%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on broad ridgetops & less sloping side slopes.
50E	Remote-Digger-Preacher complex; 30-50% slopes	**Remote (35%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on convex side slopes & narrow ridgetops. **Digger (25%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on convex side slopes & narrow ridgetops. **Preacher (20%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on concave, less sloping areas.
58F	Umpcoos-Rock outcrop association; 70-99% slopes	**Umpcoos (40%):** Shallow; well drained; surface – v. gravelly sandy loam/3" depth; subsoil – v. gravelly sandy loam; located on ridgetops & in more gently sloping areas. **Rock outcrop (35%):** Hard, fractured sandstone located on steeper areas along drainageways & on upper slopes of mountains.

Soil Productivity

The main General Soil Map Units in the Planning Area are 10 – Preacher-Bohannon; 11 – Digger-Preacher-Remote; and 13 – Umpcoos-Rock outcrop-Digger. Natural productivity is rated as High for General Map Unit 10, Moderate for General Map Unit 11, and Low for General Map Unit 13 (USDA SCS, 1989). Refer to the Silviculture Diagnosis for additional discussion of soil productivity, including maps displaying the location of soils based on productivity, and the vegetation communities they are supporting.

The following table (Table III-18) displays the relative sensitivities of each of the soil map units in the Planning Area to disturbance (Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/), based off of various soil properties. The higher the rating, the higher the sensitivity the soil has to disturbances that can affect soil productivity.

Table III-18. Sensitivities of Soils in the Planning Area to Selected Disturbances

Map Unit	Site Degradation Susceptibility	Soil Compaction Resistance	Soil Rutting Hazard	Erosion Hazard (Road/Trail)	Erosion Hazard (Off-Road, Off-Trail)	Soil Restoration Potential
14F	Highly susceptible	Low	Severe	Severe	Very severe	High
15F	Highly susceptible	Low	Severe	Severe	Very severe	High
24	Moderately susceptible	Moderate	Moderate	Slight	Slight	High
33	Slightly susceptible	Moderate	Severe	Slight	Slight	High
44E	Highly susceptible	Low	Severe	Severe	Severe	High
46D	Moderately susceptible	Low	Severe	Severe	Moderate	High
46E	Highly susceptible	Low	Severe	Severe	Severe	High
49E	Highly susceptible	Low	Severe	Severe	Severe	High
49F	Highly susceptible	Low	Severe	Severe	Very severe	High
50D	Moderately susceptible	Low	Severe	Severe	Moderate	High
50E	Highly susceptible	Low	Severe	Severe	Severe	High
58F	Highly susceptible	Low	Slight	Severe	Very severe	Moderate

The following paragraphs give a brief explanation of each rating, summarized from the Descriptions in the Web Soil Survey. Refer to the complete descriptions for more detail.

Site Degradation Susceptibility: Rates each soil for its susceptibility for soil degradation to occur during disturbance, seen conversely is the soil's buffering capacity to resist change. Ratings represent relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion and /or redistribution, and loss of adequate rooting depth.

Soil Compaction Resistance: Rates each soil for its resistance to compaction, which is predominantly influenced by moisture content, depth to saturation, percent of sand, silt, and clay, soil structure, organic matter content, and content of coarse fragments.

Soil Rutting Hazard: This rating indicates the hazard of surface rut formation through the operation of forestland equipment. Soil displacement and puddling may occur simultaneously with rutting. "Slight" indicates soil is subject to little or no rutting; "Moderate" indicates rutting is likely; "Severe" indicates that ruts form readily.

Erosion Hazard (Road/Trail): Ratings indicate the hazard of soil loss from un-surfaced roads and trails. Ratings are based on soil erosion factor K, slope, and content of rock fragments. "Slight" indicates that little or no erosion is likely; "Moderate" indicates some erosion is likely, and roads/trails may require occasional maintenance, and that simple erosion-control measures are needed; "Severe" indicates that erosion is expected, roads/trails require frequent maintenance, and costly erosion-control measures are needed.

Erosion Hazard (Off-Road, Off-Trail): Ratings indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. Ratings are based on slope and soil erosion factor K, with soil loss caused by sheet or rill erosion where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance.

Soil Restoration Potential: Rates each soil for its inherent ability to recover from degradation (i.e. soil resilience). Soil resilience is dependent upon adequate stores of organic matter, good soil structure, low salt and sodium levels, adequate nutrient levels, microbial biomass and diversity, adequate precipitation for recovery, and other soil properties.

Overall, the soils within the Eden Ridge Planning Area are sensitive to disturbances that can have an adverse effect to soil productivity. Interestingly, these soils also show an inherent ability to recover well from these disturbances, either naturally or through implementation of restoration activities. This has been apparent in field reviews throughout the Eden Ridge area looking at the residual effects of past actions, discussed below.

The Eden Ridge Planning Area was extensively railroad logged in the 1920s and 1930s utilizing steam donkeys, and was likely covered in slash or burned. There is evidence indicating a wildfire burned through northern areas of the Planning Area as well during these historical harvest operations.

Field reviews looking at soil condition from these past impacts were conducted throughout the Planning Area, particularly focusing in stands being proposed for treatments with this project. Within the stands, outside of railroad grade impacts, no detrimental disturbance still measurable affecting site productivity was found. Decomposing organic litter is providing a consistent blanket across the forest floor to protect surface soils from erosion. Occasional evidence of soil displacement from gouging along a steam donkey trail was found, but soil pits and shovel resistance tests, as well as observation of vegetation cover, did not indicate a measureable difference inside and outside of that past direct disturbance 60 to 80 years later.

Railroad grades, on the other hand, while in places are supporting large trees, are predominantly still heavily compacted and inhibiting or slowing vegetation establishment. These field observations validate the resiliency these soils have to disturbance and their ability to recover naturally over time when given the opportunity, particularly considering the high level of disturbance they experienced in the 1920s and 30s.

Recent stand management has occurred in the Planning Area, though none of these commercial timber sale units are within proposed stands for this project. An area that has experienced recent thinning using skyline harvest systems was reviewed on the western end of the Planning Area. Soil sampling through the stand did not reveal any detrimental disturbance from the recent commercial thinning activity, let alone any measurable cumulative impacts to site productivity from the historical steam donkey/railroad logging.

b. Effects Mechanisms

Slope Stability

Slope stability can be impacted by management actions, through actions that alter soil holding strength of root systems through vegetation changes, change drainage patterns through soil movement or compaction, or undermine slopes. Specific activities as related to the Eden Ridge Timber Sales Project include road construction and reconstruction, silvicultural treatments, and logging systems.

Roads
Road building in forest land is widely recognized as one of the primary causes of debris avalanches in managed forests (Sidle, 1980). Roads change the surface and subsurface water flow patterns, which can cause concentrations of flow and soil saturation where it didn‘t exist before, leading to a slope failure. Roads have the potential to accelerate slumps, earthflows, and possibly creep landslides (Megahan, 1986).

The added weight of fill material on steep slopes, combined at times with improperly routed water that causes saturation of the fill slope, often results in eventual failure. Also, roadcuts in steep, unstable terrain can trigger debris avalanches by removing downslope support.

Road maintenance provides an opportunity to minimize risk of slope failures along road prisms, by providing proper drainage, and recognizing and improving areas that are recognized to be at risk of failure.

Silvicultural Treatments
Through increasing the depth of the saturated zone in the soil, and reducing root strength, the removal of trees can increase slope failures (Megahan, 1986). When the majority of vegetation is removed, such as in a clear-cut, the amount of water in the soil profile is increased for a time due to a reduction in plant uptake and transpiration, as well as reduction in canopy interception. Roots increase the strength of soil by helping to bind soil particles together, and to reinforce a soil mass by anchoring it to the underlying bedrock, particularly in shallower soils (Ziemer, 1981a). When trees die or are cut, the roots die and decay, resulting in a decline of reinforcement by the roots; approximately 50% of the original root reinforcement is lost within 2 years after deforestation, with 90% gone within 9 years (Ziemer, 1981a). However, if only some of the vegetation is removed, such as in a thinning, the loss of root strength is greatly reduced. This is because the remaining trees' root systems are still there to anchor the soils, and they take advantage of the reduction in competition by expanding their root systems (Ziemer, 1981b). Based on the silvicultural treatments proposed (thinning), it is not expected that there would be a measurable effect that would result in an increase in slope failures in the Planning Area (refer to effects discussion, below).

Soil Productivity

Soil productivity can be impacted by management activities, through actions that reduce effective ground cover, displace soil, cause soil compaction or otherwise negatively impact soil structure, destabilize slopes, and change nutrient cycling processes through vegetation and down wood manipulation. Specific activities as related to the Eden Ridge Timber Sales Project include road construction and reconstruction (including temporary road construction and decommissioning), silviculture treatments, activity fuels treatments, and use of heavy equipment logging systems.

Roads
Of any of the forest management activities being proposed with this project, the road system being used/reconstructed/constructed is expected to result in the greatest opportunity for soil erosion per unit area (Megahan, 1986).

Existing System Roads (and historical railroad grades)
Existing system roads are considered a long term commitment of the soil resource to something other than soil productivity. The use of existing system roads during the implementation of this project would not result in a change to the current condition of the soils that are committed to supporting the transportation system. However, where system roads have been closed for a period of years, some level of road reconstruction and maintenance would be necessary to make them suitable for treatment access.

Road (and railroad grade) reconstruction generally requires the removal of vegetation and the reshaping of the former road prism, possibly including ditches, from a road in disrepair. The road may have achieved some degree of restoration from past use, but whatever that degree, it would be reversed. The conditions of roads needing reconstruction vary greatly, from those with near complete restoration to those with hardly any. Reconstruction of these routes, however, has far less impact to soil productivity (since it had long since been comprised) than to native soil sites, and that is the benefit of reusing them over new construction. Nonetheless, soil is compacted and short-term erosion from newly exposed soils is likely.

New System Roads
The construction of new system roads would be a long term commitment of the soil resource to something other than soil productivity. Road construction requires the removal of vegetation and the reshaping of the ground to form a road prism. Minimal disturbance would be on flat terrain where surface soils would be displaced during grading operations, and the surface compacted. On slopes, cut-and-fill slopes would be created, displacing a much greater amount of surface and subsurface soil and potentially bedrock, and affecting a wider area along the route due to creation of cut slopes and fill slopes.

Temporary Roads and Landings
Construction of temporary roads (and associated landings) detrimentally compact soils and contribute to erosion by allowing water to run overland rather than naturally infiltrate at the point of raindrop impact, resulting in indirect impacts on pathways for water movement. Properly designed and constructed temporary roads require structures for channeling this now-redirected water flow to desired locations.

Temporary roads and landings are expected to have an irretrievable reduction in soil productivity since they are bladed (soil is mixed and displaced) and compacted. Even once rehabilitated, the soil profile is modified to a degree that may take many decades to return to the productive state of the undisturbed forest soils adjacent to it. Landings also, with their likely deep compaction, and soil mixing from construction and recurrent disturbance are expected to produce irretrievable reductions in soil productivity. Nonetheless, their use is temporary, with the expectation that following use they would be returned to the highest degree of productivity reasonably achievable.

Silvicultural Treatments
Silvicultural treatments being proposed include: commercial thinning (i.e., —variable density thinning") and non-commercial thinning. Variable density thinning may include the creation of irregular shaped openings (—gaps"), no-thin areas (—skips"), and wide-thin gaps and roadside sanitation that focus on selectively thinning to manage Port-Orford root disease issues. These actions have the potential to affect soil productivity, and organic matter and large woody material through changes to vegetation. Detrimental disturbance as it relates to these silvicultural treatments is discussed under Harvest Systems, below.

Vegetation uptakes nutrients from the soil in a mostly soluble, inorganic form, and converts them to an organic form for metabolism. Most of a tree's nutrients are distributed in the leaves, twigs, and branches; as the tree discards leaves, branches, bark, or dies, the plants organic nutrients are returned to the soil. Organic material returned to the soil is decomposed and the nutrients are mineralized (i.e., converted to an inorganic form) by soil organisms depending on the soil's physical conditions (such as moisture, temperature, aeration, etc…) (Farve and Napper, 2009). All of the silvicultural treatments manipulate to various extents the vegetation component that is a part of the nutrient cycle of the soils it is directly growing on. However, since all of these treatments maintain a component of the original forest system, including some overstory vegetation and the forest floor organic litter layer (i.e., they are not harvest systems such as clear-cuts that drastically change the vegetation component), it is not expected that direct or indirect effects to soil productivity as it relates to nutrient cycling would be measurable.

In the forest, precipitation is intercepted, retained, and redistributed by the tree canopy. Water ultimately evaporates from the canopy (interception) or drips through (through-fall) or runs down the stems (stem flow) to the forest floor. Tree canopies intercept precipitation, moderating and metering its fall to the soil surface. They also redirect this intercepted moisture toward the drip line of the tree, and away from the base of the trunk. In extreme rainfall conditions in the absence of deep-crowned tree cover, such as following clear-cut or shelterwood logging, the rate of water striking the surface could exceed the rate of the soil's ability to absorb it, with localized sheet erosion a likely result.

Such effects are generally only relevant to degrees of canopy removal associated with clear-cutting or shelterwood logging, or high intensity stand replacement fire. The treatments in the Eden Ridge Timber Sales Project, however, are variable density thinning, or select removal of diseased or susceptible trees forming small gaps, where a measurable direct or indirect effect of this sort is unlikely, since there would still be various levels of an overstory component.

As discussed in Chapter II, prescribed amounts of snags and downed wood would be left on a per-acre basis consistent with historical fire regime effects and plant association (plant series) capabilities where existing amounts are below such levels. However, this mitigation is only effective where such snags are available in adequate numbers.

Where they are not so available, there would be an opportunity to create more from remaining live trees. Snag creation would have a positive effect on long-term soil productivity since snags are a source of future down logs, which are a critical component of long-term soil productivity.

There is a limit to this mitigation, however. Snag creation invariably creates —hard" snags, not those in advanced stages of decay. Ideally, a stand would have representatives of snags in all stages of decay at any one time. Since timber management activities exert a disproportional impact on soft snags (since they are most likely to be felled as hazards) than hard snags (more likely to be retained as non-hazards), and they can only be replaced with created or retained hard snags, the inevitable result is an imbalance between the number of snags in advanced decay (near-term down logs) and hard snags (likely to remain hard as either a snag or down log) for a few decades.

Harvest (Logging) Systems
Logging systems (ground-based, skyline-cable, and aerial) have the potential to adversely impact soil productivity through detrimental compaction, displacement, erosion, and loss of effective ground cover/organic matter. Ground-based systems typically have the greatest potential for effects, whereas aerial systems typically have the least potential for adverse effects.

Ground-based Systems (tractor, rubber-tired skidder, harvester-forwarder)
Ground-based logging systems have the greatest potential to adversely affect short and long-term soil productivity. Logging and other equipment can compact and ‗puddle' soils over which they operate (landings, skid roads, roadways, etc). Tractor, or ground based logging has the greatest potential to cause **soil compaction**, which decreases soil volume and pore space and modifies soil structure and results in a decrease in gas, water, and nutrient exchange, slows root penetration, and can aggravate soil drought, especially in Mediterranean climates such as that of SW Oregon (Atzet et al., 1989), though soil drought may be less of a concern here where there is a much stronger maritime weather influence. **Puddling** is the destruction of soil structure, primarily when wet, by severe compaction, to the point where ruts or imprints are made and the soil structure has been so destroyed as to prevent water from infiltrating into the soil profile.

Compaction may inhibit occupation of the soil by organisms that assist in the decomposition of wood to soil organic material that improves site productivity, and help to aerate the soil. Compaction also possibly inhibits the growth of beneficial fungi (mycorrhizae) that provide nutrients to plant roots (Keslick, 1997). Ectomycorrhizal fungi form an essential interface between soil and trees. They usually colonize more than 90 percent of the feeder roots of host plants (Goodman and Trofymow, 1998). Plant development is also restricted in compacted soils due to poor aeration and impeded root growth. As a result, soil productivity is adversely affected (Floch, 1988).

Soil moisture content, soil characteristics, and force affect the level of compaction that can occur from harvest systems. Fine-textured soils dominated by expandable clay minerals, and well-graded, coarser textured soils are most likely to compact when moist, whereas finer textured soils dominated by non-expandable clay minerals, and of poorly graded, coarser textured soils such as most pumice and coarse ash soils, are less affected by soil moisture (Atzet et al., 1989).

Compaction from logging activities is now routinely mitigated, by designating and minimizing the number of skid trails used; by requiring logging equipment to use only those roads and skid trails created during past timber harvest where feasible; using equipment and or techniques shown effective to prevent or minimize compaction (such as low psi (pounds per square inch) or operating on slash to disperse weight); and allowing operations only during conditions when soils are unlikely to be detrimentally compacted beyond the 15% LRMP allowances (such as on dry or frozen ground; or over deep snow with a firm base). These mitigations have been proven successful and are applied to all Action Alternatives in this project.

Detrimental displacement is defined as the removal of more than 50% of the soil's ‗A' horizon (topsoil) from an area greater than 100 square feet that is at least 5 feet in width. This displacement occurs by natural means, such as heavy rains that cause erosion on exposed surfaces (such as skid trails and skyline corridors), or by mechanical means such as churning tractor treads or dragging of logs across the ground. **Erosion** is a form of detrimental displacement. The majority of erosion occurs by sheet erosion (the even removal of thin layers of soil by water moving across extended areas of gently sloping land) and is difficult to detect, as there are no dramatic effects to alert one to its occurrence. Rills and gullies, however, are dramatic examples of erosion that are easily detected.

Detrimental displacement is routinely mitigated by designating and minimizing the number of skid roads and skyline corridors used; requiring a minimum of one-end log suspension to prevent soil gouging; and placing percent slope limitations on ground-based harvest equipment. Additionally, erosion associated with skid trails and skyline corridors can be effectively mitigated by the placement of cross drains (water bars); drainage dips; placement of down wood and slash; and erosion control seeding (or any vegetative cover on exposed soil). These measures have been used for many decades and there has been considerable monitoring and demonstration of their effectiveness.

Large woody material, such as large logs, and standing snags (future large down logs), are critical components in the development and retention of productive soils. Snags are routinely felled if they are believed to be a safety hazard to operations. Operation of logging equipment can mechanically damage/destroy downed logs in advanced stages of decay. Logging and burning has the potential to eliminate these features, particularly those in advanced degrees of decay, from the landscape if care isn't taken to retain them in adequate sizes, numbers, and distribution across the landscape.

Skyline-Cable Systems

Using cables to suspend one or both ends of logs as they are pulled from the stand to the landing largely eliminates the potential for compaction and puddling within the stand. What remains, however, is the potential for detrimental soil displacement if one or both ends of the log are dragged across the ground from the stump to the landing. Full suspension (where the log is lifted entirely off the ground during yarding to the landing) and one-end suspension (where one end of the log is allowed to drag along the ground), are effective mitigations that are now regularly employed to minimize detrimental displacement, as well as the use of a pre-designated skid trail or skyline corridor layout. Skyline systems typically result in approximately 5% detrimental soil conditions.

Aerial Systems

Helicopter logging has the least impact of all logging systems on soil productivity. This is a form of full suspension, with no part of the log being drug across the ground, except for very short distances as logs are lifted off the ground from a central point between logs. Such logging eliminates any potential for equipment-generated detrimental soil displacement, compaction, or puddling and their attendant erosion effects. Helicopter logging does, however, require larger, though fewer landings, with the associated compaction and displacement effects (typically around 2%).

An exception to this is the practice of pre-bunching in helicopter units. Pre-bunching is the short-distance yarding (using small and lightweight yarding equipment) of numerous logs to a reduced number of collection sites within the stand where they would then be picked up by the helicopter. The potential soil benefit is the elimination of skid roads, with their multiple soil compacting and soil displacing passes by heavy equipment with logs in tow; but the practice still induces some level of soil compaction and displacement for short distances in single passes.

Activity Fuels Treatments

Activity fuels treatment refers to the slash and accumulated fuel resulting from the proposed density management treatments. Several methods of activity fuels treatment are being proposed, and include the following: burning tree tops that were yarded to landing sites, and burning materials accumulated by harvest activity that is piled.

Leave Tops Attached
This treatment requires that the top of the tree be yarded to the landing along with the last log (or whole tree if small enough). In some small tree cases, this practice may mitigate the potential for detrimental soil displacement from the dragging log end as the limbs of the top cushion and elevate that end and prevent soil gouging and displacement.

With the increased interest in harvesting biomass, there has been an increased need to understand how removing the branches and needles from the site might be affecting short and long-term soil productivity. Most studies have been based on models and/or nutrient budgets which forecast likely effects; however long-term field studies have also been started. In a review of literature regarding the effects of whole tree harvesting on soil productivity, Farve and Napper (2009) refer to a summary of effects by Waring and Running (2007: 214) that found that ―a whole-tree harvest can remove as much as three times the nutrients as compared to a conventional bole-only harvest….however, since the soil nutrient (belowground) pool contains most of the nutrient capital of a forest ecosystem (by several orders of magnitude), in general, removal of the whole tree during timber harvesting should result in only a small percentage of nutrient loss from the forest ecosystem." With implementation of the Eden Ridge Timber Sales Project, where only a portion of trees are being removed instead of all the trees, the impacts of leaving tops attached is expected to be even less, and likely immeasurable. Therefore this will not be analyzed further.

Handpile burning
Heat produced during the combustion of aboveground fuels (i.e., dead and live vegetation, litter, duff) is transferred to the soil surface and downward through the soil by several heat transfer processes (radiation, convection, conduction, vaporization, and condensation). As heat is transferred downward into and through the soil, it raises the temperature of the soil. The greatest increase in temperature occurs at, or near, the soil surface. Within short distances downward in the soil, however, temperatures can rapidly diminish so that within 2.0 to 3.9 inches (5 to 10 cm) of the soil surface the temperatures are scarcely above ambient temperature (Neary et al., 2005).

Typical physical effects to soil that can occur from fire include changes to soil structure (particularly as a result of loss of organic matter), changes in porosity and bulk density, loss of cover (i.e., canopy, litter, duff), water repellency, and runoff and erosion vulnerability.

Organic matter plays a key role in soil structure in the upper part of the mineral soil at the duff-upper A-horizon interface, in that it acts as a glue that helps hold mineral soil particles together to form aggregates. Fire can impact the organic matter content in soil by killing the living organisms at temperatures as low as 122 to 140^{o}F, and by destructively distilling to completely consuming nonliving organic matter at temperatures of 224^{o}F and 752^{o}F, respectively (Neary et al., 2005). Loss of the organic matter component in the soil breaks down the soil structure, which in turn results in a reduction in the amount and size of soil pore space. When the soil structure collapses, it particularly reduces the amount of macropore spaces, and increases the bulk density of the soil, resulting in a loss to soil productivity.

When fire results in the loss of canopy, litter, and duff cover, it exposes the mineral soil to erosion processes. The litter and duff layers also act as an insulator that protects the underlying soil layers from heating, and if they are consumed, it exposes the mineral soil to greater soil heating impacts. Fire-induced water repellency may occur when combustion of organic matter vaporizes hydrophobic organic substances that then move downward in the mineral soil and condenses into a water repellent layer. This in turn increases risk of soil erosion. Water repellent layers have the greatest impact within the first year after fire, as they tend to break down fairly quickly.

Typical chemical effects to soil that can occur from fire include nutrient losses, cation exchange capacity loss, and changes to pH. Nitrogen is the most limiting nutrient in wildland ecosystems, and as such requires special consideration when managing fire. Nitrogen loss increases with increasing temperatures through volatilization, with no loss of N at temperatures below 392°F all the way up to complete loss of N at temperatures above 932°F (Neary et al., 2005). The amount of N lost is generally proportional to the amount of organic matter combusted, and burning during moist litter and soil conditions have shown a decrease in the amount of total N lost compared to dry conditions (DeBano et al., 1979; cited in Neary et al. 2005).

The cation exchange capacity of soil can be impacted by fire through the destruction of organic matter. The negatively charged particles of organic matter adsorbs otherwise highly soluble positively charged cations, which prevents them from being leached out of the soil. As the amount of organic matter is destroyed from fire, so too is the soils cation exchange capacity.

Cation nutrients (i.e., Ca, Mg, Na, K, NH_4) become concentrated in the ash following fire, and can be lost in several ways such as volatization (but this takes very high temperatures), particulate loss in smoke, runoff and erosion, and there can be a long term loss of cations to leaching due to the soils reduction in cation exchange capacity. Cation exchange capacity rebuilds over time with new accumulation of organic matter. The release of soluble cations from the organic matter during combustion can temporarily increase soil pH, but this is dependent in part upon the amount and chemical composition of the ash. Thick layers of ash (termed the ash-bed effect) found from severe burning conditions tends to have the greatest impact on raising soil pH.

Typical biological effects to soil that can occur from fire include loss of microorganisms, loss of meso- and macrofauna, and loss of roots and reproductive structures such as seed banks. Impacts from fire to microorganisms as well as their recovery can be very complex because so many variables are involved. In general it can be stated that "intense wildfire can have severe and sometimes long-lasting effects on microbial population size, diversity, and function", whereas at the other end of the spectrum, "low-severity underburning generally has an inconsequential effect on microorganisms." (Neary et al., 2005). This range of effects is in part related to the amount of organic matter impacted by fire, and the temperature and depth of soil heating. If both of these can be minimized, so will impacts to the microbial population in the soil. Effects of fire to meso- and macrofauna, such as mites, insects, and earthworms, is also highly variable, depending in part on species, habitat and adaptations.

Pile/concentrated slash burning increases the residence time of the fire due to concentrated fuels, which can lead to more consumption of organic matter, higher soil heating temperatures, heating deeper into the soil profile, and thus resulting in isolated patches of severely burned soils directly under the slash pile. Mitigations minimizing to the extent possible the size of the piles and burning during moist soil moisture conditions can reduce these impacts by keeping burn temperatures and soil heating as low as possible. Smaller burn areas tend to recover quicker as well due to the high amount of un-impacted soil around them that contribute to recolonization of soil microorganisms and other soil biota.

The *1998 Regional Supplement to the Forest Service Manual (FSM 2520 R-6 Supplement 2500-98-1, Effective August 24, 1998)* defines detrimentally burned soil as:

> "The condition where the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer. The detrimentally burned soil standard applies to a contiguous area greater than 100 square feet, which is at least 5 feet in width".

Burning of slash piles should not exceed the detrimentally burned soil standard since individual burn piles are designed to be discontinuous and not greater than 10 feet in diameter. Even if these burn areas are taken into account, it is expected that less than 2 percent of the area would be left in a severely burned condition.

Detrimental burning occurs when high intensity fire consumes organic matter above and within the soil, heating the soil to the point where the mineral soil surface changes color and the next one-half-inch deeper of soil organic matter is charred. This can happen under natural high-intensity wildfire conditions or by management actions beneath burn piles or ‗prescribed burns' when the prescriptions are applied incorrectly or ―escape" the parameters of their prescription and become overly intense.

Detrimental burning is most likely under extreme fire weather and dry fuel moisture conditions where fuel accumulations are greatest. Reduction of this fuel through management action decreases the potential of high intensity fire and detrimental burning of the soil. In areas where fuels have been treated (reduced), it is common to have only approximately 20% of the soils in a wildfire-burned area to be in a detrimentally burned condition; this is half of what has been observed in areas where fuels had not been treated.

c. Direct and Indirect Effects of Alternatives

Alternative 1 – No-Action
Under the No-Action Alternative, no project activities would take place. No slopes or soils would be disturbed from road management (construction, reconstruction, maintenance, decommissioning) activities. Slope stability throughout the Planning Area would continue at its natural rates, based on the natural conditions of the forest vegetation and climatic conditions.

Soils would continue to develop along current trajectories and under natural vegetation and climatic conditions. The forest floor would remain intact, maintaining a natural level of effective ground cover. The current level of large woody material would be unaffected.

Effects Common to Action Alternatives

Slope Stability

Roads
Many of the proposed roads are ridge top routes with no grade. There would be very little to no risk that these segments would fail or otherwise create slope instability. However, other roads would be on slopes with grade and/or would cross riparian areas, and/or reconstruct sections of old railroad grade trestle, where there could be an increased chance of failure at some point in the future.

Therefore, only the miles of road with characteristics having increased risk are compared between Action Alternatives (Table III-19). The road characteristics are based upon the tables in EIS Chapter II and field knowledge of the proposed routes.

Table III-19. Miles of New Road with Conditions that Could Increase Risk of Failure

	Alternative 2	Alternative 3	Alternative 4
Miles of new classified and temporary road that crosses riparian/ has some grade/ reconstruct. railroad trestle	4.74 miles	0.32 miles	0 miles

Silvicultural Treatments
It is not expected that there would be an increased chance of slope instability due to the silvicultural treatments (commercial or pre-commercial) being planned with the Eden Ridge Timber Sales Project, under any Action Alternative. It is expected that the thinning treatments planned would not reduce the density of remaining live tree roots enough to cause a weakening of the soil-root reinforcement. The remaining trees' root systems would respond to the reduction in competition and expand in the soil profile before the root systems of the cut trees had substantially decayed.

Soil Productivity

Roads

Under all Action Alternatives, the proposed road system would have an effect on soil productivity through increased likelihood of surface erosion, as well as a commitment of the soil resource to something other than supporting a forest ecosystem. The potential extent of the effects between each alternative is shown in Table III-20. For the acreage of land taken out of productivity, the range is based on a minimum road width of 12 feet, and a maximum road width of 16 feet. Level of erosion from road surfaces compares the overall miles of road surface that would exist and have the potential to shed sediment, between alternatives.

Table III-20. Estimated Acres of Total Commitment of Soil Resource/Loss of Soil Productivity

	Alternative 2	Alternative 3	Alternative 4
Acres taken out of Productivity (range based on est. road widths)	78 acres -104 acres	63 acres – 84 acres	60 acres – 80 acres
Long-term opportunity for Erosion: Miles of System Road (existing &new construct/reconstruct)	53.4 mi.	43.1 mi.	40.52 mi.
Short-term opportunity for Erosion: Miles of Temporary Road	0.3 mi.	0.03 mi.	0 mi.

Silvicultural Treatments

As discussed earlier, since all of the silvicultural treatments (commercial and non-commercial) maintain a component of the original forest system, including some overstory vegetation and the forest floor organic litter layer (i.e., they are not harvest systems such as clear-cuts that drastically change the vegetation component), it is not expected that direct or indirect effects of proposed silvicultural treatments to soil productivity would be measurable.

Harvest (Logging) Systems and Pile Burning

Table III-21, below, provides an estimate of the maximum amount of detrimental disturbance that could potentially occur with each harvest system, per alternative. However, implementation of mitigation measures is expected to result in less than the estimated acreages actually resulting in *detrimental* disturbance (in particular displacement and compaction).

In addition, review of recently commercially thinned stands in the Eden Ridge Planning Area also showed very little to no evidence of residual detrimental disturbance, which is another indication that this is a worse-case scenario estimate of disturbance.

Table III-21. Estimated Acres of Detrimental Disturbance per Action Alternative

	Alternative 2	Alternative 3	Alternative 4
Ground-based harvest system (est. 15%)	318 acres	268 acres	216 acres
Skyline harvest system (est. 5%)	60 acres	47 acres	23 acres
Aerial harvest system (est. 2%)	0 acres	10 acres	23 acres
Pile & Burn (est. 2%)	21 acres	16 acres	12 acres
Totals	**399 acres**	**341 acres**	**274 acres**

d. Cumulative Effects

The cumulative effects area for the soil resource is the proposed treatment units and road systems in the Project Areas, and areas downslope of proposed treatments and road systems that could be impacted by soil movement/slope instability.

Past actions in these areas include the historical railroad logging and related burning/wildfires from the 1920s and 30s. As discussed earlier, the soils and slopes in the Planning Area are in a state of near to total recovery from those past actions, based on growth of vegetation, lack of erosion or other active mass wasting, and build-up of organic matter in the surface soils. Therefore proposed actions under the Action Alternatives would have no measureable adverse cumulative effect with these past activities within the stands.

There are no other current or proposed activities in the Planning Area that would occur at the same locations; therefore there are no other potential cumulative effects with any of the Action Alternatives.

5. ECONOMICS

Commercial variable density management (thinning) treatments and other connected actions may generate various economic benefits/costs depending on design. Effects of economic factors on the feasibility to implement treatment activities as well as economic return to the local economy.

Activities associated with the Proposed Action or its alternatives may generate various economic benefits/costs and overall present net values or benefit cost ratios. The economic value (cash flow) of commodities provided under these proposals may be less than the associated costs.

Under all Action Alternatives, varying amounts of commercial timber would be made available to the local wood products industry. Revenue sharing from harvested timber would provide contributions to federal, state, and county budgets relative to the amount of timber offered for sale.

a. Background and Analysis Framework

National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA)
NEPA requires that federal agencies evaluate all activities which may have significant effects on the environment. The Act requires that an environmental assessment regarding the project's impacts on its surroundings be made available to other agencies and to the public. Land-management plans for national forests must provide the Forest Service the ability to mitigate any adverse effects on the environment.

NFMA mandates that national forest plans must

> "provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area" [16 U.S.C. §1604].

The mission of the USDA Forest Service is to:

> ~~–~~sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations."

Siskiyou National Forest Land and Resource Management Plan
The decision to provide a sustainable and predictable supply of commercially valuable timber was made and documented in the Record of Decision for the Siskiyou National Forest Land and Resource Management Plan Final EIS (USDA 1989), as amended. The Forest Plan was designed to achieve the following Forest-wide goals (LRMP ROD-10):

1. Provide a balance of resource management that will maintain a healthy Forest ecosystem, and help to supply local, regional and National social and economic needs.

2. Provide a sustained yield of resource outputs at a level that will promote the stability of local communities.

Timber sale projects are expected to maximize net public benefits while achieving management goals for other resources in the most economically efficient manner and to contribute toward having total timber sale program benefits equal or exceed the total costs over time.

The lands of the Siskiyou National Forest have demonstrated their capacity to produce timber. Timber supply is critical to the communities of southwest Oregon. The amount of timber supplied by the Forest has been and will continue to be an important part of the economic picture. Timber production also contributes to the National economy, generates receipts to Oregon counties, and contributes to the overall economic health of the Nation (LRMP ROD-26).

The Matrix land allocation, as stated in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl:

"The matrix consists of those federal lands outside the six categories of designated areas (Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, And Riparian Reserves). Most timber harvest and other silvicultural activities would be conducted in that portion of the matrix with suitable forest lands, according to standards and guidelines. Most scheduled timber harvest (that contributing to the probable sale quantity [PSQ] not taking place in Adaptive Management Areas) takes place in the matrix. The matrix includes non-forested areas, and forested areas that are technically unsuitable for timber production, and therefore do not contribute to PSQ"

Riparian Reserve treatments are to restore lands along all streams, lakes, ponds, wetlands, unstable areas, and potentially unstable areas that are subject to special Standards and Guidelines designed to conserve aquatic and riparian-dependent species. Standards and Guidelines apply to activities in Riparian Reserves that may otherwise retard or prevent attainment of Aquatic Conservation Strategy (ACS) objectives, as defined in the 1994 ROD for the Northwest Forest Plan.

"Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain the Aquatic Conservation Strategy objectives."

New roads will be constructed as needed during the planning period to achieve the objectives specified in the Forest Plan. This is highly variable from year to year: the locations and extent of roading will be determined through site specific analyses at the project level (LRMP ROD-22).

Analysis Area

The Eden Ridge Timber Sales Planning Area is situated southeast of Powers, Oregon. Centrally located, commercial timber products have historically and are currently being transported to the communities of Broadbent, Myrtle Point, Coquille, Coos Bay, Bandon, Brookings, Glendale, Winston/Dillard, Roseburg and surrounding areas. Timber industry jobs include a variety of logging, forestry and mill positions. The current level of timber harvesting on the Rogue River-Siskiyou National Forest has dropped substantially from the levels of the mid-1980s. This decrease has contributed to a decline in the number of local jobs associated with the wood products industry in this and surrounding areas. Eden Ridge Timber Sales are proposed for several sale auctions and awards in the next five years (under separate and unique sales and sale names). There are three Action Alternatives plus a No-Action Alternative being considered.

The geographic scale used to assess direct, indirect and cumulative effects for economic issues includes the project activity units (Project Areas) associated with the Eden Ridge Timber Sales and the surrounding communities that would be affected by the proposed project.

b. Economic Assumptions and Effects Mechanisms

Outputs

The estimated sale volume varies with each alternative between a high of 53,130 thousand board feet (MBF) in Alternative 2, the Proposed Action, 52,028 MBF in Alternative 3, to a low of 49,175 MBF in Alternative 4 (Table III-22). The difference in volume between the alternatives is a reduction in treatment acres due to harvesting systems and engineering considerations. After the ~~"n~~o harvest" Riparian Reserve acres are deducted (based on Riparian Reserve Project Design Criteria), an average volume per acre of commercial product is used to calculate the total harvest volume by yarding system and alternative.

Table III-22. Projected Treatment Acres and Volume by Alternative

Alt.	Tractor Acres minus 8% RR No Harvest	Skyline Acres minus 8% RR No Harvest	Helicopter Acres minus 8% RR No Harvest	Total Treatment Acres	Total Tractor Volume MBF	Total Skyline Volume MBF	Total Helicopter Volume MBF	Total Volume MBF Harvested
1	0	0	0	0	0	0	0	0
2	1,939	1,097	0	3,036	33,933	19,197	0	53,130
3	1,641	863	469	2,973	28,718	15,102	8,208	52,028
4	1,324	420	1,066	2,810	23,170	7,350	18,655	49,175

Harvest volume is estimated at an overall average of 17.5 MBF/acre (not a target or a threshold)

Yarding Costs

Current costs and values were used which may not reflect future costs and values, but will show a ***relative*** comparison that should remain relatively consistent into the future. Currently, log values are near a historical low and costs are high due to recent increases in fuel costs. It can be expected that log values would increase as the economy improves and demand increases.

For this analysis, the costs are from logging systems and transportation needs by alternative. Each proposed yarding system has associated costs that have been averaged based on past timber sale appraisals on similar terrain (Table III-23).

Table III-23. Estimated Yarding Costs by Alternative

Alt.	Tractor Yarding Costs @210/MBF	Skyline Yarding Costs @250/MBF	Helicopter Yarding Costs@465/MBF	Total Yarding Costs
1	0	0	0	0
2	$ 7,125,825	$ 4,799,375	$0	$ 11,925,200
3	$ 6,030,675	$3,77,625	$ 3,816,487	$ 13,622,787
4	$ 4,865,700	$ 1,837,500	$ 8,674,575	$ 15,377,775

Note: Costs are meant to be used for the relative comparison of alternatives only and do not represent actual appraised costs

Roading Costs
New road construction, reconstruction of existing rail road grades, reconstruction of existing non-system roads and maintenance of system roads were identified and proposed in an effort to try and reduce associated harvest costs. Alternatives 2 and 3 propose new roads to increase access to harvest units and reduce harvest cost. Alternative 4 uses the existing system roads and proposes reconstruction of a portion of an existing rail road grade.

Additional costs are applied to the road construction, reconstruction and maintenance incurred by each alternative (Table III-24). The unit costs used for this analysis were determined by using current bid rates from recent projects in the area and by using local knowledge of construction practices. The rate per mile is not specific to individual roads but rather an average cost per mile of road. Maintenance estimates were determined in the same manor with the addition of surface rock replacement assuming $1/10^{th}$ of an inch of rock loss per 10 million board feet of haul. Maintenance collections for Roads 33 and 3358 were estimated using current bid rates from recent contracts. The need for collections in lieu of performance is due to multiple users at the same time.

Table III-24. Transportation Cost Estimates

	ALT 1		ALT 2		ALT 3		ALT 4	
Road Type	**Miles**	**Cost**	**Miles**	**Cost**	**Miles**	**Cost**	**Miles**	**Cost**
Classified	31.03		31.03	$0.00	31.03	$0.00	31.03	$0.00
CUM	0		7.77	$234,654	7.77	$234,654	6.37	$192,374
CUW/R	0		3.74	$594,860	2.08	$419,440	1.89	$185,220
New Construction	0		10.45	$1,736,790	7.66	$1,273,092	0	$0.00
Maintenance	31.03	$62,000	52.99	$1,701,987	48.54	$1,580,910	39.29	$1,238,885
TOTALS	31.03	$62,000	52.99	$4,268,291	48.54	$3,508,096	39.29	$1,616,479

Classified: This designation is the existing roads system including the 33 and 3358 Roads that access the Planning Area.
CUM: Classified Use and Maintenance. This designation is existing roads that are not part of the National Forest Road System and would need some improvement before becoming part of the system. These roads would be added to the National Forest Roads System through the Cost-Share Roads Program.
CUW/R: Classified Use with Reconstruction. This designation consists mainly of abandoned railroad grades. The old rail grade prism is present but clearing and grubbing of trees and stumps, establishing drainage, placing crushed aggregate and cut and fill slope repairs would be needed.
New Construction: This designation is where no existing template or prism exists.
Maintenance: This designation is for the maintenance of the all roads as a result of log haul for this project, except for Alternative 1, the No-Action alternative. This cost represents the cost of reoccurring maintenance needed regardless of hauling activities.

See the transportation and Logging System Report (EIS Appendix I, incorporated by reference) for more detail on the cost analysis for road miles used for comparison.

Revenue
The benefit basis of this analysis is the timber sale revenue from the estimated volume. The present value of benefits is based on current log prices for timber sold in Region 6 obtained through the Transaction Evidence Appraisal System. This amount reflects deductions for logging, general logging overhead, road construction, road re-construction, road maintenance, and temporary developments. Additional deductions may include special tree falling costs, slash disposal, environmental protection, engineering design, and operator profit and risk margin.

Economic Indicators
The demands for timber harvest are most affected by regional and national economics as well as costs from other markets. One of the outputs and effects is the determination of **Present Net Value (PNV)**, which estimates the maximum value that might be attained by maximizing the net value of priced outputs under a non-declining flow policy. This benchmark serves as a basis for an economic comparison between benchmarks and alternatives, as well as a basis for determining the effects of various constraints on outputs and costs. Further discussion is found in the SNF-LRMP Standards and Guidelines where economic analysis shall be included when areas have alternatives with substantial roading and harvesting, and choices that maximize net public benefits are not obvious from environmental and resource considerations. Present Net Value or Least Cost are appropriate measures of economic efficiency to use in this analysis (SNF LRMP, page IV-39).

The ratio of **benefit to cost (B/C)** is a useful parameter of economic efficiency intended to complement the PNV calculations associated with projects. The ratio is simply the total discounted benefits divided by the total discounted costs and reflects an average value rather than the total return to the government. This ratio is a measure of cost efficiency given different levels of investment among the alternatives. It does not reflect benefits from future use of a road system developed for future harvests after this entry.

Cost increases, with all other factors held constant would reduce the likelihood that a proposed project would sell. It is obvious to have stumpage values greater than logging costs for projects to be sold. Cost efficiency analysis utilizing PNV calculations can provide an indication of whether or not a timber sale would be "cost efficient". Increasing logging costs, with all else held constant, will result in projects being below cost.

It is important to recognize the impact more expensive harvest methods such as helicopter yarding in lieu of road construction with cable yarding or ground based methods has on the economic feasibility of a project. Historical information has shown that the cost to tractor yard (with associated construction for road access) is the least expensive operation. As yarding systems change to cable (skyline) and helicopter, these costs increase with helicopter yarding considered as very expensive due to the price of equipment and required support of material and personnel.

c. Direct Effects of Alternatives

Alternative 1 (No-Action)
The No-Action Alternative would not commercially harvest any timber, and therefore, would not generate a PNV or B/C for meaningful comparison to the Action Alternatives. Road maintenance costs for this alternative (Table III-24) represents the cost of reoccurring system road maintenance needed regardless of hauling activities.

Action Alternatives
The result of the economic analysis shows that the Proposed Action (Alternative 2) is the most economically feasible (Table III-25). The Proposed Action has the highest positive net present value and benefit cost ratio. The Proposed Action utilizes no helicopter yarding by adding engineer specified, low impact roads and spurs to allow access for tractor and cable yarding. Alternatives 3 and 4 have negative B/C ratios with Alternative 4 having the lowest PNV. Generally, this decrease of returns among the alternatives is reflected in the use of a greater % of high-cost yarding, (i.e., helicopters) as opposed to conventional yarding systems.

Table III-25. Present Net Value and Benefit/Cost Ratio Comparison between Alternatives

Alternative	Volume in MBF	Total Estimated Benefit or Revenue from Sale of Timber	Total Estimated Cost	Present Net Value PNV	Benefit-Cost Ratio (B/C)
1 No Action	0	0.00	$ 62,000.00	$ (62,000.00)	0.00
2 Proposed Action	53,130	$ 16,515,991.80	$ 16,193,491.00	$ 322,500.80	1.02
3 Less Roads–Some Heli	52,028	$ 16,173,268.65	$ 17,130,883.50	$ (957,614.85)	0.94
4 Least Roads–Max Heli	49,175	$ 15,286,540.50	$ 16,994,254.00	$ (1,707,713.50)	0.90

Note: Based on a market value of $310.86 per MBF; values and costs are meant to be used for the relative comparison of alternatives only and do not represent expected selling values or actual costs

Region 6 uses Log Lines for west side forests in Oregon, as the basis of relative stumpage values for western Douglas-fir. Market stumpage value or the price per thousand board feet of timber contributes the most to this economic analysis, assuming road and yarding costs remain the same. Slight changes in logging costs or road construction costs do not change the B/C ratio as must as market price. To demonstrate, an outcome of an 11.5% increase for the price per MBF, Table III-26 summarizes the effect to the point where Alternative 4 is at a break-even, otherwise the point where money spent and money returned is the same (B/C = 1.0). The cost to maintain the road system is included in the No-Action Alternative to demonstrate the associated cost of the existing road system.

Table III-26. PNV and B/C Comparison between Alternatives with an 11.5% increase in $/MBF

Alternative	Volume in MBF	Total Estimated Benefit or Revenue from Sale of Timber	Total Estimated Cost	Present Net Value PNV	Benefit-Cost Ratio (B/C)
1 No Action	0	0	$ 62,000.00	$ (62,000.00)	0.00
2 Proposed Action	53,130	$ 18,361,051.66	$ 16,193,491.00	$ 2,167,560.66	1.13
3 Less Roads–Some Heli	52,028	$ 17,980,041.69	$ 17,130,883.50	$ 849,158.19	1.05
4 Least Roads–Max Heli	49,175	$ 16,994,254.00	$ 16,994,254.00	$ 0.00	1.00

Note: Based on a market value of $345.59 per MBF; values and costs are meant to be used for the relative comparison of alternatives only and do not represent expected selling values or actual costs

d. Indirect and Cumulative Effects of Alternatives

Alternative 1 (No-Action)
The No-Action Alternative would not commercially harvest any timber, and thus no sawtimber or other forest products would be provided to regional mills with no economic value derived from the sale of forest products. No-Action would not support direct, indirect, and induced employment. It would not result in increased income to the regional or local economy (including the counties). Current levels of employment in the wood products sector would not change under this alternative.

Action Alternatives
All Action Alternatives could be economically viable, depending on current selling values, timber volume per acre, yarding systems required, proposed road construction, system road maintenance and the post-timber harvest projects. In general, the primary indirect and cumulative effect on timber harvest-related employment would occur from commercial timber harvest associated with the Action Alternatives from estimated selling years of 2013 through approximately 2017. The Action Alternatives would provide some opportunity for timber harvest-related employment, and higher revenues.

Alternative 2 would provide higher net value than Alternative 3 and substantially more than Alternative 4. Though the combined economic benefit from implementation of any of the Action Alternatives is expected to be positive, each of the action alternatives from the project would have a localized beneficial effect for the socio-economic environment of southwestern Oregon. The Action Alternatives would also have an indirect benefit in the form of revenues going toward the National Forest Fund (NFF). Portions of revenue generated by the sale of timber from the Action Alternatives would be available to the county for roads and schools.

New Classified roads were determined to be necessary to minimize temporary impacts on resources, especially, land, water, wildlife, and air. These new Classified roads are necessary to maintain a quality that permits future use without need to re-accomplish or replace work that is currently in satisfactory condition. Construction should minimize repeated impacts and avoid unacceptable risks to resources. It would also result in higher future capital expenditures that could be required if, for example, roads had to be rebuilt or relocated for each sale or entry.

New Classified road construction is designed to result in the lowest total transportation cost (construction, hauling, and maintenance) for the intended management use, while ensuring safety and minimizing temporary or extended resource impacts (FSM 2432.34 and FSM 7700). All proposed new Classified roads would be created and managed as Maintenance Level 1. Classified (System) roads are for long-term, multiple management needs, often with some potential for future use every five-to-ten years. Timber sale contracts may authorize construction of both specified Classified roads and temporary roads.

Cumulative
Given that the current log prices and reasonably foreseeable future of the regional economy, the speculation is that prices will continue to be low during the life of this proposed project. In an economically depressed area such as southwestern Oregon, the work provided by this project is potentially substantial. The project and its Action Alternatives are primarily proposed within the land allocation intended for the purposes of sustained timber production. The silvicultural prescriptions are generally an intermediate treatment, and designed to include all attributes essential for ecologically sustainable land management. Roads constructed, reconstructed or otherwise used and maintained by the Forest Service or cooperators would not only provide feasible treatments to meet the Purpose and Need for this project, but would provide for future management needs to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people.

D. ENVIRONMENTAL CONSEQUENCES: OTHER ISSUES

Other Issues (also presented in Chapter I) were used to formulate design elements and/or mitigation measures common to Action Alternatives (as effects are predicted to be minor and/or similar between Action Alternatives), providing nominal comparison of consequences to aid in later decision-making.

1. AQUATIC CONSERVATION STRATEGY

Effects of variable density management (thinning) treatments and other connected actions on attainment of the Aquatic Conservation Strategy Objectives associated with the Northwest Forest Plan and/or Standards and Guidelines associated with Riparian Reserves and Key Watersheds.

The Aquatic Conservation Strategy (ACS) was designed to facilitate the management and restoration of aquatic ecosystems within lands covered by the Northwest Forest Plan (1994). Specifically, the strategy is intended to protect anadromous fish habitat on federal lands within the range of Pacific Ocean anadromy. It is assumed that implementation of the ACS provides protection for all aquatic species present on the Rogue River-Siskiyou National Forest.

According to the Northwest Forest Plan Standards and Guidelines, the ACS was developed to improve and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The four primary components of the ACS are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems; they include: 1) Riparian Reserves; 2) Key Watersheds; 3) Watershed Analysis; and 4) Watershed Restoration.

Riparian Reserves are established as a component of the Aquatic Conservation Strategy, designed primarily to restore and maintain the health of aquatic systems and their dependent species. Riparian Reserves also help to maintain riparian structures and functions and conserve habitat for organisms dependent on the transition zone between riparian and upland areas.

a. Background and Analysis Framework

Riparian Reserves include lands along all streams, lakes, ponds, wetlands, unstable areas, and potentially unstable areas that are subject to special Standards and Guidelines designed to conserve aquatic and riparian-dependent species. Standards and Guidelines apply to activities in Riparian Reserves that may otherwise retard or prevent attainment of Aquatic Conservation Strategy (ACS) objectives, as defined in the 1994 NWFP ROD.

Widths for Riparian Reserves necessary to ensure ACS objectives for different waterbodies are established based on ecological and geomorphic factors. Widths are typically one site potential tree height **(**175 feet for the Siskiyou portion of the Forest**,** unless site-specially determined at the project scale), along each side of stream channels. Widths are twice this distance along fish bearing streams. These widths are designed to provide a high level of protection to fish and riparian habitats.

Key Watershed designation is an additional component of the ACS that is applied to watersheds that contain at-risk fish species or anadromous stocks and that provide high quality water and fish habitat.

b. Compliance with Riparian Reserve Standards and Guidelines

The analysis of the existing conditions of the affected sixth-field watersheds (see Hydrology Report) relative to Riparian Reserve Standards and Guidelines is presented below for all Action Alternatives (1994 NWFP ROD, pages C-31 through C-39). These Standards and Guidelines were reviewed for applicability relative to the types of actions being proposed under the Eden Ridge Timber Sales Project.

The **Timber Management** Standards and Guidelines (NWFP page C-31) were determined to be partially applicable because timber management is a subordinate goal of treatments. Timber management is discussed on pages C-33 and C-34 of the NWFP ROD. Specifically:

TM-1 was found to be partially applicable: "Timber harvest is prohibited in Riparian Reserves, unless it is to acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy (ACS) objectives ***or*** to mitigate damaging affects to Riparian Reserves from catastrophic events such as fire, flooding, volcanic, wind, or insect damage."

TM-1 (a) is *not* applicable because salvage is not being proposed as associated with any catastrophic event..

TM-1 (b) is *not* applicable because salvage is not being proposed.

TM-1 (c) is applicable "Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives."

The **Roads Management** Standards and Guidelines (NWFP page C-32) were determined to be applicable because of proposed new system road construction and the maintenance and/or reconstruction of existing roads for access and hauling needs (RF-2, RF-3, RF-4, RF-5, RF-6, and RF-7) are connected actions. Some proposed and existing roads cross stream courses and Riparian Reserves.

The **Grazing Management** Standards and Guidelines (NWFP page C-33) were determined to *not* be applicable because grazing management is not the goal of density management of second growth stands.

The **Recreation Management** Standards and Guidelines (NWFP page C-34) were determined to *not* be applicable because recreation management is not the goal of density management of second growth stands.

The **Minerals Management** Standards and Guidelines (NWFP page C-34) were determined to *not* be applicable because minerals management is not associated with density management of second growth stands.

The **Fire/Fuels Management** Standards and Guidelines (NWFP C-35) were determined to be *partially* applicable because fuels management is a partial goal and a connected action to Eden Ridge Timber Sales and some activity fuels and hazardous fuel reduction treatments could occur within Riparian Reserves. FM-1 and FM-4 were determined to be applicable.

The **Lands** Standards and Guidelines (NWFP page C-36) were determined to *not* be applicable because no lands actions are associated with density management of second growth stands.

The **General Riparian Management** Standards and Guidelines (NWFP page C-37) were determined to be applicable to all projects under the NWFP that include actions proposed within Riparian Reserves.

The **Watershed and Habitat Restoration** and **Fish and Wildlife Management** Standards and Guidelines (NWFP page C-37) were determined to be partially applicable because other connected or related include restoration and enhancement opportunities. WR-1 and FW-1 were determined to be the primary applicable Standard and Guidelines (NWFP page C-37).

The **Research** Standards and Guideline (NWFP page C-38) RS-1 was determined to be *not* applicable because research is not an activity associated with density management of second growth stands.

c. Response to Northwest Forest Plan Standards and Guidelines

The applicable NWFP Standards and Guidelines (1994 ROD, pages C-31 through C-39) for alternatives considering density management and connected activities under Eden Ridge Timber Sales, and their consequences, are displayed in Table III-27.

Table III-27. Evaluation of Applicable NWFP Riparian Reserve Standards and Guidelines

Standard and Guideline	Alternative 2 Proposed Action	Alternative 3	Alternative 4
TM-1 (c)	The Purpose and Need for the Proposed Action is based on employment of silvicultural practices that are designed to control stocking, and acquire desired vegetation characteristics to allow attainment of ACS Objectives.	Alternative 3 would treat Riparian Reserves in a similar manner as Alternative 2, on slightly less acres.	Alternative 4 would treat the fewest acres of Riparian Reserves. Stocking control would occur and desired vegetation characteristics would improve in treated areas, but not within untreated areas.
RF-2	Alternative 2 includes some new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may also be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has the most new road construction and has the greatest risk, based on the amount and location of certain roads (see Hydrologic Condition Issue).	Alternative 3 includes some new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may also be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has less new road construction and has minimal risk, based on the amount and location of proposed roads (see Hydrologic Condition Issue).	Alternative 4 does not include new proposed roads within Riparian Reserve. Existing roads, skid roads and landings within Riparian Reserves may be utilized if they would not deliver sediment to streams. Extensive project design criteria would minimize disruption of hydrologic flow paths. This alternative has the least risk, based on its design (see Hydrologic Condition Issue).
RF-3	All Action Alternatives include road maintenance and road reconstruction that protects and or minimizes adverse effects to riparian resources. Stabilizing haul routes is an element under all Action Alternatives.		
RF-4	All Action Alternatives propose road reconstruction that is likely to involve stream crossings. Alternatives 2 and 3 include new construction where stream crossings are possible. Culvert replacement would be designed, to the extent possible, to accommodate a 100-year flood, provide fish passage as necessary, and would result in overall improved conditions over current conditions.		
RF-5	All Action Alternatives include road maintenance and road reconstruction that protects and or minimizes adverse effects to riparian resources. Alternatives 2 and 3 include new construction where stream crossings are possible. Extensive Riparian Reserve project design elements would minimize delivery of sediment.		
RF-6	All Action Alternatives propose road reconstruction that is likely to involve stream crossings. Alternatives 2 and 3 include new construction where stream crossings are possible. Culvert replacement would be designed, to the extent possible, to accommodate a 100-year flood, provide fish passage as necessary, and would result in overall improved conditions over current conditions.		
RF-7	Road Management Objectives are in place for all existing system roads. Under all Action Alternatives, Road Management Objectives would continue to be in place and inspection and maintenance during and after storm events would be a reoccurring practice.		
FM-1 and FM-4	All Action Alternatives include activity fuel treatment and fire management practices, and activities to allow attainment of the ACS, and to minimize disturbance of riparian ground cover and vegetation. Design elements exclude slash piles and ignition of prescribed fire within Stream Channel Protection Zones.		
RA-1	All Action Alternatives would maintain in-stream flows, riparian resources, channel conditions and aquatic habitat.		
RA-2	All Action Alternatives include project design elements that would require any trees felled within the Stream Channel Protection Zones to be left on-site.		
RA-3	All Action Alternatives include no proposed use of herbicides, insecticides, and other toxicants or other chemicals as part of density management or other managed stand treatments. Use of chemicals (not herbicides) for dust abatement on existing system roads that occur within Riparian Reserves would be carefully controlled by project design elements.		
RA-4	Use of water drafting sites associated with existing system roads that occur within Riparian Reserves would be carefully controlled by project design elements to maintain flow and habitat for all Action Alternatives.		
WR-1	All Action Alternatives include restoration projects with a design that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species (e.g., Port-orford-cedar), and allows attainment of Aquatic Conservation Strategy objectives.		

Effects Regarding Key Watershed Designation

Key Watershed designation is an additional component of the ACS that is applied to watersheds that contain at-risk fish species or anadromous stocks and that provide high quality water and fish habitat.

All of the lands associated with the candidate stands have been analyzed by a Watershed Analysis and have been used during the analysis of this proposal. Under Northwest Forest Plan direction, Key Watersheds are not a designated area or matrix, but overlay all allocations.

Key Watershed designation is a component of the ACS that is applied to watersheds that contain at-risk fish species or anadromous stocks and that provide high quality water and fish habitat. The South Fork Coquille fifth-field watershed is designated as Key Watershed (the Middle Fork Coquille fifth-field watershed is not).

South Fork Coquille River is a Key Watershed for which Watershed Analysis has been performed (see EIS Chapter I and Hydrology Report, EIS Appendix C). An Aquatic Restoration Plan was prepared in 2007 (see above and Hydrology Report). As documented in the Restoration Plan, the South Fork Coquille is a Tier 1 Key Watershed as defined by the Northwest Forest Plan (1994) and is approximately 108,300 acres in size. In 2005, the Rogue River - Siskiyou National Forest engaged in an Integrated Work Planning process. As part of that process, fifth-field watersheds across the Forest were prioritized for resource valve and restoration potential. The South Fork Coquille ranked as number 1 on the Forest for fisheries, water, and wildlife values.

Timber harvest cannot occur in Key Watersheds or Riparian Reserves unless watershed analysis is performed to characterize the aquatic, riparian, and terrestrial features within a watershed and to guide activities toward meeting Aquatic Conservation Strategy goals (ROD, page B-20, USFS, 1994). Outside of Inventoried Roadless Areas (RARE II), management direction is to reduce existing system and non-system road mileage.

According to the Northwest Forest Plan, Basis for Standards and Guidelines (NWFP page B-19),

> *"The amount of existing system and non-system roads within Key Watersheds should be reduced through decommissioning of roads. Road closures with gates or barriers do not qualify as decommissioning or a reduction in road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds. That is, for each mile of new road constructed, at least one mile of road should be decommissioned, and priority given to roads that pose the greatest risks to riparian and aquatic ecosystems."*

Road Decommissioning South Fork Coquille Watershed Road Bank
With the South Fork Coquille watershed, road decommissioning on the Powers Ranger District has been occurring since 1992. To date, the miles of decommissioned roads have totaled approximately 61.1 miles (see Appendix I, Attachment A). This amount of roads removed from lands allocated to other purposes than timber production, has created a "road bank", that is, the current amount of road mileage through decommissioning is less than 1992 conditions.

The Eden Ridge Timber Sales Project could construct roads to current environmental standards, and be located on the landscape to minimize effects to the environment and still result no net increase in the miles of roads within a Key Watershed. This is due to the "road bank" of decommissioned road miles, in compliance with this NWFP Standard and Guideline. The precise accounting of miles of decommissioned road compared to new road construction would depend on the final decision for Eden Ridge Timber Sales Project.

d. Consistency with Aquatic Conservation Strategy for Action Alternatives

The Northwest Forest Plan requires project consistency with ACS with specific reference to nine ACS Objectives. Below is a summation of the environmental analysis regarding consistency with the elements and components of the ACS Objectives for the Action Alternatives. Additional discussion and rationale may be found in analysis documented under Significant and Other Issues in this Chapter including hydrology, water quality, soils, botany, fisheries, and terrestrial wildlife.

ACS Objective 1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

The Action Alternatives are expected to have no effect on watershed and landscape-scale features because they are largely avoided. Density management (thinning) could occur within portions of non-fish bearing stream Riparian Reserves, however canopy closure would not be reduced below 50%. Treatments would improve stand structure and composition. Connected actions such as roads would be developed largely outside of Riparian Reserves. Logging systems and use of new constructed, temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. Planting resistant Port-Orford-cedar would enhance landscape scale presence of this species. The Action Alternatives would have an insignificant and undetectable effect on watershed and landscape-scale features.

ACS Objective 2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

The Action Alternatives are expected to maintain spatial and temporal connectivity within and between watersheds. Density management (thinning) could occur within portions of non-fish bearing stream Riparian Reserves, however canopy closure would not be reduced below 50%. Treatments would improve stand structure and composition. Connected actions such as roads would be developed largely outside of Riparian Reserves. Logging systems and use of new constructed, temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. The Proposed Action (and other Action Alternatives) would have no effect on network connections and would not create any physical obstructions. There would be no measurable effect on aquatic and riparian dependent species.

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

The Action Alternatives are expected to maintain physical integrity of the aquatic system. Density management (thinning) could occur within portions of non-fish bearing Riparian Reserves, with variable width no-treatment buffers. Treatments would maintain and potentially improve stand structure, composition and the integrity of the aquatic system. Connected actions such as roads would be developed largely outside of Riparian Reserves. Logging systems and use of new constructed, temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. The Action Alternatives would have an insignificant and undetectable effect on the physical integrity of the aquatic system.

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

The Action Alternatives are expected to maintain water quality. Density management (thinning) could occur within portions of non-fish bearing Riparian Reserves, with variable width no-treatment buffers. Treatments are designed to maintain or improve the biological, physical and chemical integrity of the aquatic system. Connected actions such as roads would be developed largely outside of Riparian Reserves. Logging systems and use of new constructed, temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. The Action Alternatives would have no measurable effect on water quality including increases in stream temperature.

ACS Objective 5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

The Action Alternatives are expected to maintain the sediment regime under which aquatic ecosystems evolved, with an insignificant and undetectable effect on sediment regime. Density management (thinning) could occur within portions of non-fish bearing Riparian Reserves, with variable width no-treatment buffers. Connected actions such as roads would be developed largely outside of Riparian Reserves. Logging systems and use of new constructed, temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. The Action Alternatives would have no measurable effect on the sediment regime (see Hydrology section and Hydrology Report).

ACS Objective 6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

The Action Alternatives are expected to maintain stream flow. Density management (thinning) could occur within portions of non-fish bearing Riparian Reserves, with variable width no-treatment buffers. Logging systems and use of new constructed, temporary and existing roads for haul would employ extensive Project Design Criteria and Mitigation Measures. There would be no measurable effect on stream flow because stands would be thinned, not clear-cut, and because only relatively small portions of 6th field subwatersheds would be treated.

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

The Action Alternatives are expected to maintain the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands. There would be no effects to these features because wet meadows and wetlands would be avoided and buffered if detected during implementation. Indirect effects to floodplain inundation and water table elevation in meadows and wetlands are not anticipated.

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

The Action Alternatives are expected to maintain the species composition and structural diversity of plant communities in Riparian Reserves and wetlands. Treatments would promote the genetic integrity of native species (e.g., Port-orford-cedar) and Douglas-fir (laminated root rot treatments). No effects are anticipated through manipulation of vegetation that would adversely affect species composition and structural diversity of plant communities within Riparian Reserves or wetlands.

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

The Action Alternatives are expected to maintain habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species. Treatments would promote the genetic integrity of Port-orford-cedar and Douglas-fir. There would be no measurable adverse effects.

Therefore, as an overall evaluation, the impacts associated with the Proposed Action or other Action Alternatives, either directly, indirectly, individually or cumulatively, would not prevent attainment of Aquatic Conservation Strategy, or the nine ACS Objectives, at the site, watershed or landscape scales.

2. FIRE / FUELS

Effects of density management (thinning) treatments and other connected actions on fuel loading and fire hazard conditions.

This issue focuses on potential consequences regarding fuels and fire hazard conditions. EIS Appendix E, Fire/Fuels and Air Quality Report (incorporated by reference) includes more detail on current conditions, characteristics, and consequences.

a. Background and Analysis Framework

The fire occurrence rate in the South Fork Coquille drainage is relatively low for lightening and human-caused fires. The fire occurrence interval for western hemlock series in the Klamath region is about 65 years (USDA 1995). Previous reported fires mostly occur in the west half of the ER Planning Area (see Map B-11 in Silvicultural Diagnosis Appendix B). There have been no substantial fires recorded in the Planning Area during the twentieth century. Most of the lightning storm events are accompanied by moderate and sometimes heavy rainfall. Under these circumstances, fires have sometimes been started, burned small areas, and then have been put out by the accompanying rainfall shortly thereafter. Most lightning fires have been detected while they are small in size, and have been suppressed before becoming larger than one acre.

The potential for human caused starts could be considered low to moderate. Public and industrial users travel the main road through the area during the dry season, and industrial logging activity on the private lands within the Planning Area during the past decade has been quite active. Hunters frequent the area during the fall, but camping opportunities are limited.

The existing levels of dead and down fuels in the proposed treatment units are considered light, consisting primarily of fine limbwood from the self-pruning occurring in the stands. In the Photo Series for Quantifying Natural Forest Residues in Common Vegetative Types of the Pacific Northwest (PNW-105, 1980), the classification 1-MC-3 closely represents the fuels present in these stands, with 2.5 to 5 tons per acre of 0 to 3-inch material, with a small amount of larger material. These fuels are compact and low to the ground, and are best described as a Fuel Model 8-Closed Timber Litter, of the Fire Behavior Fuel Models (Anderson 1982).

Live ground fuels are also scattered and comprise a very minor amount of the available fuels. Salal and Oregon grape are the primary ground cover, and are considered a low to no threat component of the overall fuel picture due to its fire resistant nature. Wild rhododendron and evergreen huckleberry make up the shrub layer of vegetation, with burning characteristics similar to Salal. In general, ladder fuels capable of carrying a fire from the ground to the crowns of trees are minimal within these stands. The trees themselves are generally reaching a point where their bark thickness is more likely to tolerate the heat that is generated by the low to moderate intensity surface fire which may pass through the stands.

Fires, burning in this fuel model, are generally characterized by slow burning ground fires; with short flame lengths (less than 4 feet), and present only minimal control problems, under normal dry season weather conditions. High winds and temperatures, steep slopes, and low humidity can cause control difficulties in this fuel model; as well as create a more stand-damaging effect.

Fire behavior is influenced by the shading and wind-breaking effects of the closed conifer canopy. This shading effect generally maintains a cooler microclimate, as opposed to an open-grown area where increases in solar radiation and wind tend to decrease fuel moisture and increase fire intensity. The closed canopy creates conditions conducive to cooler fire behavior by reducing fuel bed heating (a function of shading) and by buffering the prevailing wind speeds. While these stands could tolerate a surface fire, they are still vulnerable to an independent crown fire initiated from the outside, and carried into the area by weather (wind) and/or topographic conditions. The closed canopy condition would readily allow fire to move from one crown to another. Steeper slopes would amplify this situation due to pre-heating. Such a fire would likely be lethal to the stand.

Management Direction
The activities associated with Eden Ridge Timber Sales are tiered to, and would be designed to comply with direction established in the *1989 Siskiyou National Forest Land and Resource Management Plan* (SNF-LRMP) as amended by the *1994 Record of Decision for Amendments to Forest Service and bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (Northwest Forest Plan, USDA 1994).

Management prescriptions for fire management within General Forest – Matrix (SNF-LRMP; page IV-143) and Riparian (SNF-LRMP; page IV-128) would be applied to this project. A high level of wildfire prevention activities should be maintained and direct treatment methods should be emphasized in the management of natural and activity fuels.

The Biscuit Fire of 2002 provided considerable empirical evidence that many stands of commercial thinning size had poor chances of surviving a wildfire, where no fuels treatments had been employed. A goal of this project is to improve forest resiliency which would help control the possibility of stand replacement disturbances such as those created by severe wildfire. The range of harvest treatments proposed with the Eden Ridge Timber Sales needs to consider stand and fuels treatment which would promote stand survivability, in the event that they are subjected to a wildfire, or perhaps are intentionally burned, in the future.

b. Effects Mechanisms

Peterson, et al., 2005, Omi and Martinson, 2002, and Agee and Skinner, 2005 present a hierarchy of potential treatments to prevent stand replacement disturbances by fire. The initial step to be taken is to reduce the potential for a surface fire to get into the crowns of the trees in the stand. Research indicates that to keep a surface fire on the surface, breaking the ladder fuel chain, while concurrently raising the crown base height (with emphasis on raising crown base height), must be accomplished. The general recognized practice to accomplish this is to thin from below (Peterson, et al., 2005, Omi and Martinson, 2002, and Agee and Skinner, 2005). The three papers referenced go on to say fuels created by any harvest operations must be reduced to the point where surface fire intensity will be low enough to prevent mortality of residual trees by crown fire initiation (keep the fire on the ground), as well as minimizing any lethal amounts of heat being applied to the base of the bole of the tree. Agee and Skinner (2005) state that timber stand improvement work, without treatment of the fuels created by such activities, were burned more severely than unmodified areas. Omi and Martinson (2002) also reach this same conclusion. Agee and Skinner (2005) said that whole tree harvest, with disposal of tops at the landing; is most effective at preventing surface fuel increases in the residual stand.

The next level of treatment is to prevent the spread of an active crown fire, once it has been initiated. Fire can spread from crown to crown through heat transfer, via two mechanisms. Pre-heating of the crowns by an advancing surface fire will allow a passive crown fire (torching) to escalate to an active crown fire, and propagate in the direction of fire spread, so long as the surface fuels allow this pre-heating to occur (notwithstanding the thorough treatment of surface fuels), and by the continuity of the crowns which allow for the aerial spread of the fire.

Combinations of steeper slopes, drier/hotter conditions, and the influence of wind can exacerbate this problem; and could lead to an independent crown fire, spreading through the crowns without the need of pre-heating by burning surface fuels, and regardless of the crown base height. Reducing the crown densities is the common recommendation. Given the proper degree of crown bulk density reduction, this chain can effectively be broken, causing the fire to drop back to the surface. There are general guidelines for addressing crown continuity. An example of a field based rule is that the distance between adjacent tree crowns should be the average diameter of the crown of the codominant trees in the stand (Peterson, et al. 2005). Another rule of thumb taught at S-490 (Advanced Wildland Fire Behavior Calculations) is that thinning to a 75% canopy closure is generally adequate. Thinning to below these levels further reduces the risk of crown-to-crown fire spread.

Reduction of crown density can open up the understory so that mid-flame wind speed may be increased, fine fuel moisture may be reduced due to increased solar radiation (Agee and Skinner, 2005 and Omi and Martinson, 2002), and growth of fine herbaceous fuels may be promoted due to increased exposure to sunlight (Omi and Martinson 2002).

Using the Fire Behavior Field Reference Guide (PMS 436-4), the effects to surface winds and fine fuel moistures, as a result of opening up the canopy can be described. Wind Adjustment Tables indicate that a wind speed of 10 mph at the 20 ft. level would result in a 1-2 mph mid flame wind speed (ground level); in a fully sheltered stand, such as can be found with the existing condition. Implementation of the Proposed Action would leave the stand in a partially sheltered condition, with a resulting mid flame wind speed of 3 mph. The table itself offers only 3 levels of sheltering: Fully Sheltered, Partially Sheltered, and Unsheltered.

Fine Fuel Moisture Adjustment Tables offer two levels of comparison, Shaded (>50% shading) and Exposed (<50% shading) of surface fuels. The differences in fine fuel moisture corrections can range from 1-3%. The existing condition would be considered as shaded, any portion of the proposed action which opens up the canopy more than 50% would be considered exposed.

Both the wind and fine fuel moisture components described above relate more to the probability of ignition and rate of fire spread, than to fire intensity, in the overall picture of fire behavior. The amount, size, and arrangement of the fuel left on site will dictate fire intensity and any resultant mortality.

These variable density treatments are designed to enhance overall forest vigor and resiliency. Density management would release remaining trees from inter-tree competition for sunlight, water and soil nutrients when compared to untreated areas. More fire resistant stands would be created by retaining the largest of the existing trees while developing larger trees at a faster rate. Larger trees are more fire resistant in nature because of their thicker bark and higher crown base height. Post-treatment objectives are to develop a sustainable forest resilient to drought, wind, insects, disease, fire and other natural disturbances.

c. Direct and Indirect Effects of Alternatives

Modeling of crown fire initiation, the potential to sustain an active or independent crown fire, and the types of treatments needed to mitigate these problems, generally requires in-depth stand data (stand examinations). FVS-FFE (Forest Veg Simulator-Fire Fuels Extension) is the analytical tool which uses stand exam data to estimate potential mortality and the type of fire burning within a given stand. The modeling uses a simulated silvicultural harvest prescription to remove trees from the stands. A simulated fire is then run through these stands under set weather and fuel moisture parameters, using surface fuel types assigned to most nearly represent the results of either the pre-harvest conditions, or post-harvest conditions representing different levels of fuel treatment.

Analysis for selected examples shows that in their existing condition most stands of the stands proposed for treatment would generally tolerate a wildfire burning under the 95th percentile conditions; with less than 25% potential mortality resulting from the fire (Table III-28).

Fire characteristics tend to be surface fires, with low flame lengths, and the modeling shows that crown fires are difficult to initiate in all sizes/ages of stands. While the fuel models in these stands varied between Low to Moderate Load Conifer Litter models, the Moderate Load Conifer Litter model was used to represent a worst case scenario in the analysis.

Table III-28. Forest Veg Simulator-Fire Fuels Extension: Example Modeling Results

Unit	Existing Condition	Post-Harvest, Leave Tops	Post-Harvest, Yard Tops
201	12%, Surface Fire	17%, Surface Fire	9%, Surface Fire
303	20%, Surface Fire	26%, Surface Fire	18%, Surface Fire
334	9%, Surface Fire	12%, Surface Fire	7%, Surface Fire
102	14%, Surface Fire	34%, Surface Fire	8%, Surface Fire

% mortality based on Basal Area and Type of Fire

Alternative 1 – No-Action
Under the No-Action Alternative, no management activities within the Planning Area would occur. It would be expected that current stand conditions would continue to develop in a natural and undisturbed manner into the foreseeable future.

Deep shading, tight canopy cover inhibiting air flow, low crown ratios, and advanced decomposition of the more volatile surface fuels aid in reducing fire severity in forested stands. The stands in the Eden Ridge Planning Area are reasonably resilient to the effects of wildfire in their current condition. These stands have survived through many years of vulnerability to the potential adverse effects of fire, and have evolved into a condition of becoming more resistant and resilient to these effects. Crown base heights are generally raised and the fuel ladder would continue to be eliminated (both positive fire resistive attributes). They could tolerate most surface fires, with the only true threat to mass mortality being an independent crown fire situation.

This condition would not remain static over time however. While fuels in the majority of the areas proposed for commercial thinning presently constitute a low to moderate hazard, stand dynamics would slowly alter this situation over time. Natural foliage loss and self-pruning are presently contributing fine fuels to the litter layer. Suppressed and intermediate trees would slowly begin to die out and contribute larger fuels to the forest floor. This process is being somewhat offset by the meltdown (slow decomposition) of these same fuels, with the smaller more flammable fuels decomposing at a much faster rate than the larger fuels. The process of fuels build up and the inevitable changes in stand dynamics is a very slow cycle, possibly taking numerous decades to actually develop a noticeable hazard. The results of these processes would more readily facilitate fire spread and contribute to potentially higher severity fire, which can put the stand at an increasingly higher risk of mortality than currently exists. During this same time period, the trees themselves would be developing a thicker bark layer, making them more resistant to the effects of fire, countering (to a degree) the potentially higher fire severity created by fuels being contributed from the stand itself.

Alternative 2 - Proposed Action
Alternative 2 would commercially thin 75 treatment units totaling approximately 3,314 acres. Harvest activities would use a combination skyline and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings.

In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s), essentially creating a ‗cleaner', more defensible space along the aforementioned roads. All landing piles of slash would be burned.

Prescriptions and treatments would be designed, whereby in the event of an unwanted wildfire, the treated stands would be left in such a condition that wildfire would pass though without generating unacceptable levels of mortality, and provide an area where the fire can be managed by ground based initial attack resources.

The direct effects of this project from a fire and fuels perspective would be a short-term increase in fuels loading and the associated fire hazard within the units as generated from activity-generated slash. Such an increase would be ameliorated by implementing activity fuels treatments. Other untreated slash would be expected to reach a near natural condition within approximately 5 years.

The Variable Density Thinning (VDT) proposed for this project calls for modifying the existing canopy cover to a condition of 35 to 50 percent. This action, in itself, generally reduces the potential for a running crown fire by opening up the spacing between tree crowns.

The primary concern to fire managers, related to fuels remaining after harvest, is the amount of the smaller diameter (0 to 3 inch) fuels that are left on site. These smaller fuels constitute a hazard from two points. The finer fuels are the most receptive to an ignition source (spark, match, lightning), and are the elements that promote rapid fire-spread and increased flame lengths. While the larger fuels (3 inches and greater) contribute to the duration and intensity of a fire (once one has started), the reduction of these fuels is of lesser importance than the reduction of the finer fuels, in the scheme of hazard reduction to reduce the potential for adverse affects of wildfire. Besides being of lesser importance in hazard reduction, the retention of this larger material would provide a multitude of other benefits, which enhance site productivity and complement other ecosystem values.

The stands are most vulnerable to the potential adverse effects of fire from the time the fine fuels (needles and small twigs) become cured, until these fuels drop to ground level and become part of the litter layer. Curing usually occurs within the first month of exposure to late spring/early summer like weather conditions. The needles would generally fall off the twigs by the second or third year following harvest. The twigs decompose at a slower rate, taking four to six years to fall from the main branches. Larger branch wood follows suit, taking upwards of eight to twelve years to decompose to ground level. Once these smaller diameter fuels (<1") have all reached ground level, decomposition is rapidly accelerated, and the risks associated with a wildfire have substantially diminished. Without treatment, the first 0 to 5 years present the window of highest risk.

Harvest activities (i.e., tractor and skyline yarding systems) associated with the Proposed Action would add needles, limbwood, and tops to the existing fuel bed in varying degrees throughout each treatment area. Disturbed ground vegetation and larger woody material would contribute to the dead fuel loading. In comparison with the natural long-term accumulation of ground fuels, harvest would contribute fuels to the site at an accelerated rate. The fuels remaining after harvest would be mostly of the smaller size classes, as most of the larger fuels would be removed for utilization, unless contractual requirements specify that they be left on site. The estimated fuel bed remaining after harvest is best described as a Fuel Model 11- Light Logging Slash, of the Fire Behavior Fuel Models. The Photo Series For Quantifying Forest Residues (GTR PNW-51), 3-DF-3-PC; with a substantial reduction 3.1-9.0 inch size class due to increased utilization also is representative of this fuel type. This fuel bed typically has 5 to10 tons per acres of 0 to 3 inch size class fuels. In the event of an un-planned fire start, the potential for rapid-fire spread would be higher than a stand in a natural condition (2 to 7 chains per hour in a natural state, compared to 6 to 9 chains per hour after harvest).

Effects to the activity-generated fuel bed as a result from implementation of mechanical pre-bunching has shown that fuels are concentrated under the tracks of the machine as it travels over the area. Needles and small diameter limbs (fuels) are crushed / compressed. This condition actually accelerates the results of natural decomposition and subsequent faster response to a reduction of potential fire intensities.

Below, are fuels treatment options considered for the proposed density management units. Implementation of these fuels treatment methods would likely be one or a combination of several treatments.

No treatment: This method would be appropriate for sites where fuel loadings fall well below LRMP Standard and Guideline recommendations by photo series (S&G 12-2, page IV-59). When residual fuels exceed the guidelines, not treating the fuels may be appropriate in areas of low risk where risks may be assumed for a period, until the hazard has been reduced by natural processes.

Hand piling fuels concentrations: This method would be effective in breaking up fuel continuity thereby reducing fire spread rates. Hand piling, followed by burning of the piles, can remove most fuels from a site. Hand piling is most effective in continuous moderate fuel loadings (25 to 50 tons per acre), and is less effective in scattered light fuels. This method may also be employed in areas where no other disposal methods are prescribed, or in conjunction with non-burning types of treatments, but where the risks may warrant some sort of hazard reduction; such as the piling proposed along Roads 2000, 5000, 290, 440, and 448. On the commercially thinned units that are adjacent to the aforementioned roads, logging slash within 100 feet of these roads would be hand piled and burned.

Yarding of tops: This method would be effective in removing concentrations of the 0 to 3-inch size class fuels. In all treatment areas using ground-based or skyline yarding, tops of commercial trees would be left attached to a commercial log while yarding (Yard Tops Attached – YTA). The tops would be piled and disposed at the landing location.

Piling and Burning Landing Slash: This method would be effective in disposing of all remaining un-merchantable vegetation on log landings (piling and burning).

SNF-LRMP Standards & Guidelines (S&G) 7-2 (Detrimental Soil Conditions) directs that the application of prescribed fire be conducted so that thresholds for bare soil exposure are not exceeded. Burning in the winter and spring windows of opportunity would best meet this objective, and would also compliment the objectives of maximizing the retention of Large Woody Material (S&G 7-8).

Forest-wide S&Gs for fire management (SNF-LRMP; pages IV-59 through 62) would be applied to this project. The fire hazard presented by natural, activity or prior activity fuels should be reduced to appropriate levels; and proposed activities should be designed and coordinated on the ground to help make the fuel treatment and fire protection as practical and economical as possible.

The indirect effects of this project from a fire and fuels perspective would be an increase in potential fire intensity due to reduced canopy closures. The reduction of canopy closure would allow for an increase in solar radiation and air movement. Both of which, would potentially decrease fuel moistures and allow an herbaceous and shrub understory to develop. These conditions would continue to develop until the residual canopies grow together. At that time, the treated stands would return to near natural conditions.

Alternative 3

Alternative 3 would commercially thin 65 treatment units totaling approximately 3,240 acres. Harvest activities would use a combination of helicopter, skyline, and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings.

In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s) and all landing piles of slash would be burned. On units where the logging system would be helicopter based, slash would be treated by YTA, piled and burned at landing sites.

The direct and indirect effects of Alternative 3 would be much the same as those described for Alternative 2, as the fuels treatment proposed for this alternative are the same, the only difference being the acres (3,240 as opposed to 3,314) proposed for treatment. Fuels treatments for this alternative would continue to result in conditions that meet LRMP Standards and Guidelines, and contribute to the improvement of vigor and resiliency of the forestlands located in this Planning Area.

Alternative 4
Alternative 4 would commercially thin 53 treatment units totaling approximately 3,058 acres. Harvest activities would use a combination of helicopter, skyline, and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings.

In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s) and all landing piles of slash would be burned. On units where the logging system would be helicopter based, slash would be treated by YTA, piled and burned at landing sites

The direct and indirect effects of Alternative 4 would be much the same as those described for Alternative 2, as the fuels treatment proposed for this alternative are the same, the only difference being the acres (3,058 as opposed to 3,314) proposed for treatment. Fuels treatments for this alternative would continue to result in conditions that meet LRMP Standards and Guidelines, and contribute to the improvement of vigor and resiliency of the forestlands located in this Planning Area.

d. Cumulative Effects

Analysis for determining cumulative effects is considered to include stand density reduction and activity-generated fuels on fuel loading and fire hazard in the Eden Ridge Planning Area. 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. Any other past, present or future treatment activities such as Four Does, Lookout Partner, Backwoods Thin (past), and Silver Doe (present), would be expected to meet LRMP Standards and guidelines. This cumulative effects area is considered adequate since the concern is relevant to activity-generated fuels.

Under all Action Alternatives, although there may be a short-term increase in fire hazard due to the generation of fine fuels, there would be a long-term benefit by decreasing tree/crown spacing and roadside fuels so that defensive measures could be deployed.

The long-term combined (cumulative) effects of this project and other past, present and future projects from a fire and fuels perspective would be to improve the defensible space along the system roads as described in the Proposed Action. Stands along these roads would be thinned and slash would be treated with hand piling concentrations and YTA to help establish a defensible space if another wildfire were to start in the area. This along with the removal of the future potential for natural tree mortality would contribute to reducing the potential for high severity, stand replacement wild fire in this portion of the forest.

3. AIR QUALITY

Effects of variable density management (thinning) treatments and activity fuels treatments on air quality.

This issue focuses on potential consequences regarding air quality. EIS Appendix E, Fire/Fuels and Air Quality Report (incorporated by reference) includes more detail on current conditions, characteristics, and consequences for air quality.

a. Background and Analysis Framework

The Planning Area for Eden Ridge Timber Sales is approximately twelve miles west of the coastal crest. The combination of good air circulation along the Pacific coast and relatively limited industrial development has resulted in only minor air quality problems west of the coastal crest. Wildland fires that occasionally occur are the primary source of air quality problems in this area.

The nearest Class I Airshed is the Kalmiopsis Wilderness, approximately 30 miles south of the Planning Area. The nearest Smoke Sensitive Receptor Area (SSRA) listed in the Oregon Smoke Management Plan is the city of Coos Bay, about 38 miles to the north/northwest.

National Ambient Air Quality Standards (NAAQS) were established by the Clean Air Act (CAA) of 1963 and subsequently amended (as amended, at 42 USCA 7401 to 7671(q)). Primary air quality standards were established under the act to protect public health; secondary standards were established to protect public welfare from any known or anticipated adverse effects associated with the presence of ambient air pollutants.

Particle pollution, also called particulate matter or PM, is a complex mixture of extremely small particles and liquid droplets in the air (i.e., dust, soot and particles too small to see). When breathed in, these particles can reach the deepest regions of the lungs. Exposure to particle pollution is linked to a variety of significant health problems. Particle pollution also is the main cause of visibility impairment in the nation‘s cities and National Parks.

To better protect public health and welfare for millions of Americans across the country, the EPA on September 21, 2006 issued the Agency‘s most protective suite of national air quality standards for particle pollution ever. The final standards address two categories of particle pollution: fine particles ($PM_{2.5}$), which are 2.5 micrometers in diameter and smaller; and inhalable coarse particles (PM_{10}) which are smaller than 10 micrometers (a micrometer is $1/1000^{th}$ of a millimeter; there are 25,400 micrometers in an inch).

EPA strengthened the 24-hour fine particle standard from the 1997 level of 65 micrograms per cubic meter (p.g/m3) to 35~ig/m^3, and retained the annual fine particle standard at 15p~g/m^3. The Agency also retained the existing national 24-hour PM_{10} standard of 150p.g/m^3. The Agency revoked the annual PM_{10} standard, because available evidence generally does not suggest a link between long-term exposure to current levels of coarse particles and health problems.

To further comply with this direction, the Forest has several strategies to manage prescribed fire smoke: Curtailment, reduction, avoidance, dilution, and education. Also, since the early 1990s, harvest amounts have dropped dramatically, further reducing the amount of pollutants generated by prescribed burning.

Management Direction
The activities associated with Eden Ridge Timber Sales would be designed to comply with direction established in the *1989 Siskiyou National Forest Land and Resource Management Plan* (SNF-LRMP) as amended by the *1994 Record of Decision for Amendments to Forest Service and bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (Northwest Forest Plan, USDA 1994).

Forest-wide Standards and Guidelines for air quality resources (SNF-LRMP; pages IV-48 through 50) would be applied to this project. Activities shall be planned: to maintain air quality at a level adequate for the protection and use of the National Forest resources, coordinate with the appropriate air quality regulatory agencies, reduce total suspended particulate emissions and minimize the impact of prescribed burning on smoke sensitive areas.

b. Direct and Indirect Effects of Alternatives

Alternative 1 – No-Action
Under the No-Action Alternative, no management activities within the Planning Area would occur and there would be no direct, indirect or cumulative effect to air quality or the Class I Federal areas.

All Action Alternatives
All Action Alternatives (including the Proposed Action) would burn landing piles and hand piles which may affect air quality. Though the amount of burning may vary between Action Alternatives, the intent of this discussion of effects is to disclose to what extent burning activities would have on the air quality in the Coos Bay area, or to visibility in the Class I Federal area (Kalmiopsis Wilderness). Direct, indirect and cumulative analysis of all Action Alternatives relates to those activities which may affect the Coos Bay and Kalmiopsis Wilderness Class I Federal areas; therefore, effects analysis is combined below.

The use of prescribed fire would be limited in the implementation of the Proposed Action, or any of the Action Alternatives. Fire would be applied for the burning of landing slash and burning of hand piled slash. The proposed action (Alternative 2), calls for the treatment of 3,314 acres on 75 units. For the purposes of this analysis, the assumption is made that these treatments would be spread out over a period of 5 years or approximately 1 sale per year with 15 units per sale. Thus, on average, the Proposed Action could generate as much as 7.3 tons of PM, 5.4 tons of PM_{10}, and 4.6 tons of $PM_{2.5}$ per year, which is well below the thresholds defined in the National Ambient Air Quality Standards. Alternative 3 would produce approximately 86 % of the TSP produced by Alternative 2, and Alternative 4 would produce approximately 70 % of the TSP produced by Alternative 2. (Piled Fuels Biomass and Emissions Calculator, PNW Research Station, 04/2011).

SNF-LRMP Standards and Guidelines 8-1 would be followed. This standard states, ~~"~~Management activities shall be planned to maintain air quality at a level adequate for the protection and use of National Forest resources and meet or exceed applicable Federal and State standards and regulations." (36 CFR 219.27(a)(12).

For the protection of Class I Airshed visibility values, as well as preventing any air quality degradation in the Coos Bay area, avoidance is the key to preventing any impacts due to man-made pollutants, such as smoke created by slash disposal. Any burning planned to occur would require development of a Burn Plan, to include avoidance measures. Among various factors taken into account; detailing prevailing wind direction, timing, and coordination with regulatory agencies would ensure that any burning would occur during conditions where any smoke would not degrade air quality within the Coos Bay and/or visibility within the Kalmiopsis Wilderness (Class I Airshed).

Further, burning would not take place during the visibility protection period of Class I Airsheds, which is July 1 to September 15. Using the direction and tools described above, slash disposal managers would consult with Smoke Management agencies to determine what proper atmospheric conditions are best to assure that impacts to either are avoided.

It the case of the Eden Ridge Timber Sales Action Alternatives, burning under conditions where transport winds and mixing heights are favorable, as well as following the daily Smoke Management forecast, would assure no adverse impacts to the nearest SSRA (Coos Bay), or the nearest Class I Airshed. As the majority of burning that would be done is pile burning, and can be accomplished in a broad window of opportunity, there is little risk of not being able to meet the slash disposal needs as a result of this constraint.

Burning would not take place within 38 miles of the Coos Bay area or within 30 miles of the Kalmiopsis Wilderness (Class I Area). Further, burning would not take place during the visibility protection period of July 1 to September 15. Therefore there are no expected direct adverse effects to air quality in either the Coos Bay area or the Class I Area.

The potential for the smoke produced by any of the proposed actions, to indirectly enter either of these areas would be mitigated by the avoidance methods such as implementation of the visibility protection period and not burning during weather conditions when smoke could travel to those areas.

c. Cumulative Effects

All past, present, and foreseeable future projects; have been, are, or would be conducted under the same air quality restrictions. Therefore, there would be no measurable adverse cumulative effects to air quality expected to occur. Since all burning would be prescribed and controlled, there would be ample opportunity to schedule burning when the atmospheric conditions are optimal for smoke dispersal. Likewise, there would be an opportunity to limit the size of burning events to control emissions.

It is expected that none of the Action Alternatives would result in a violation of National Ambient Air Quality Standards, or an appreciable reduction in air quality related values. There would be no adverse cumulative effects predicted from proposed treatments. Any project generated emissions would be smaller in volume than natural fires, and can be scheduled to take advantage of favorable meteorological conditions.

4. BOTANICAL RESOURCES

Effects of variable density management (thinning) treatments and other connected actions on rare, special status, Forest Service Sensitive or Federally listed botanical species.

EIS Appendix F includes a complete Botanical Resources Report (incorporated by reference). Forest Service Manual (FSM) Chapter 2670 outlines the policy and direction for the management of TES vascular plants, bryophytes, lichens and fungi and their habitat on Forest Service lands. FSM Chapter 2670 requires a Biological Evaluation (BE) report in order to determine and document effects from proposed actions on TES species. The Botanical Resources Report (Appendix F) satisfies the BE requirement as stated in the Forest Service Manual.

a. Background and Analysis Framework

Threatened, Endangered and Sensitive (TES) Plants and Fungi

The National Forest Management Act (NFMA) of 1976 also contains language relating to diversity and species viability that guides decision and management of native plant species on Forest Service lands. The language in the currently used planning rule (1982) states ―management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the Planning Area." This language led to the following additions to the Siskiyou National Forest Land and Resource Management Plan in1989:

Forest-wide Standards and Guidelines for Special Status Plants (see LRMP IV 26-27, 37)
Standards and guidelines applicable at the project level are:

1. Monitor the effects of management activities on TES plant species. If the results of monitoring show a decline in species viability then, alter the management strategy.
2. Analyze the potential effects of all ground disturbing projects on TES plant species and habitat. Mitigate project effects to avoid a decline in species viability at the Forest level.
3. Map, record, and protect essential habitat for TES plant species. Species management guides should be prepared to address the effects of land management activities on local populations of TES at a broader scale, and to identify opportunities to enhance and develop habitat locally.

Strategic Plants and Fungi

Strategic, is a new category of species established in May of 2007 by the Interagency Special Status and Sensitive Species Program (ISSSSP). Strategic Species are **not** considered ―Sensitive" species under Forest Service Manual (FSM) 2670. These are species listed by the Oregon Biological Inventory Center (ORBIC) as category 3 because of information gaps (i.e., distribution, habitat, threats) resulting in status or taxonomic uncertainties.

These species may be rare or uncommon but the current level of scientific knowledge is not adequate enough to make an accurate determination for listing as TES. ISSSSP staff in the Regional Office (RO) work in coordination with field offices to compile information to remove these uncertainties. The management requirement for this group of species is to record survey and location information in the agency's corporate database: Natural Resource Information System (NRIS). Strategic species are not specifically targeted during surveys and in the event new sites are located active management is not required. However, the rarity of a given species will be taken into account when deciding whether or not a site should be protected.

Survey and Manage Plant and Fungi Species

The 1993 Final Environmental Impact Statement (FSEIS) and 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (also known as the Northwest Forest Plan (NWFP)) created the Survey and Manage standard and guideline for all land allocations on the west side of the Cascades in Oregon, Washington and northern California and east Cascade forests within the range of the northern spotted owl.

The standard and guidelines were created to gain information that could help manage a set of lesser known and possibly rare taxa. Species of fungi, lichens, bryophytes and vascular plants were included to determine the status of their population viability.

The original Survey and Manage provision of the NWFP was amended in 2001 and 2004, then it was completely removed in 2007. A recent settlement agreement to a lawsuit (*Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.)) reinstated the program to the 2001 species list and level of management.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the *Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007).

In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are now subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

The Eden Ridge Timber Sale Project applies a 2006 Exemption from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in *Northwest Ecosystem Alliance v. Rey*, No. 04-844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management.

Also known as the Pechman Exemptions, the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

> ***a. Thinning projects in stands younger than 80 years old****;*
> *b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;*
> *c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and*
> *d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."*

Per the 2011 Settlement Agreement, the 2006 Pechman Exemptions remain in force:

> *"The provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash. Oct. 10, 2006), shall remain in force. None of the following terms or conditions in this Settlement Agreement modifies in any way the October 2006 provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04844-MJP (W.D. Wash. Oct. 10, 2006)."*

The Eden Ridge Timber Sales Project meets **Exemption a.** because it entails no regeneration harvest and entails thinning in stands less than 80 years old (see Eden Ridge TS Silviculture Report, 2011). Therefore, no specific Survey and Manage surveys were conducted for any plant or fungi species listed in the standards and guidelines.

b. Pre-Field Analysis

Based on the applicable laws, policies and procedures outlined above, a review of potential TES plant and fungi species was conducted in order to determine the extent of botanical analysis needed for the project. The NRIS database was consulted in order to determine the potential likelihood of encountering TES plant and fungi species within this project. The results of the data query showed that Oregon bensonia is the only Sensitive plant species previously known to occur within the planning/analysis area.

Sensitive Vascular Plant, Lichen, Moss and Liverworts
An analysis of the 99 vascular plants, 17 mosses, 7 liverworts and 11 lichen species listed TES and either suspected or documented on the RRSNF was completed to determine potential habitat that should be surveyed (the complete list and analysis can be seen in Attachment A to Appendix F, Botanical Resources Report). The analysis considered the location where the project would occur as well as the type, intensity and duration of disturbance the project would entail in relation to the quality of habitat present. Using GIS, digital aerial imagery and known variables such as elevation, aspect and surrounding vegetation type, it was determined that the project is within the geographic distribution and elevation ranges and contains potential suitable habitat for the following Forest Service Sensitive listed vascular plant, moss, liverwort and lichen species.

Table III-29. Potential Sensitive Vascular Plant, Lichen, Moss and Liverwort Species with Habitat in Eden Ridge Planning Area

Vascular Species	Habitat/Distribution
Arctostaphylos hispidula Gasquet or Howell's manzanita	Forest edges, brush fields, barren ridgelines. Often on serpentine but not always. Usually found with other manzanita species especially *A. columbiana*. Fire dependent species. Occurs sporadically from Coos Co., OR south into Humboldt Co., CA. Nearest site to this project is about 15 miles to the southwest on the RRSNF.
Bensoniella oregana Oregon bensonia	Seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Range is restricted to the Coast and Siskiyou Mountains In extreme SW Oregon and NW California. Elevations 2,800 to 5,200 feet. Known sites within the Planning Area.
Carex crawfordii Crawford's sedge	Seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Range is restricted to the Coast and Siskiyou Mountains In extreme SW Oregon and NW California. Elevations 2,800 to 5,200 feet. Nearest site to the project is about 27 miles west.
Carex gynodynama hairy sedge	Moist meadows, open forests, seeps. Found in the Coast Range and Klamath-Siskiyou Mts. from Coos County, Oregon to Monterey County California.
Illiamna latibractreata California globe mallow	Moist sites, stream sides in coniferous forests. Often in open or partial shade, disturbed ground, often recently burned. Elevation 300-4,000 ft. Coos, Curry, Douglas, Jackson and Josephine Cos., OR; south to Humboldt Co., CA. The closest known site to the project is 5 miles to the southwest on RRSNF lands.
Romanzoffia thompsonii Thompson's mistmaiden	Sunny vernally wet, mossy (esp. *Bryum miniatum*), rocky hillsides at 750-6,000 ft. Douglas, Jackson, Lane, Linn, Marion Cos., in foothills and west Cascades of OR. In relation to this Planning Area, there is a known site on BLM land within 20 miles to the east.
Lichen Species	**Habitat/Distribution**
Chaenotheca subroscida	Usually in shaded moist situations, esp. close to the base of trunks. On old western red cedar and Engelmann spruce trunks, decorticated stumps and dry twigs of spruce under canopy. Occurring throughout SW Oregon. Known site approximately 20 miles east of this project.

Moss Species	Habitat/Distribution
Codriophorus depressus	Forming mats on rocks in perennial or intermittent streams, and in the spray zone of waterfalls, between 400 and 11,000 feet elevation. Habitats are subject to scour at high water.
Tayloria serrata	Forming green sods on old dung, rotten wood, or on soil enriched by dung on roadsides, trails, in dry to moist coniferous forest of various age classes including early seral, and in wetlands. Decomposed dung may be scarcely visible or completely humified. Scattered sites throughout SW OR. Nearest site about 40 miles NE of this project.
Liverwort Species	**Habitat/Distribution**
Diplophyllum plicatum	Tends to occur in either Western hemlock/Douglas-fir stands with western cedar present or Sitka Spruce older forests stands. It occurs in areas that sustain year-round cool habitats with high humidity which are fairly common along the immediate coast and in the Coast Range. Many populations known just to the north of the project, the closest are about 5 miles away.
Porella bolanderi	Forming shaded to partly exposed mats on a variety of rock types (siliceous, calcareous, and metamorphic) and trunks of *Quercus*, *Umbellularia*, and *Acer macrophyllum* (Piippo and Norris 1996). In the Pacific Northwest, known elevations range from 500-3,000 feet.

Sensitive Fungi

Rare ephemeral fungi, such as mushrooms, coral‘s and club‘s , are treated separately from the above listed species because of the difficulty in surveying and detecting them prior to projects being implemented. Surveys for species presence are often difficult, because fungi can be seen only when fruiting bodies are produced. Even with above-ground fruiting bodies present, their correlation with the extent and abundance of the fungal organisms underground is unknown (Straatsma and Krisai-Greilhuber, 2003). Because of the logistics and costs involved with completing surveys, which takes two years with several visits to each unit, the Forest Service Region 6 policy has been to manage these species at a broader landscape scale by conducting regional —strategic" surveys. These are surveys for the sake of finding new sites, not for clearance of a project. Therefore the effects analysis for fungi is based on existing knowledge of the distribution of each species and focuses on the likelihood of extirpation of a population.

The following table lists the Sensitive fungi species either documented or suspected on the RRSNF with the potential to be found in the Eden Ridge Planning Area:

Table III-30. Potential Sensitive Fungi that may Occur in Planning Area

Arcangeliella camphorata (16)	*Phaeocollybia psuedofestiva (38)*
Boletus pulcherrimus (22)	*Phaeocollybia scatesiae (18)*
Cudonia monticola (31)	*Phaeocollybia spadicea (68)*
Dermocybe humboldtensis (4)	*Ramaria largentii (21)*
Leucogaster citrinus (45)	*Ramaria spinulosa var. diminutive (1)*
Otidea smithii (12)	*Rhizopogon chamaleontinus (1)*
Phaeocollybia attenuata (152)	*Rhizopogon ellipsosporus (7)*
Phaeocollybia californica (35)	*Rhizopogon exiguous (5)*
Phaeocollybia olivacea (99)	*Sowerbyella rhenana (53)*

***The number in parentheses represents the amount of known sites in the PNW as of 2007.**

In order to determine the likelihood of finding Sensitive fungi species in the Planning Area several documents written by the Region 6 ISSSSP were referred to. These documents include: Fungi Effects Analysis Guidelines, 10/2008; Attachment 1- Likelihood of Occurrence Key, 9/2004; Attachment 2- Conservation Assessment for Fungi in Region 5 & 6, 7/2007; Attachment 4 – Potential Impacts to Fungi Table; and Habitat Summary for Sensitive Fungi Species, 2007. (ISSSSP website: http://www.fs.fed.us/r6/sfpnw/issssp/species-index/flora-fungi.shtml)

Most of the species in the table above are associated to some degree with forest floor litter, down woody material, host tree/shrub species, or a combination thereof. While this association is known, details about the requirements for forest floor litter or down woody material for most fungal species are not well understood, and host specificity is not often known beyond the broad categories of conifers hardwoods or plant families within these categories. Down woody material and forest floor litter are direct food sources for fungi that play a role in decomposing organic material. Host trees (or shrubs in some cases) provide necessary carbohydrates to some fungi through transference of carbohydrates from the roots of the host to the fungus via an underground network termed mycelia.

Down woody material requirements for most fungal species are not well understood. Down woody material may function to retain moisture, allowing root tips to support active ectomycorrhizae (Harvey et al. 1976, Harvey et al. 1978, Amaranthus et al. 1989, Harmon and Sexton 1995). These fallen tree "reservoirs", large limbs, and stumps can provide refugia for seedlings and mycorrhizal fungi, especially in drier forest communities. As stands mature, the availability of downed wood may be crucial for establishment of fungi as well as plant seedlings (Kropp 1982).

Down woody material is a direct food source for wood-decaying fungi. Studies in Scandinavia and North America indicate that the presence of large down wood promotes higher diversity of wood-decay fungi species (Kruys, 1999, Crites and Dale 1998, Ohlson et al. 1997, Høiland and Bendiksen 1996, Bader et al. 1995, Wästerlund and Ingelög 1981). Høiland and Bendiksen (1996) found that rare wood-inhabiting fungal species occurred primarily on long (average length = 11 meters) and well decayed (average decay Class III) down wood. When surface area is taken into consideration, fine woody debris appears to be equally important to species diversity (Kruys and Jonsson 1999).

The presence of large, well decayed down wood in managed stands can provide habitat for both ectomycorrhizal and wood-decay fungi, as well as plant seedlings. For some fungi, spore dissemination into disturbed areas is the primary method of re-establishment. Remnant stands of late seral forest neighboring managed areas may serve as refugia (Clarkson and Mills 1994). In addition, resistant fungal propagules may remain in soils or down wood after disturbance (Baar et al. 1999). Regardless of the method of re-establishment, it may take a great deal of time before fungal species can be detected.

The size and scale of down woody material influence the range in size of fungal individuals. Fungal colonies can range in size from microscopic to many acres and can persist for years or decades (Smith et al. 1992, De la Bastide et al. 1994, Bonello 1998). Typically fungi are patchily distributed, in part due to patchy distribution of substrate (living host plants, down wood). Scattered islands of down wood throughout a management unit, including many sizes ranging from twigs to large logs, as well as a variety of decay classes, may provide better fungal habitat than one size or decay class of down wood homogeneously covering the forest floor.

Data on quantities or coverage of down wood necessary to support a diversity of fungi in Pacific Northwest forests do not currently exist. In the dry forests of western Montana, Harvey et al. (1981) estimated that 25-37 tons of down wood per hectare are needed to support ectomycorrhizal activity necessary for forest communities developing after stand removal.

c. Field Inventory Results

Surveys for the above listed vascular plant, lichen, moss and liverwort species were conducted between June and August of 2010 with revisits to some areas occurring in June of 2011. Surveys were conducted by contract (Siskiyou Biosurvey, LLC) and by Agency botanists. High potential habitat areas were delineated prior to commencing surveys. The intuitive controlled survey method was utilized, so that each delineated habitat area was searched with a high degree of likelihood that TES species would be found if present. In accordance with Region 6 Forest Service direction, fungi surveys were not conducted.

Oregon bensonia was the only Sensitive species found during surveys. It was relocated at a handful of historically known sites, as well as being located in several new areas, including within some of the proposed units and roads in this project. There were several sites found along the edge of existing road beds where wet conditions have persisted due to the change in hydrology caused by the roads original construction. One site was found within a historical road bed scheduled for rebuilding. Units/roads with sites include 007, 314, 318, 319 and 326 and Road 5000-448 (see maps in the Botanical Resources Report, Attachment B for details).

Based on results of downed wood material surveys during stand exams in some units in 2009 (Silviculture Diagnosis, 2011) and from field observations during surveys for TES plant species, the Planning Area appears to be stocked with coarse down wood probably due to debris remaining from historical railroad logging. There is sufficient substrate and habitat currently available for colonization by Sensitive saprophytic fungi, although there are less large diameter structures than desired. Though the structure and composition of the forest does not qualify it as old-growth, there is likely to be sufficient opportunity for colonization of the existing tree species by Sensitive ectomycorrhizal fungi.

d. Effects Mechanisms

Oregon bensonia
Direct effects to Sensitive plants may include impacts such as trampling by foot or equipment, piling of vegetation or logs on known sites or any other soil disturbing activity that could potentially uproot individuals or a population. Examples of indirect effects are things like edge effect (Chen et al., 1992) which can cause changes in microclimatic conditions that may be necessary for a species to persist. If Project Design Criteria (PDC) were not implemented there is a high likelihood that the populations of Oregon bensonia found within treatment areas of this project would be directly impacted by workers or their equipment. There is also potential for indirect impacts from thinning due to the potential for lower relative humidity and moisture retention levels in the soil from decreased canopy and shade cover causing the sites to dry out.

Sensitive Fungi
Threats and impacts to fungi may occur at several scales. At a local habitat scale, impacts or threats could include anything that affects (removes, alters) the substrate on which fungi grow. Impacts may also occur on a larger scale as a result of the cumulative effects of many smaller local impacts. Local threats combined on larger scales could alter the distribution of populations across regional landscapes, resulting in the impairment of landscape-wide species persistence. For example, the loss of several populations within one area could truncate population continuity, inhibiting the ability of a species to disperse across distances. Such disjunct distributions can often result in expanding areas of extirpation. As cumulative effects may be difficult to address, perhaps the most useful strategy is to focus on what can be managed locally, assuming that cumulative effects would thus be minimized as well.

Larger-scale, indirect effects (such as climate change or air pollution) are difficult to assess, given limited knowledge of even microhabitat requirements of most fungi. The effect of larger-scale issues on fungi populations remains unknown, and cannot be adequately addressed with the management options discussed in this document.

Management activities may pose direct or indirect threats to fungal individuals or mycelial mats, depending on the timing or intensity of the activity. Types of activities that can result in threats to fungal individuals or alter habitat conditions beyond a given threshold of tolerance include activities that:

- intensively or extensively remove or consume the woody substrate, forest floor litter, or shrub hosts with which the species is associated;
- remove or destroy the fungal organism; or
- remove host tree species or significantly modify the microclimate at the species‘ site.

The following table from the regional Interagency Special Status Sensitive Species Program (ISSSSP) —FungiEffects Analysis Guidelines" highlights potential impacts to Sensitive fungi:

Table III-31. Potential Habitat Impacts to Sensitive Fungi Species

Thinning	Increase in solar radiation up to 60%. Modification of forest floor conditions. Retention of large wood is an important factor in protecting Ectomycorrhizal (EM) and Saprobe/wood decaying species viability	
	Direct Impacts	***Indirect Impacts***
	Removal of host trees necessary to sustain EM Disturbance of mycelial network	Moisture retention capability • overstory shade • forest floor litter and duff • large wood Nutrient source Large woody material or host trees for regeneration of inoculum source Soil compaction (less for helicopter) • root growth and root tip availability for fungi

e. Direct and Indirect Effects of Alternatives

There are no populations, nor is there any habitat for any federally listed Threatened or Endangered plant or fungi species within the Project Area. The project would have **no effect** on any Threatened or Endangered plant or fungi species or their habitat.

Oregon bensonia

Oregon bensonia (*Bensonia oregana*), a Sensitive vascular plant species, was found within the Planning Area and within Project Areas.

Alternative 1 (No-Action)
The current condition would remain the same under this alternative. Natural processes would continue to progress in a random succession with an unknown future outcome. Known and unknown TES plant and fungi species that currently exist within the project boundary would respond and continue to evolve within the natural system. There would be no direct or indirect effects from implementing this alternative.

Action Alternatives
The differences in Alternatives 2, 3 and 4 have no bearing on effects to Oregon bensonia because under all Action Alternatives, the known sites found in Units 007, 314, 318, 319 and 326 would undergo vegetation treatments. Effects are relatively similar because of only subtle changes in alternative proposal acreages in relation to the larger landscape. For this reason, effects for each alternative have been lumped in the discussion below.

Avoidance of the bensonia populations located within this project is proposed so that direct and indirect effects are minimized to insignificant. The methods for avoidance are discussed in EIS Chapter II. Acknowledging there may be habitat and populations that were not found during the surveys of the project it is determined that the **Eden Ridge Timber Sale Project may impact individuals or habitat, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species.**

The Eden Ridge Timber Sales project will have **no impact** on any of the other Sensitive vascular plant, lichen, moss or liverwort species listed as having potential habitat in the project.

Sensitive Fungi

Alternative 1 (No-Action)
The current condition would remain the same under this alternative. Natural processes would continue to progress in a random succession with an unknown future outcome. Known and unknown fungi species that currently exist within the project boundary would respond and continue to evolve within the natural system. There would be no direct or indirect effects from implementing this alternative.

Action Alternatives
The differences in Alternatives 2, 3 and 4 have no bearing on effects because they would be relatively similar for sensitive fungi species. This is due to only subtle changes in alternative proposal acreages in relation to the larger landscape. For these reasons, effects for each alternative have also been lumped.

Sensitive fungi may be present within the Project Areas but surveys were deemed impractical. Based on existing data the regional Interagency Special Status and Sensitive Species Program (ISSSSP) provided literature review and several analysis documents which are all incorporated by reference to this analysis.

Based on the regional assessment, all Action Alternatives **may impact individuals or habitat of Sensitive fungi, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to any population or species within its range.**

f. Cumulative Effects

Cumulative effects are "those effects on the environment that result from the incremental effect of the action when added to past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions.

Oregon bensonia
The scale considered for cumulative effects to Oregon bensonia is the extent of the species distribution (Coast and Siskiyou Mts. of Coos, Douglas, Josephine and Curry County, Oregon disjunct to the south in Humboldt County, California). There are roughly 60 populations of this species known in Oregon. Management of this species dates back to the early 1980s when Forest Service botanists began conducting surveys prior to proposed projects and recommending PDCs to protect populations of Oregon bensonia (Rare Plant Siting Forms, Gold Beach and Powers RD, 1978-present).

It is likely that adverse effects occurred to some populations of Oregon bensonia from past logging prior to the early 1980s. The Eden Ridge Timber Sales Project would not incrementally increase any significant effects to Oregon bensonia because it would have no direct or indirect effects to the species with the proposed PDCs being implemented.

Sensitive fungi
The scale considered for cumulative effects to Sensitive fungi is the Pacific Northwest Region 6 area in Oregon and Washington because this is the level used by ISSSSP biologists to develop the analysis tools that have allowed for the assessment of Sensitive fungi without doing field surveys to verify species presence or absence within projects. There is a high probability that adverse effects have occurred to several of the listed Sensitive fungi species in the past 100 or so years within the region.

Acknowledging that impacts may occur to Sensitive fungi sites, that are as yet unknown because of a lack of surveys and/or an inadequate protocol, is inevitable. Therefore it is can also be said that with these potential direct and indirect effects there would also be cumulative effects because of the certainty that there have been past impacts.

There is also likely to be future impacts because of the lack of information on the distribution of these Sensitive species. Overall, these effects are not likely to be significant enough to cause a loss of viability to a population or species, keeping in mind there is a high level of uncertainty in this determination.

5. INVASIVE PLANTS

Effects of variable density management (thinning) treatments and other connected actions on the spread of invasive plant species.

EIS Appendix F includes a complete Botanical Resources Report (incorporated by reference). This report also includes current condition and effects discussion, and lists of priority invasive species.

a. Background and Analysis Framework

The definition of an invasive plant is those plant species designated as Invasive Plants by the Secretary of Agriculture or by the responsible State official. Invasive Plants generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of a serious insect or disease, or being non-native or newly introduced and not common to the state. Generally, species that can survive and reproduce in a natural setting away from landscape areas are considered invasive.

Management Direction
Management direction on this subject is given in the Siskiyou NF LRMP under forest-wide standards and guidelines item 12-6: *"Control of Invasive Plants should be accomplished in cooperation with state, county, and private organizations through Weed Control Districts or Coordinated Resource Management Agreements. Preventive management is critical to an effective control program."*

In addition, this document incorporates by reference all the standards and guidelines described in the Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision and Final Environmental Impact Statement Volumes I-III, 2005. That document amends the Siskiyou NF LRMP to include an updated set of information on preventing and managing invasive plant species in Region 6.

Current Management Direction for Invasive Plants as stated in the Forest Service Manual 2080, Amendment No. 2000-95-5, effective November 29, 1995 states the following:

District Rangers are responsible for:

1. Determining the risk of Invasive Plant introduction or spread as part of the NEPA process for proposed actions, especially for ground disturbing and site altering activities.

2. Enforcing closures or prohibition orders issued under 36 CFR parts 261.50 (a) and 261.58 (t) and enforcing contract specifications intended to prevent and control the spread of Invasive Plants.

3. Ensuring that the contracts and permits contain appropriate clauses concerning the prevention or spread of Invasive Plants as described in the Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (September 2005).

Policy: When any ground disturbing action or activity is proposed, determine the risk of introducing or spreading Invasive Plants associated with a proposed action.

Current Conditions within the Planning Area
Invasive plant surveys were completed as part of the TES plant surveys discussed in subsection 4 (above). The Planning Area was found to be relatively void of invasive plants, especially species that are prioritized for active treatments (see EIS Appendix F, Attachment B, Priority Invasive Plants Documented or Suspected on the RRSNF for a list of priority species).

Tansy ragwort (*Senecio jacobaea*) was found to be common along at least some portion of each road within the Planning Area. The district uses only biological controls when treating Tansy, no manual or spraying treatments are used. Bull Thistle (*Cirsium vulgare)* was also found to be fairly common along roads and within old landings. The district is not actively treating bull thistle, as it is biennial, it comes and goes quickly from locations and does not cause irreparable harm. Canadian thistle (*Cirsium arvense)* was found to be less common than the other two previously listed species but is more of a concern for persistence and harm to the environment. One historical site of Scotch broom (*Cytisus scoparius*) is known from the Planning Area but was not relocated during surveys.

b. Effects Mechanisms

Most invasive species on the Rogue River-Siskiyou NF are found along roads. There are many native species but non-native plants have increased over time mainly in places of past disturbance. In the past, heavy equipment has been a primary mover of noxious weeds by movement of plants and seed in the soil on the equipment.

Thinning of pre-commercial or commercial material and other connected actions (e.g., roads) may spread existing infestations and introduce invasive species by moving seed or opening up areas for invasive species to establish if PDCs and Mitigation Measures are not followed.

c. Direct and Indirect Effects of Alternatives

Alternative 1 (No-Action)
There are no known high priority invasive plant species within the Planning Area. There would be no chance to infest new areas because no actions would occur if this alternative were chosen. This alternative would result in no direct or indirect effects with regard to invasive plant spread.

Action Alternatives
For effects determinations the alternatives are similar enough to lump together, although Alternative 4 (3,058 ac.) would have slightly less impact than Alternative 3 (3,240 ac.) which in turn would have slightly less impact than Alternative 2 (3,314 ac.). This is due to the amount of acres of disturbance being slightly less for Alternative 4 and Alternative 3, with both proposing less thinning than Alternative 2.

Direct effects with regard to spreading invasive plants are actions such as parking road working equipment on an invasive plant site that has gone to seed then moving the equipment to another area in the Planning Area and potentially spreading the seed to a new site. Several scenarios similar to this example have been considered and PDCs were developed (see EIS Chapter II) to avoid the introduction and/or spread of invasive species in the project. Direct effects would be minimized to insignificant by following the PDCs.

The removal of canopy in an area adjacent to an existing invasive plant site is an example of an indirect effect that could lead to further spread of that species by opening up bare ground and increasing available sun light. The actions proposed for this project have some potential to increase light and expose bare soil after thinning occurs, which has been shown to increase invasive plant colonization (Nelson et al., 2008).

d. Cumulative Effects

Based on the limited potential for direct or indirect effects it is anticipated that there would be **low to moderate risk** of increasing cumulative effects on the spread of invasive plant species within the Project Area.

6. PORT-ORFORD-CEDAR ROOT DISEASE

Effects of variable density management (thinning) treatments and other connected actions on the spread of *Phytophthora lateralis*, a non-native pathogen that causes disease, affecting Port-Orford-cedar.

Phytophthora (meaning "plant destroyer") is a genus of more than 70 described species of the Oomycetes (Brasier et al. 2006). Often referred to as "fungi", *Phytophthora* species are "water molds" that are more closely related to marine algae than fungi (Erwin and Ribeiro, 1996). Favored by moist conditions, *Phytophthora* species include some of the world's most notorious plant pathogens. Their spread may be influenced by human activities that move infested soil, water, or organic material. EIS Appendix B includes a complete Port-Orford-cedar Report and Risk Key Assessment (incorporated by reference).

a. Background and Analysis Framework

Port-Orford-cedar (*Chamaecyparis lawsoniana*) is native to an area along the Pacific Coast from Coos Bay, Oregon, to the mouth of the Mad River near Arcata, California. Its range extends from the coast to about 50 miles inland. There is also a small disjunct population in the Scott Mountains of California. On most of the Rogue River-Siskiyou National Forest, Port-Orford-cedar (POC) is concentrated in Riparian Reserves except on the Powers Ranger District where POC is often well distributed across the landscape.

The Powers Ranger District has the greatest concentration of POC occurring in the world, from the South Fork of the Coquille River to Iron Mountain. This district is also unique in having stands with POC stand components of up to 70 to 80 percent. Included within the district are the Port-Orford-cedar Research Natural Area, Big Tree Viewing Area, which includes the largest POC in the world at nearly 12 feet in diameter, and the Coquille River Falls Research Natural Area.

The 2008 inventory showed 47,902 acres of POC present on the district, of which 2,349 acres (4.9%) are infested with *Phytophthora lateralis* (PL). The research natural areas are infested with POC root disease.

Phytophthora lateralis
PL is a virulent, non-native pathogen that was introduced into the native range of POC in the early 1950s and its place of origin is unknown. PL readily kills POC of all ages that are growing on sites favorable for infection. Once an area becomes infested, it is difficult to eradicate PL.

PL can cause mortality within weeks of infection in the case of small trees, and in one to four years when large trees are infected (Roth et al. 1987). Trees usually lose all foliage two to three years after death. In areas where the disease has been active for several years, dead and dying trees with all degrees of foliage symptoms are visible (Hadfield et al. 1986).

PL is spread in the following ways (Hansen et al. 2000; Zobel et al. 1985):

-Human vectors over long distances via resting spore transported in infested plant material or soil.
-Locally via waterborne spores moving in ditches, streams, or overland flow.
-Via mycelia growing across root contacts and grafts between infected and uninfected POC.

PL is favored in areas of slow-moving or standing water and on poorly drained microsites, especially when such sites occur below roads. Susceptible areas are segregated by risk categories based on USDA Forest Service, 2004: *Record of Decision and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon*, Siskiyou National Forest. See EIS Chapter II for more detail on risk categories and examples of PL infested sites within the Eden Ridge Planning Area.

Port-Orford-Cedar Inventory and PL Infection
An updated POC inventory based on field verification was finalized in 2008 on the Powers Ranger District of the Rogue River-Siskiyou National Forest. POC presence and PL root disease is mapped in small portions of the Planning Area.

Most of ER Planning Area is mapped as canopy cover 1 in the updated inventory. This attribute is defined as 2-5% canopy cover of POC foliage present in mapped polygons. Canopy cover is estimated during air photo interpretation and field verification in some cases (Polygon Attribute Table-Data Dictionary).

Canopy cover 1 can be considered to not measurably contribute to land management objectives[1]. Where POC is a small percentage of the stand or does not provide unique stand attributes, its loss is probably not meaningful when measured against management objectives (USDA 2004, p. 34). In these circumstances, the recommendation to manage for POC is determined by the ER Interdisciplinary Team.

Dead and dying POC seedlings and saplings, likely infected with PL are present in road ditches and drainages in the surrounding private land ownership. PL has been diagnosed in dying POC regeneration alongside the 5000 Road west of the eight mile gate before entering into FS lands (June 14, 2011, field trip with Frank Betlejewski, Interregional POC Manager).

Measurably contributing POC and PL infection is present west of the private inholding around Doe Swamp. This area is mapped as canopy cover 2, defined as 6-20% POC present in mapped polygons, **which triggers the POC Risk Key.**

Previous tree planting of 98,100 POC seedlings occurred in 1937 across 144 acres in a portion of the area inventoried as canopy cover 2 (see stand history in Preliminary Silvicultural Diagnosis, EIS Appendix B). This plantation is adjacent to the land ownership boundary around Doe Swamp with private timber company which has recently been clear-cut harvested in 2010. Many planted POC appear to be deformed with busted tops that are being out competed and overtopped by larger Douglas-fir.

Whether or not areas with POC are considered measurably contributing in the ER Planning Area, landscape-scale POC distribution should be considered as surrounding private timber company land downstream from the Doe Swamp area is being managed for Douglas-fir regeneration on a 40-50 year rotation. The ecological value of maintaining healthy POC during treatment activities on Forest Service lands should be considered important for vegetation diversity and meeting ACS Objectives in Riparian Reserves.

b. Effects Mechanisms

Phytophthora lateralis is spread via water or soil. A typical spread scenario involves infested soil being transported into an un-infested area on a vehicle or piece of equipment or, potentially, in infested water being transported in the tanks of fire engines or helicopter buckets during suppression activities. The infested soil falls off of the vehicle or spores are delivered via water and the pathogen first infects POC near the site of introduction.

[1] Pers. conv. Frank Betlejewski, Interregional Port-Orford-cedar Program Manager, Southwest Forest Insect and Disease Service Center.

New spores from that infection are then washed downhill in surface water infecting additional hosts. This is especially lethal along drainages and creeks where infested water is channeled and flows near concentrations of healthy POC.

Port-Orford-Cedar Risk Key
The POC Risk Key is used to clarify the environmental conditions that require implementation of one or more of the disease controlling management practices listed in the *2004 Record of Decision (ROD) and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon Siskiyou National Forest*.

Program objectives are to maintain POC as an ecologically and economically significant species on National Forest (NF) lands. POC management will provide cost-effective mitigation for management activities that create appreciable additional risk to important uninfected POC though not to reduce all risk to all trees at all cost (USDA-FS 2004).

Proposed treatment activities and road building through PL pockets in ER Units 326 and 327 could have potentially adverse effects to POC in this area. A project-specific POC Risk Key assessment is required in areas with measurably contributing POC to help determine where risk reduction management practices would be applied and to comply with the LRMP amendment (USDA 2004).

Figure III-3. PL Pocket in Unit 326 Adjacent to Railroad Grade Proposed for Road Reconstruction



c. Direct and Indirect Effects of Alternatives

Potential for the spread of *Phytophthora lateralis*, the pathogen that causes Port-Orford-cedar root disease is not simply a function of how many acres are entered. Rather, it is a function of a number of factors including acres entered with healthy POC, acres entered with PL, management performed on these acres, season of activity on these acres, and sequencing of units containing POC and PL to name a few.

Employing a planned combination of treatments can reduce the probability of long-distance spread more than a single treatment. An integrated treatment program that uses a combination of sanitation treatments, vehicle washing treatments, road drainage improvements, timing of activities during dry seasons, using certified clean or bleach-treated water, scheduling treatments in uninfested before infested areas, regulation of special use activities such as cedar bough collecting, and public education efforts combined with road closures, has a suggested probability of pathogen spread between zero and two percent per activity (page 3 7 4-37: USDA FS USDI BLM, 2004).

Alternative 1
Under the No Action Alternative, the existing condition would continue. The consequences of this alternative are described in the January 2004, Final Supplemental Environmental Impact Statement Management of Port-Orford-cedar in Southwest Oregon as Alternative One.

Action Alternatives
The Port-Orford Cedar Risk Key is a site-specific analysis to help determine where risk reduction management practices would be applied. Only those areas that trigger the POC Risk Key were analyzed. The analysis of POC risk is documented and is part of Appendix B of this EIS.

In areas proposed for timber harvest and road building, mitigation measures would be required as described in the POC Risk Key assessment (see EIS Appendix B, Port-Orford-cedar Report) and summarized in EIS Chapter II. These include seasonal project scheduling, use of uninfested water, unit scheduling, road management measures (including not building roads (e.g., Road W through PL pockets in Units 326 and 327) or relocating the proposed road to avoid these infested areas, resistant POC planting, washing project equipment, roadside sanitation, and site-specific POC management (e.g., manage to favor POC uphill from creeks, on ridgetops and on well-drained sites to emphasize management of POC on sites where conditions make it likely that trees would escape infection).

Recommended treatments for management of PL include wide-thin gap treatments, roadside sanitation, planting and favoring POC in low risk areas in the silvicultural prescriptions (see EIS Chapter II).

This project-specific NEPA analysis has appropriately documented the application of the risk key and the consideration of the available management practices, and will make the project and its effects consistent with the mid- and large-geographic and temporal-scale effects described by the 2004 SEIS analysis and Forest Plan Amendment, and will permit the project analysis to tier to the discussion of those effects (USDA FS 2004).

d. Cumulative Effects

The Rogue River–Siskiyou National Forest is within the North Coast and Siskiyou Risk Regions for POC. Of the 47,902 POC acres on the Powers Ranger District, 2,349 acres (4.9 %) are infested. Twenty percent of the sites in the North Coast Risk Region are considered to be high risk (25,250 acres). At this time approximately fifteen percent of the risk region is considered infested (18,900 acres). This level of infestation on the Powers Ranger district is below the infestation level for the Risk Region as a whole. In 100 years, the predicted amount of infested acres is predicted to increase to 17 percent of high-risk sites (approximately 20,800 acres).

For the Gold Beach and Wild Rivers Ranger Districts, there are approximately 99,551 acres of POC of which 10,649 acres are infested (10.7%). In this risk region, forty percent of the acres are considered to be at high risk (approximately 46,550 acres). Eleven percent of the Risk Region (12,800 acres) is considered infested. The current level of infestation is slightly below the eleven percent infested acres for the Risk Region as a whole. In 100 years, the predicted amount of infested acres is predicted to increase to 20 percent of high-risk sites (approximately 23,600 acres).

These estimates cover all management activity for the Forest Service and BLM. A more complete discussion of cumulative risk and rate of spread can be found in the POC FSEIS (USDA Forest Service USDI Bureau of Land Management 2004).

7. THREATENED TERRESTRIAL WILDLIFE SPECIES AND CRITICAL HABITAT

Effects of variable density management (thinning) treatments and other connected actions on Threatened terrestrial wildlife species and/or Critical Habitat.

EIS Appendix G includes a complete Wildlife Report (incorporated by reference). Forest Service Manual (FSM) Chapter 2670 requires a Biological Evaluation to be prepared for the proposed Eden Ridge Timber Sales Project. The purpose of this evaluation is to determine and document the possible effects that the proposed activity and alternatives would have on any Endangered, Threatened, Proposed, or Sensitive wildlife species (FSM 2672.4). A second objective of this evaluation is to ensure these species receive full consideration in the decision-making process, to maintain species viability and meet defined recovery goals.

The Biological Evaluation process (FSM 2672.43) provides a description of office analysis, and mitigation activities necessary to ensure proposed management actions will not likely jeopardize the continued viability of: species listed or proposed to be listed as Endangered (E) or Threatened (T) by the USDI Fish and Wildlife Service and species listed as Sensitive (S) by the USDA Forest Service Region 6 (USDA FS 2008, FSM 2670.44).

Section 7 of the Endangered Species Act (ESA) also directs each Federal agency to insure that any action authorized, funded or carried out by such agency is not likely to jeopardize the continued existence of any Threatened or Endangered species or result in the destruction or adverse modification of their critical habitat. The ESA also directs each Federal agency to confer or consult with the appropriate Secretary on any action, which is likely to jeopardize or affect the continued existence of any species or its critical habitat.

a. Background and Analysis Framework

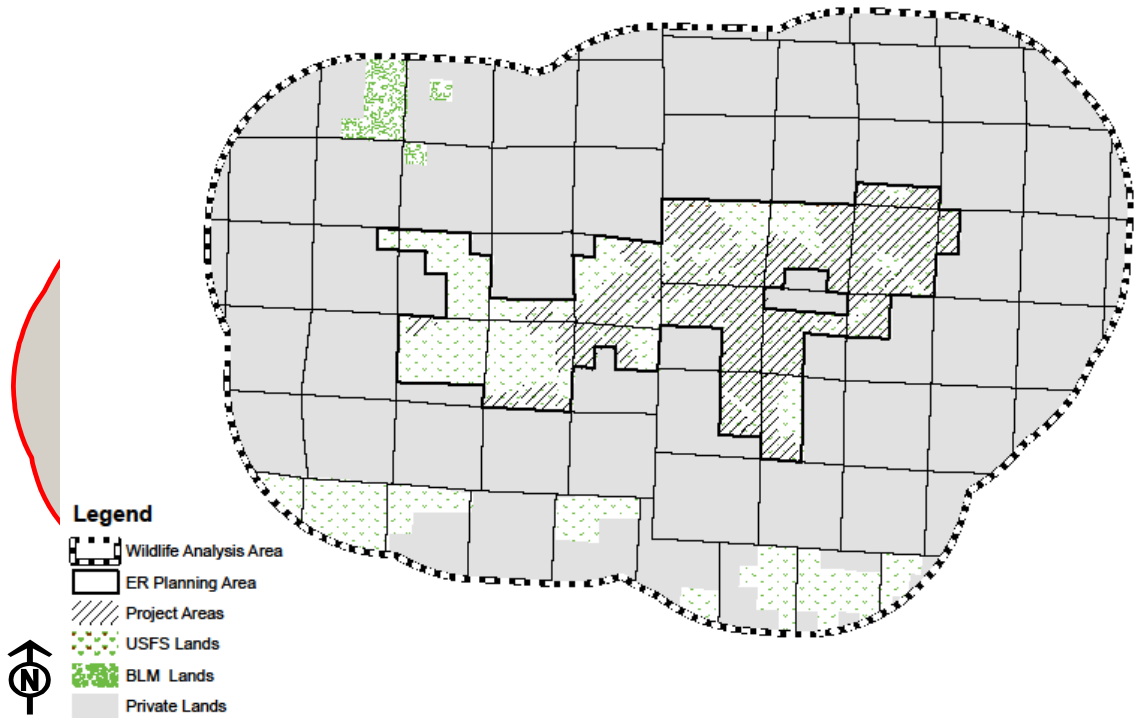
In compliance with Section 7 of the Endangered Species Act (ESA)(1973 et seq.) and the Forest Service Biological Evaluation process for Proposed, Threatened, Endangered, and Sensitive (PETS) wildlife species, the list of species potentially occurring within the RRSNF was reviewed. The January 31, 2008 Pacific Northwest Region (R6) listing of species applicable to the RRSNF was reviewed in regard to potential effects on any of these species by actions associated with the Eden Ridge Timber Sales Project.

This project is within the species range of the northern spotted owl (*Strix occidentalis caurina*), and marbled murrelet (*Brachyramphus marmoratus*). These species are listed as Threatened under the ESA.

The Eden Ridge Timber Sales Planning Area was buffered by 2 miles (see MAP III-4), which is a northern spotted owl home range plus one half mile. This effects Analysis Area distance will encompass the home range of most of the terrestrial wildlife species analyzed in this EIS. The term Project Area, is used to describe where action would occur, such as units where forest thinning is proposed and where road construction or road improvements are proposed.

The Plum Creek Timber Company owns approximately 30,000 of the 39,731 acres within the Analysis Area. Timber harvest activities on the surrounding private lands are typically on a 40-50 year regeneration rotation. These harvest activities keep the surrounding lands in a fairly consistent early successional vegetation stage. Additionally, 8,634 acres within the Analysis Area are managed by the USFS and the remaining 444 acres are managed by the Bureau of Land Management (BLM).

MAP III-4. Wildlife Analysis Area



b. Late-Successional Forest

—Late-successional forests are those forest seral stages that include mature [21-32" DBH or 80-200 years of age] and old-growth [>32" DBH or >180-200 years old] age classes." (NWFP FSEIS Vol. 1, Glossary, p. 9 and ROD, p. B-1) (NWFP FSEIS Vol. 1, p. 3&4 – 13 and 3&4 - 26). —Although the processes that created the current late-successional and old-growth ecosystems are not completely understood, they include: (1) tree growth and maturation, (2) death and decay of large trees, (3) low-to-moderate intensity disturbances (e.g., fire, wind, insects, and diseases) that create canopy openings or gaps in the various strata of vegetation, (4) establishment of trees beneath the maturing overstory trees either in gaps or under the canopy, and (5) closing of canopy gaps by lateral canopy growth or growth of understory trees." (NWFP ROD, p. B-2).

Two Threatened species that occur within the fifth-field watersheds associated with the Project Areas use late-successional forest habitat for their survival needs. These Threatened species are the northern spotted owl and the marbled murrelet. The most important habitat component these species need in late-successional forest is very large trees with large cavities or platforms, which are needed for nesting. The majority of trees used for nesting by the marbled murrelet and the northern spotted owl are conifers greater than 50" dbh with unique structure, such as large limbs or cavities (Nelson and Wilson, 2002; LaHaye and Gutierrez, 1999; Forsman and Giese, 1997). In addition, some species, such as the Pacific fisher, use large deciduous hardwoods with cavities and large limbs (Yaeger, 2005).

Although there are a number of characteristics in late-successional forest, quantification of old-growth forest generally uses a combination of diameters (described above) and canopy closure (generally greater than 50%), because diameter and canopy closure are easily measured and because these are the types of stands where the characteristics of late-successional forest are likely to begin developing or may already occur. For example, a stand, which is sixty years of age, could be dominated by 21-32" dbh trees with high canopy cover, but is not likely to contain giant trees, large cavities, or large limbs. This stand could contain a few large snags or large down wood; therefore, this stand is only beginning to develop late-successional forest characteristics.

Patch sizes have been fragmented by past timber harvest and wildfire reducing the overall sizes and number of patches. There is a need to grow larger patches of older forest (LSRA, 1995). Additionally, the diversity within existing late-successional forest habitat is probably less than it was historically, when low to moderate intensity fires were historically more common than they have been over the past 100 years. Low to moderate intensity fires increase diversity by creating gaps and scattered dead wood where small groups or individual large trees are killed by burning.

Within the Eden Ridge Planning Area, there is an estimated 3,300 acres of proposed treatment acres that are best represented by the mature (21-32" dbh) forest habitat type, **however these "mature" stands do not contain giant trees, large cavities, or large limbs, and are not considered late-successional forest.** Further, based on historical records and stand examination, these stands are currently less than 80 years old.

Northwest Forest Plan Standard and Guideline C-44

The Northwest Forest Plan ROD has Standards and Guidelines designed to limit harvest of older forest in watersheds/analysis areas where little late-successional forest remains (Northwest Forest Plan ROD, page C-44). Standard and Guideline C-44 of the Northwest Forest Plan ROD establishes the need to provide for retention of old-growth fragments in watersheds where 15% or less is late-successional forest within 5th field watersheds.

NWFP S&G (C-44) discusses that,"…Within such an area, all remaining late-successional stands should be protected". NWFP ROD B 1-4 discusses structure and composition of late-successional and old-growth forest ecosystems and does not limit the determination of such stands to diameter and canopy closure.

The entire area associated with proposed treatments (the Project Areas) is within the land allocation designation of Matrix. Two 5th field watersheds are affected by the project. Existing late-successional and old-growth forest habitat by 5th field watershed is summarized in Table III-32.

Table III-32. Posthabitat[2] Conditions within 5th field Watersheds

5th Field Watershed	Watershed - USFS acres	% Late-successional	% Old-growth
Middle Fork Coquille River	1,534	43% (653 ac)	1% (14 ac)
South Fork Coquille River	65,370	21% (14,001 ac)	14% (8,967 ac)

As part of implementation for the Eden Ridge Timber Sales Project, an analysis exercise would be done to determine whether or not any 5-acre portion of a candidate stand contains 6 or more trees with potential late-successional structure. If an area contains 6 or more trees with potential structure, it constitutes potential suitable habitat. Any stand with a potential suitable habitat (remnant late-successional tree) component would be further assessed with a walk-through of the area that would be impacted (USDI, 2006). If a late successional component is confirmed, that portion of the stand (or the entire stand) would be excluded from treatments (including ½ site tree un-thinned buffer) (see Wildlife Report PDC #6 and EIS Chapter II).

Therefore, **the Eden Ridge Timber Sales Project would not affect (change or reduce) the current condition regarding late-successional or old-growth forest**, in conformance with Standard and Guideline at Northwest Forest Plan C-44.

[2] Posthabitat is defined as late-successional forest habitat (mature and old-growth), which is synonymous with nesting-roosting habitat for northern spotted owls.

c. Description of Species and Critical Habitat Listed Under ESA

Northern Spotted Owl (*Strix occidentalis caurina*

Habitat and Management Requirements
A detailed account of the taxonomy, ecology, and reproductive characteristics of the spotted owl is found in the Interagency Scientific Committee Report (ISC 1990) and the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (USDA FS/USDI BLM 1994).

The spotted owl was federally listed as Threatened primarily due to the loss of suitable habitat. Spotted owls tend to be associated with forest stands in which many of the trees are more than 80 years old, and stands that contain some old-growth forest structures such as large, decadent live and dead trees. Spotted owls are year-round residents in suitable habitat. Generally, the greater the amount of forest greater than 80 years old, the greater the probability for finding spotted owls within those forests. Approximately 90 percent of existing spotted owl habitat occurs on federally managed lands.

Suitable habitat refers to habitat that functions for nesting, roosting, and/or foraging. Spotted owls usually occupy larger forested stands exhibiting older forest structure that normally includes mature or old-growth conifers with limited fragmentation. The stand usually has multiple canopies, with the secondary canopy often composed of both conifers and hardwoods under a conifer over-story. Canopy closure at nest sites is usually 60 percent or greater, with conifers at least 21 inches dbh. Most spotted owl nests have been found in mature and old-growth forests.

The FAUNA database contains 4 spotted owl records within the Analysis Area. Three of the records are for observations of one historic owl in 1991 and 1992. The forth was an incidental observation from 1992. The Project Area was surveyed to protocol in 2008 and 2009. No spotted owls were detected within any of the proposed units; however, contract surveyors reported an incidental observation of a spotted owl. Detected owls may be using the Project Area for forage and would likely continue to do so. Originally some larger trees existed within the units; however, boundaries for the harvest units were re-delineated or portions of units were dropped to avoid areas where large diameter trees were common and there was potential for suitable habitat for spotted owls (see Wildlife Report PDC #5 and EIS Chapter II). The nature of the treatment prescription would retain the largest overstory trees ((see Wildlife Report PDC #15 &16 and EIS Chapter II)).

The northern spotted owl was listed as threatened throughout its range ~~–d~~ue to loss and adverse modification of spotted owl habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USDI FWS 1990: 26114). More specifically, threats to the spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of populations within physiographic provinces, predation and competition, lack of coordinated conservation measures, inadequacy of regulatory mechanisms and vulnerability to natural disturbance (USDI FWS 1992b).

A primary spotted owl recovery goal of the Revised Recovery Plan is to conserve older stands that are either occupied or contain high-value spotted owl habitat. Long-term spotted owl recovery could benefit from forest management where the basic goals are to restore or maintain ecological processes and resilience. In general, to advance long-term spotted owl recovery and ecosystem restoration in moist forests in the face of climate change and past management practices; the principles recommended to be applied by land managers include:

1) Conserve older stands that have occupied or high-value spotted owl habitat as described in Recovery Actions 10 and 32. On Federal lands this recommendation applies to all land-use allocations outside of Congressionally Reserved Areas.

2) Management emphasis needs to be placed on meeting spotted owl recovery goals and long-term ecosystem restoration and conservation.

3) Continue to manage for large, continuous blocks of late-successional forest.

Recovery Action 10 – Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.

Recovery Action 32 – Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees (USFWS 2011).

In their 2004 evaluation of the status of the northern spotted owl, Courtney et al. (2004) state that present major threats to the species include the effects of past and current timber harvest; loss of habitat to fire; and barred owls. The 2004 authors go on to state that other threats are also present but of threats identified at the time of listing, only one (predation linked to fragmentation) is not well supported.

Management direction for the northern spotted owl has its basis in *A Conservation Strategy for the Northern Spotted Owl* (Thomas et al. 1990). Direction stems from the Northwest Forest Plan, which amended current forest planning documents and established a system of Late-Successional Reserves (LSR) across the landscape to provide habitat for the recovery of spotted owl populations. Thomas et al. (1990) disclosed northern spotted owls‘ use of old-growth forests almost exclusively and rarely use clear-cuts or young forest plantations. When young stands are used, they typically contain remnant large trees (Thomas et al. 1990). Where timber harvest has occurred, spotted owls are usually found in the remaining patches of old-growth and mature forest (Forsman 1982). Habitat features associated with forests used by spotted owls include multi-layered canopies, relatively high canopy closure, large diameter trees, and numerous snags and logs (Forsman 1982, Thomas et al. 1990). These stand features are related to requirements for feeding, nesting, and roosting (Forsman 1982). Spotted owls most commonly nest in tree cavities or on platforms created by debris or mistletoe infections (Thomas et al. 1990).

Northern spotted owls generally inhabit older forested habitats because they contain the structures and characteristics required for nesting, roosting, foraging (NRF), and dispersal. A definition of NRF habitat in the Klamath Province is difficult to identify because of the variety of ecological types and frequent fire history (USDA Forest Service 1996). The Mt. Ashland LSR Assessment (USDA Forest Service 1996) identified stands which supported northern spotted owl as >17” average diameter and >60% canopy closure (CC). The Rogue River/South Coast Biological Assessment defines Nesting/Roosting/Foraging (NRF) habitat as >21” average diameter and >60% CC (USDA Forest Service, USDI Fish and Wildlife Service 2009c).

The primary prey of northern spotted owls in the Analysis Area are dusky-footed woodrats (*Neotoma fuscipes*) and northern flying squirrels (*Glaucomy sabrinus*) (USDA Forest Service 1996). Dusky-footed woodrats are occasionally abundant in early mixed-conifer forests and present in late stages of forest development (Carey et al. 1999). Northern flying squirrels are generally associated with older forests. Zabel et al. (1995) verified a trend of negative, linear relationship between home range size during the breeding season and the proportion of woodrats in the diet of northern spotted owls. The proportion of northern flying squirrels in the diet was positively correlated with home range size.

Northern Spotted Owl Critical Habitat
Critical habitat for the northern spotted owl was designated on 1 January 1992 (USDI FWS 1992a). A revised designation of critical habitat was published in the Federal Register in August 2008 (USDI FWS 2008b). Critical habitat for the northern spotted owl corresponds closely with those areas designated as Late-Successional Reserve in the Northwest Forest Plan (USDA and USDI BLM 1994). The spotted owl's listing reflected primarily the loss of suitable habitat for spotted owls. **There is no Northern Spotted Owl Critical Habitat designated within the Eden Ridge Planning/Analysis Area.**

Marbled Murrelet (*Brachyramphus marmoratus*)

Habitat and Management Requirements
The marbled murrelet is a small seabird (Alcidae) that nests along the Pacific coast from Alaska to central California, and winters as far south as Baja California, Mexico. Murrelets forage at sea where they consume a diversity of prey species including small fish and invertebrates, but nest on large limbs in old-growth coniferous forests.

In the Pacific Northwest, murrelets have been found as far inland as 53 miles (USDI FWS 1997). Dillingham et al. (1995), examining murrelet survey data for the Rogue River-Siskiyou N.F., found that no murrelets were detected more than 32 miles from the ocean, although surveys had been conducted up to 47 miles inland. South of the divide between the Rogue and Coquille Rivers, the farthest inland murrelets had been detected was 17 miles (Dillingham et al. 1995). The Eden Ridge Timber Sales Project is approximately 28 miles from the ocean.

The 2009 status review (USFWS 2009d) reconfirmed the murrelet's status as a Threatened species and summarized the terrestrial habitat. Throughout the forested portion of their range, marbled murrelet habitat use is positively associated with the presence and abundance of mature and old-growth forests, large core areas of old-growth, low amounts of edge and fragmentation, proximity to the marine environment, and increasing forest age and height (Hamer and Nelson 1995b). In all cases, marbled murrelets focus on the presence of platforms used for nesting. Platform presence is more important than the size of the nest tree, and tree size alone is not a good indicator of the abundance of platforms (Evans Mack et al. 2003). The presence of platforms is the most important characteristic of marbled murrelet nesting habitat (Burger 2002). Individual tree attributes that provide platforms suitable for nesting include large or forked branches, deformities caused by broken tops or mistletoe infection, or other structures large enough to provide a platform for a nesting adult murrelet (Hamer and Nelson 1995b).

The NWFP establishes all murrelet occupied stands on Federal lands as LSRs, which greatly restricts the habitat modification activities that can occur. In 1996, the Service designated murrelet critical habitat, which largely overlaps mapped LSRs within the murrelet range on Federal lands. Predation via corvids and or rodents is also considered a threat to reproductive success.

An account of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet can be found in the 1988 species status review (Marshall 1989), the final rule designating the species as threatened (USDI FWS 1992b), the final rule designating critical habitat for the species (USDI FWS 1996), *Ecology and Conservation of the Marbled Murrelet* (Ralph et al. 1995), *Recovery Plan for the Marbled Murrelet* (USDI FWS 1997), and the Service's BO for Alternative 9 (USDI FWS 1994) of the *Final Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (USDA and USDI 1994a).

In 1995, it was estimated 1,077 occupied murrelet sites occurred within Washington, Oregon, and California. Suitable habitat for the murrelet was estimated at 2,561,500 acres of Federal lands in the listed range of this species (Ralph et al. 1995). Murrelet habitat is protected on Federal land under the NWFP.

Current management direction for the marbled murrelet comes from the Northwest Forest Plan ROD and the Marbled Murrelet Recovery Plan (USDA and USDI BLM 1994, USDI FWS 1997). If surveys determine a stand is occupied, a Late-Successional Reserve is set up to protect all contiguous existing and recruitment habitat (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years) within one-half mile of the occupied site. Suitable habitat is generally 80 years old or more with trees averaging 32 inches dbh or more, with at least one platform > 5.9 inches in diameter containing nesting substrate (e.g., moss, epiphytes, duff) on that platform which has overhead protective cover (tree branch or foliage), and has an access route through the canopy that a murrelet could use to approach and land on the platform (USDI 2009).

Marbled Murrelet Critical Habitat
Critical habitat for marbled murrelets was designated in May 1996 (61 FR 102:26256-26320). The Service has designated approximately 3.9 million acres of land as critical habitat, of which 78 percent (3.0 million acres) is located on Federal lands within the area covered by the NWFP.

The Service considers two components of marbled murrelet habitat to be biologically essential: 1) terrestrial nesting habitat and associated forest stands and 2) marine foraging habitat used during the breeding season. Within areas essential for successful marbled murrelet nesting, the Service has focused on the following primary constituent elements: 1) individual trees with potential nesting platforms and 2) forested areas within 0.5 miles (0.8 kilometers) of individual trees with potential nesting platforms, and with a canopy height of at least one-half the site potential tree height. Within the boundaries of designated critical habitat, only those areas that contain one or more primary constituent elements are, by definition, critical habitat.

The Eden Ridge Timber Sales project is within the known range (Area A) of the marbled murrelet; however, **there is no designated marbled murrelet critical habitat designated within the Planning/Analysis Areas**.

d. Effects Mechanisms

Northern Spotted Owl

Density management can have short term (less than 5 years) adverse impacts on prey species and foraging and dispersal habitat given the removal of vegetative cover for small mammals. However, Gomez et al. (2005) noted that commercial thinning in young stands of Coastal Oregon Douglas-fir (35-45 yr) did not have a measurable short-term effect on density, survival or body mass of northern flying squirrels, an important prey species for spotted owls.

Gomez et al. (2005) also noted the importance of fungal sporocarps, which were positively associated with large down wood. Some disturbance of habitat may improve forage conditions, provided under-story structure and cover are retained. Removal of some tree canopy, provided it is not too extreme, would bring more light and resources into the stand, stimulating forbs, shrubs and other prey food.

In general, noise disturbance has the potential to adversely affect a spotted owl such that their normal behavior is disrupted. The degree to which an individual spotted owl may be affected from noise disturbance varies with the proximity (distance), intensity (sound level) and duration of the disturbance. Activities that generate noise levels that result in the alteration of an individual owl's behavior would constitute a form of harassment as defined by the ESA. Harassment is —an intentional or negligent act or omission which creates the likelihood of injury by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering" (50 CFR 17.3).

The potential effects of elevated stress hormones on spotted owl population dynamics are not well understood. Evidence of recreation effects on spotted owls was reported by Swarthout and Steidl (2001) who found that the closely related Mexican spotted owl (*Strix occidentalis lucida*) was affected by hikers. They reported that juveniles and adults were unlikely to flush at distances ≥24 m from hikers, respectively. Delaney et al. (1999) studied the effects of chainsaw and helicopter noise on Mexican spotted owls. They found that no spotted owls flushed when noise stimuli were >105 m away. This study further shows that spotted owls may be sensitive to some types of noise disturbance.

Required Project Design Criteria (mitigation measures) have been developed for northern spotted owls on the Rogue River-Siskiyou National Forest. Table G-6 in the Wildlife Report (EIS Appendix G) and Mitigation Measures contained in Chapter II of the EIS portrays zones of restricted operations distances from known activity centers for certain operations.

If spotted owls are detected in or adjacent to treatment units, Project Design Criteria (PDC) from the USDI Fish and Wildlife Service Formal Consultation on timber harvest, meadow restoration and quarry activities proposed by the Rogue River–Siskiyou National Forest (TAILS #: 13420-2009-F-0146) dated August 27, 2009 (USDA/USDI, 2009c) would be applied to proposed activities ((see Wildlife Report PDC #2&3 and EIS Chapter II).

Marbled Murrelet

There is potential for disturbance to murrelets from activities in adjacent non-murrelet habitat. The majority of information on disturbance to nesting marbled murrelets has been from anecdotal observations and inferred from studies on other seabird species (Long and Ralph 1998). Professional opinions vary on the subject but it is the Service‘s and the BLM‘s positions to approach the issue cautiously until such data exist to support a less restrictive approach to disturbance issues. The sensitivity of an individual to disturbance is likely related to the baseline level of disturbance the bird is accustomed to, the level and proximity of disturbance (Hamer and Nelson 1998), and the timing of the disturbance within the nesting cycle and daily activity periods.

Many bird species, including murrelets, can habituate to relatively high levels of disturbance over time (Long and Ralph, 1997; Hamer and Nelson 1998). However, for murrelets, the adverse effects of disturbance may also lead to nest abandonment by adults, reduced nest attentiveness (leading to increased vulnerability of predation), aborted feeding visits, premature fledging, and avoidance of otherwise suitable habitat (Hamer and Nelson 1998).

e. Direct and Indirect Effects – Northern Spotted Owl

No-Action Alternative
The No-Action Alternative would not result in any change in levels of disturbance to spotted owl nest sites. No spotted owl pairs would be affected by disturbance to habitat and dispersal opportunities would not be reduced from current conditions. In the absence of large-scale disturbance (wildfire, insects, and disease) the densities of northern spotted owls would likely remain stable, notwithstanding other threats identified by the Sustainable Ecosystems Institute report (Courtney et al. 2004) which include barred owls and West Nile Virus.

Action Alternatives
The Action Alternatives would commercially treat and maintain up to 3,314 acres of spotted owl dispersal habitat and non-commercially treat up to 363 acres The resultant canopy closure (40-50%) and residual tree structure (the larger tree component) is likely to maintain the dispersal function of the treated stands. The reduced structural complexity, e.g., loss of snags and vertical canopy diversity, is a degradation of habitat quality for late-successional associated species but the effect on wildlife from this degree of change is likely minimal and dispersal habitat is likely to be maintained.

Over the long term, the thinning should allow the remaining trees to reach a larger diameter and develop larger branches sooner than would be possible if no thinning were done. Spotted owl dispersal habitat would be maintained by the project.

No snags or down woody material is proposed for removal. No new road construction is proposed within any spotted owl home range (1.3 miles). No northern spotted owl activity center (300 meter) occurs within the Project Area or along the haul route. One core area (0.5 mile) occurs along the haul route. One home range occurs within the Project Area and portions of 3 home ranges occur along the haul route. Thirty two acres of dispersal habitat would be maintained within the mean home range of northern spotted owl - activity center #290.

Harvest and vegetation treatments may improve foraging habitat conditions for prey (USDI, 2009). Lemkuhl et al. (2006) confirmed the importance of maintaining snags, down wood and mistletoe. Primary prey species of spotted owls are small mammals that include northern flying squirrels (*Glaucomys sabrinus*) and dusky-footed (*Neotoma fuscipes*) and bushy-tailed (*N. cinerea*) woodrats, followed by tree voles (*Arborimus* and *Clethrionomys*) and mice (*Peromyscus* spp.). While flying squirrels tend to increase in abundance in older forests, they can also be common in younger stands. Dusky-footed wood rats tend to be more abundant in younger and drier forest stands and bushy-tailed woodrats are often associated with cliffs, rocky outcrops, and talus, but they also occupy hollow trees and logs. Tree voles appear to show a positive correlation with stand age and are more abundant in old-growth forests.

The understory habitat conditions for prey food should increase over the next few years, until shrubs and residual trees respond to again close in the stand. In addition, residual trees, snags and down wood that are retained in the thinned stands would provide some cover for prey species over time, and would help minimize harvest impacts to some prey species. Some arboreal prey species would venture into harvest units a short distance for food. Northern spotted owls seldom venture far into non-forested stands to hunt. However, edges can be areas of good prey availability and potentially increased vulnerability (i.e., better hunting for owls) (Zabel 1995). The retained trees may respond favorably to more light and resources and gain height and canopy over time (USDI, 2009). Any areas found meeting Recovery Action 32 definitions would be excluded from treatment areas under all Action Alternatives.

There is the potential for disturbance to any dispersing spotted owls that may be moving through the Project Area searching for suitable habitat, or to any potential foraging spotted owls, within the disturbance limits identified in the mitigation measures (PDCs). If any spotted owls are discovered in the Project Area, the PDCs are required, unless it is determined through protocol surveys that they are not nesting. Project Design Criteria would assure that no suitable habitat would be removed; however up to 3,314 acres of dispersal habitat may be treated and maintained. Because of the potential for disturbance to spotted owls, the Eden Ridge Timber Sales Project is considered "**may affect, not likely to adversely affect**" for the **northern spotted owl (NLAA)**.

The Proposed Action is considered "**No Effect**" (**NE**) to **northern spotted owl critical habitat**, because the Project Area and treatment units are not within northern spotted owl Critical Habitat Units (CHU). The nearest treatment unit to spotted owl CHU is over 1.5 miles and the nearest road identified for use during the Action Altenatives is over 0.8 miles from the nearest CHU.

f. Direct and Indirect Effects – Marbled Murrelet

No-Action Alternative

The No-Action Alternative would not result in any change in levels of disturbance to marbled murrelet nest sites. No marbled murrelet would be affected by disturbance in habitat and nesting opportunities would not be reduced from current conditions. In the absence of large-scale disturbance (wildfire, insects, and disease) the densities of marbled murrelet would likely remain stable, notwithstanding other threats.

Action Alternatives
Scattered throughout the Eden Ridge Timber Sales Planning Area, are small pockets and scattered, individual large trees (remnant structure), some of which could serve as nesting habitat and are considered "potential nesting structure" (Roberts, 2004). Marbled murrelet surveys were conducted on one stand within the Eden Ridge Timber Sales Project Area adjacent to Alternative 2 Unit 401 in 1996 and 1997. No detections were made during these surveys. Murrelet surveys were also conducted in 16 stands of potential habitat within and adjacent to proposed Eden Ridge Timber Sales treatment areas in 2008 and 2009. Surveys included all or portions of Alternative 2, Units: 001, 003, 004, 005, 006, 007, 101, 102, 203, 204, 218, 322, 323, 324, 325, 326, 327, 328, 329, 330 and 331. No murrelets were detected and no suitable habitat was discovered within the surveyed stands.

To protect marbled murrelets from disturbance, Project Design Criteria (mitigation measures) from the USDI Fish and Wildlife Service Formal Consultation on timber harvest, meadow restoration and quarry activities proposed by the Rogue River–Siskiyou National Forest (TAILS #: 13420-2009-F-0146) dated August 27, 2009 (USDA/USDI, 2009) would be applied to proposed activities. Table G-8 in the Wildlife Report (EIS Appendix G) and Mitigation Measures contained in Chapter II of the EIS portrays zones of restricted operations distances from specific activities and other PDCs for marbled murrelet.

Marbled murrelet habitat would not be removed or degraded by the proposed activities. Over the long term, the thinning should allow the remaining trees to reach a larger diameter and develop larger branches sooner than would be possible if no thinning occurred. The planned haul route utilizes roads already receiving high timber haul use off of private lands and portions are open to public use. Any potential nesting murrelets along this route have likely developed a tolerance to motorized traffic on these roads including road maintenance and road improvement activities.

There are occasional scattered remnant trees[3] within proposed treatment units. Field reviews have identified and removed scattered pockets of remnant trees from treatment areas and any subsequent pockets identified will also be excluded from treatment ((see Wildlife Report PDC #6 and EIS Chapter II). Individual remnant trees would be retained and any remnant trees felled for safety or operational needs would remain on-site (see Wildlife Report PDC #9 and EIS Chapter II).

To prevent disturbance to occupied or unsurveyed potential habitat a seasonal restriction for activities within specified distances (see Table G-8) would be required for Unit 401 and all road work for portions of Road 5000-210 (see Wildlife Report PDC #7 and EIS Chapter II).

Project Design Criteria would assure that no habitat would be removed. Because of the potential for disturbance to nesting marbled murrelets from implementation activities to unknown sites, a "**may affect, not likely to adversely affect**" determination is made for the **marbled murrelet (NLAA)**.

The Project Area is located outside Critical Habitat Units (CHUs). The proposed haul route travels through marbled murrelet CHU; however, hauling is not expected to have any impact due to high use from private timber operations and public use accessing the national forest. There would be "**no effect**" (**NE**) to murrelet **critical habitat** from the Action Alternatives because there is no identified critical habitat within the Project Area.

[3] Remnant trees = Generally large old trees that were not removed during earlier regeneration harvest activities or that survived stand replacement fires. In some cases they are single trees, while other areas have groups of older trees up to a half acre in size. These trees generally range from 34" dbh to in excess of 60" dbh and are often at least twice the diameter of the average tree in the stand they are located in. They often have a "wolfy" structure consisting of moss covered limbs/platforms > 4-6" diameter, and fire scars or charred bark. Generally, bark is thicker and more furrowed and crowns tend to be more flat topped, less "pointed" than younger trees.

Summary of Effects to Threatened Species Listed Under ESA and CHU
A summary of presence, habitat and determination of effects with mitigation is shown in Table III-33.

Table III-33. ESA Species & Critical Habitat Unit (CHU) Presence and Effects Determination

Wildlife Species	Sighting/Habitat	Habitat Or Species Present	Determination Of Effects With Mitigation
Federally Threatened Species			
Northern Spotted Owl	Suitable Habitat Present/Species Known For Area	Suitable Habitat Not Affected By Project/Species May Be Affected	NLAA
Northern Spotted Owl Critical Habitat Unit	CHU Not Within Project Area	CHU Not Present	No Effect
Marbled Murrelet	Suitable Habitat Present /Species Not Known For Area	Habitat Not Affected By Project/Species May Be Affected	NLAA
Marbled Murrelet Critical Habitat Unit	CHU Not Within Project Area	CHU Not Present	No Effect

No Effect
NLAA = May Affect, Not likely to Adversely Affect

g. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed Project Area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area. There are approximately 675 acres of plantation commercial thinning identified under the Coastal Healthy Forest Treatment (CHFT) Project within the Analysis Area.

Approximately 50 acres are currently being treated and treatments on the remaining 625 acres may occur during the life of the CHFT Project. No National Forest projects, which would remove murrelet habitat, are anticipated in the Project Area or Analysis Area. Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40-50 year regeneration harvest rotation. There is little habitat on private land for spotted owls or marbled murrelet in the Analysis Area. The remaining approximately 444 acres are managed by the BLM.

8. FOREST SERVICE SENSITIVE TERRESTRIAL WILDLIFE SPECIES & HABITATS

Effects of variable density management (thinning) treatments and other connected actions on terrestrial wildlife species and habitats, identified as Forest Service Sensitive species.

EIS Appendix G includes a complete Wildlife Report (incorporated by reference). Forest Service Manual (FSM) Chapter 2670 requires a Biological Evaluation to be prepared for the proposed Eden Ridge Timber Sales Project. The purpose of this evaluation is to determine and document the possible effects that the proposed activity and alternatives would have on any Endangered, Threatened, Proposed, or Sensitive wildlife species (FSM 2672.4). This sub-section discusses Forest Service Sensitive Terrestrial Wildlife Species and Habitats.

a. Background and Analysis Framework

In compliance with the Forest Service Biological Evaluation process for Proposed, Threatened, Endangered, and Sensitive (PETS) wildlife species, the list of species potentially occurring within the RRSNF was reviewed. The January 31, 2008 Pacific Northwest Region (R6) listing of species applicable to the RRSNF was reviewed in regard to potential effects on any of these species by actions associated with the Eden Ridge Timber Sales Project. The following determinations are made:

Table III-34. R-6 Sensitive Species Known or Suspected to Occur on the RRSNF

R6 Sensitive Species	Habitat Presence	Species Presence	Determination Of Effects With Mitigation
American Peregrine Falcon	Habitat Present	Species Present	MIIH
Bald Eagle	Habitat Present	Species Present	NI
Harlequin Duck	No Habitat	Suspected	NI
Lewis' Woodpecker	No Habitat		NI
White-Headed Woodpecker	Not Within Range		
Northern Waterthrush	Not Within Range		
California Wolverine	Not Within Range		
Pacific Fisher	Habitat Present	Suspected	MIIH
Pacific Pallid Bat	Not Within Range		
Townsend's Big-Eared Bat	Habitat Present	Suspected	NI
Fringed Myotis	Habitat Present	Suspected	MIIH
Northwestern Pond Turtle	Habitat Present	Potential	NI
Oregon Spotted Frog	Not Within Range		
Foothill Yellow-Legged Frog	Habitat Present	Suspected	NI
Siskiyou Mountains Salamander	Not Within Range		NI
California Slender Salamander	Not Within Range		
Black Salamander	Not Within Range		
Siskiyou Short-Horned Grasshopper	Not Within Range		
Coronis Fritillary	No Habitat		NI
Mardon Skipper	No Habitat		NI
Insular Blue Butterfly	Not Within Range		
Hoary Elfin	Not Within Range		
Johnson's Hairstreak	Habitat Present	Suspected	MIIH
Franklin's Bumblebee	Not Within Range		
Siskiyou Hesperian	Not Within Range		
Crater Lake Tightcoil	Not Within Range		
Traveling Sideband	Not Within Range		
Green Sideband	Not Within Range		
Chace Sideband	Not Within Range		
Oregon Shoulderband Snail	Not Within Range		
Evening Fieldslug	Not Within Range		

NI = No Impact
MIIH = May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species

The Project Area is outside the known range for the following Sensitive species and they will not be discussed further: **white-headed woodpecker, northern waterthrush, California wolverine, Pacific pallid bat, Oregon spotted frog, Siskiyou mountains salamander, California slender salamander, black salamander, Siskiyou short-horned grasshopper, insular blue butterfly, hoary elfin, Franklin's bumblebee, Siskiyou hesperian, pristine springsnail, Crater Lake tightcoil, Pacific walker, robust walker, green sideband, Chace sideband, traveling sideband, Oregon shoulderband, evening field slug.**

b. Description of Species Habitat and Management Requirements

American Peregrine Falcon (*Falco pergrinus anatum*)
The American peregrine falcon was identified as an Endangered species in the 1970s and then delisted in 1999. Peregrine falcons are typically associated with cliffs, which serve as nesting and perching sites. Nest site criteria include ledges, potholes, and small caves that are near water, inaccessible to mammalian predators, and offer protection from rain and snow, and heat and cold. Peregrine falcons feed almost exclusively on birds.

Cliffs with suitable ledges provide nesting habitat for peregrine falcons. Peregrine habitat on the Siskiyou portion of the Forest is managed in accordance with the Regional Forester's letter of July 19, 1999 (USDA 1999b) and Standard and Guideline 4-5 of the Land and Resource Management Plan for the Siskiyou National Forest (1989). To date, six active nests are known on the Siskiyou portion of the Forest. On 25 August 1999, the USDI (1999) Fish and Wildlife Service removed (delisted) the American peregrine falcon throughout its range as a threatened species from the Federal List of Endangered and Threatened Wildlife, thereby removing all protections provided by the Act. A strategy for the 5-year monitoring plan that follows the delisting has been developed and is being implemented (FWS 2003). Evaluation of impacts of proposed actions on the peregrine falcon should follow the process described in FSM 2673.4 and be documented in the Biological Evaluation. If a proposed project may potentially impact the species or its habitat, surveys using the Regional protocol should be conducted.

Bald Eagle *(Haliaeetus leucocephalus)*
Bald eagles were listed as Endangered in Oregon and elsewhere by the FWS in 1967 (USDI FWS 1967). The bald eagle was removed from the federal list of endangered and threatened plants and wildlife by a ruling published in the Federal Register on July 9, 2007 and effective August 8, 2007 (72 FR37345). Bald eagles continue to be protected under the Bald and Golden Eagle Protection Act of 1940. The Act prohibits disturbance, recently defined by FWS as: *"to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior"* (50 CFR 22.3).

The Final Environmental Assessment Proposal to Permit Take Provided Under the Bald and Golden Eagle Protection Act (USDI 2009) and Eagle Permits; Take Necessary to Protect Interests in Particular Localities; Final Rule (50 CFR Parts 13 and 22) finalizes permit regulations to authorize limited take of bald eagles and golden eagles under the Bald and Gold Eagle Protection Act.

Bald eagle habitat on the Rogue River-Siskiyou NF is protected and managed in accordance with the Pacific Bald Eagle Recovery Plan (USDI FWS 1986), and Standards and Guidelines 4-3 and 4-4 of the Siskiyou National Forest Land and Resource Management Plan (USDA 1989). As part of the recovery plan, key nesting habitat areas have been identified on the Rogue River-Siskiyou NF along the Rogue, Illinois, and Sixes Rivers (USDI FWS 1986).

Most bald eagles nest within 0.6 to 1.2 miles of aquatic foraging areas, which is typically a lake, reservoir, large river, or coastal estuary (Anthony et al. 1982, Stalmaster 1987, Anthony and Isaacs 1989, Johnsgard 1990, Garrett et al. 1993). Nest trees are usually the dominant trees in the stand, often much larger than the surrounding trees (Anthony et al. 1982, Stalmaster 1987). The nest trees provide adequate support for the large nests, an open flight path to the nest, and a view of the surrounding terrain (Stalmaster 1987). Although bald eagles usually nest near water, they will search areas away from water to find suitable structure for their nest (Anthony et al. 1982, Stalmaster 1987). Young stands are avoided, but eagles do desire large openings in the canopy provided by lakes, rivers, and meadows (Stalmaster 1987).

Roosting and perching habitat is also important. Roost trees are often the largest trees in the stand (Anthony et al. 1982). When selecting roost trees, eagles choose trees providing greater shelter versus trees close to food. On the other hand, trees used for perching are usually near water and food. Perches are used for resting, hunting, and eating. The species of tree is less important than the location and form of the tree (Stalmaster 1987).

Bald eagles require an abundant supply of food because of their large size. Bald eagles feed on fish, waterfowl, small mammals, and carrion (Stalmaster 1987, Johnsgard 1990). The specific diet may vary by season and location (Stalmaster 1987).

On the Rogue River-Siskiyou NF, major rivers provide the best habitat for bald eagles. The South Fork Coquille River is the nearest large river, approximately 2.2 miles SW of the Planning Area. The nearest known nest is approximately 4.5 miles NW of the Planning Area and there are no known nests on the Powers Ranger District.

The Eden Ridge Timber Sales Project is considered a **"No Impact"** for the **Bald Eagle** because there are no known nests within disturbance distances from the project and the project is beyond the distance where most bald eagles nest.

Harlequin Duck *(Histrionicus histrionicus)*

The harlequin duck is a short-distance east-west migrant that moves to breeding streams from Pacific coastal areas (Cooper and Wright, 1998). Harlequin ducks migrate northward and inland in spring, arriving at their breeding areas in the intermountain western U.S. late-April through mid-May, with males departing for west coast molting areas soon after females begin incubating (Spahr et al. 1991). Breeding females move to the coast later depending on breeding success and whether or not females abandon young. Non-breeding females also remain on rivers through the incubation period. Successful females and juveniles arrive on the coast in mid to late September. Some coastal breeding populations are probably non-migratory (Cooper and Wright, 1998). Young accompany their mothers to coastal molting or wintering areas in the late summer (Regehr et al. 2001).

In Oregon, records of arrival on inland streams can be found from the first week of March, including a few reports of pairs (Dowlan 1996). Breeding occurs primarily on the rivers in northern Oregon, with occasional records from the Umpqua drainage. A pair was on Lost Creek in the McKenzie drainage in January, 1992, and an unspecified number of ducks was reported from the McKenzie in late February, 1991. Pairs are seen on breeding streams in greatest numbers between the second week of April and the end of May, though a few records of pairs can be found through June. Some of these late observations appear to represent late-nesting or non-nesting pairs (Dowlan 1996). In September 2007 a female with young was photographed on the Powers RD (J. Lowe 2007, pers. com.).

Inland, the harlequin duck dives for food in strong currents or fast-flowing streams, looking for prey on or near the bottom. Their diet is almost exclusively aquatic invertebrates, but also insects and a few small fish (Bellrose 1976).

Harlequin ducks typically nest on the ground in well-concealed locations, usually on mid-stream islands (Wiggins 2005) although successful nest sites have also been located in tree cavities or cliff ledges which afford safety from high water (Street 1999). Occasionally harlequin ducks may nest up to 45m away from a stream (EUG BLM), but nests are typically located close (within 10m) to water and have some degree of vertical cover close to the nest (Bruner 1997; Robertson and Goudie 1999). Nests may also be situated at the base of trees, on piles of woody debris, under fallen logs, or on sheltered banks (Robertson and Goudie 1999). They will sometimes nest beside mountain lakes and lake outlets. They tend to breed in the same area in successive years. The male defends the female until incubation begins, then the pair bond ends (NatureServe 2010). The female harlequin lays her eggs in a mass of down; after the eggs are laid, the male migrates to the coast to molt (Street 1999).

Harlequin ducks have been the focus of management actions in eastern North America, the Pacific Northwest, and in the Rocky Mountain states due to concern over declining populations. Relative to other species of ducks, they occur at low population densities and exhibit high breeding site fidelity, low reproductive rates, and delayed reproduction. All of these traits contribute to making harlequin duck populations particularly slow to recover from habitat degradation or loss (Wiggins 2005).

Suitable habitat for the species is not present in the Eden Ridge Timber Sales Project Area; however, suitable habitat does exist within the watershed outside of the Planning Area. The Eden Ridge Timber Sales Project is a **"No Impact"** determination for the **harlequin duck** because suitable habitat for the harlequin duck does not exist in the Project Area.

Lewis' Woodpecker *(Menalerpes lewis)*
Lewis' woodpeckers are migratory in southwestern Oregon, with sporadically large populations in the winter and scattered breeding pairs in the summer reported. Gilligan et al. (1994) reports that they are common breeders in summer in Jackson and Josephine Counties but in the last 10 years they have not been documented (N. Barrett 2008, pers. com.) and there are few recent breeding records (Janes et al. 2002). This species is closely tied to the ponderosa pine/oak savannah habitats of eastern and southwest Oregon.

Nests are often in large ponderosa pine snags or mature oaks while the birds forage on insects and acorn meat. In winter they store acorn meat in crevices in trees and power poles. Because this woodpecker does not usually excavate its own cavity, they have a close tie to older snags within the forest that are likely to contain cavities and have crevices for food storage.

The population of Lewis' woodpeckers has fallen dramatically across Oregon as pine – oak woodlands are lost (Gilligan et al. 1994). A contributing factor in the decline has been the spread of the European starling, which aggressively out-competes this species for available cavities. Habitat loss is due to a wide variety of concerns that include urbanization of valley floors, fire suppression and encroachment of conifer forests, timber harvest of pine components in the oak forests, etc.

Suitable habitat for the species is not present in the Eden Ridge Timber Sales Project Area or along the haul route; therefore, a **"No Impact"** determination for **Lewis' woodpecker** has been made for this project.

Pacific Fisher (*Martes pennanti*)
Pacific fisher was petitioned for listing by the Center for Biological Diversity and several other environmental organizations in November 2000. After a 12 month review, the U.S. Fish and Wildlife Service found Pacific fisher to be a distinct population segment (DPS) and gave a "warranted but precluded" decision to the petition, designating the West Coast DPS a Federal Candidate species (USDI 2004).

According to reviews, the fisher occurs throughout most of Canada and possibly extreme southeastern Alaska. Its distribution extends south through several forested areas of the northeastern United States. In the western United States, fisher populations are known to occur in western Montana, the Idaho panhandle, the southern Sierra Nevada of California, the Klamath and Siskiyou mountains of northwestern California and extreme southwestern Oregon, and the southern Cascade Range of southwestern Oregon. There has been a recent fisher reintroduction effort in the Olympic Peninsula in 2007 and 2008 (Happe et al. 2008).

The fisher is one of the most habitat-specialized mammals in western North America (Buskirk and Powell 1994). Specialization appears to be tied primarily to denning and resting habitats. The varied diet of fishers suggests they may forage in a variety of habitats.

Fishers use landscapes at different spatial scales for different behaviors and activities (Powell 1994). For example, fishers may establish their home ranges at the landscape scale, forage at the patch scale, and select habitat for resting or denning at the patch scale as well as at a finer scale of habitat characteristics of elements within a patch (Powell 1994, Powell and Zielinski 1994).

Cavities in both conifers and hardwoods are used by fishers for resting. However, to create suitable rest cavities, trees must be old enough to have suffered the type of stresses that create infection courts for heartrot fungi, and large enough to form cavities large enough to be used by fishers (Zielinski et al. 2004). Large trees also provide platform-type resting structures such as mistletoe brooms, clumped branches that support rodent nests, or rust brooms that can support the weight of fishers. Once these large trees die and fall, they become the type of log that fishers have been known to use as rest sites. Removal of understory and mid-story canopies around large structures may also reduce the effectiveness of the structure as a secure rest site because they contribute to the microclimate of the site. Under- and mid-story canopies probably also provide some protection for female and juvenile fishers from predation or harassment by large raptors and mobbing by corvids because sight distance is reduced in dense, multi-storied stands.

Fishers appear to be a generalist predator and opportunistic in their foraging strategies, which is reflected in their diverse diet (Zielinski and Duncan 2004, Aubry et al. 2002, Zielinski et al. 1999, Powell 1993). There is some indication of seasonal variation in the fisher‘s diet (Zielinski et al. 1999) which is likely linked to seasonal abundance of prey and forage species. While fishers require structures provided by older aged or residual stands for denning and resting, they appear to use a wider variety of stands for foraging. Jones and Garton (1994) found that fishers did not use non-forested sites while resting or hunting, but they did use pole-sapling forests for hunting significantly more than for resting. The inclusion of berries in the diet of fishers suggests that they do forage, at least occasionally or seasonally, in more open stands where many fruit-bearing shrubs and forbs are found.

Fisher have not been detected in the Analysis Area and there are only 4 records of fisher observations for the Powers Ranger District, the nearest being over 15 miles from a proposed treatment unit under the Eden Ridge Project.

Townsend’s Big-eared Bat (*Corynorhinus townsendii*)

Townsend‘s big-eared bats can be distinguished by their enormous ears, up to 40 millimeters in length and by the glandular masses on their muzzles. They are medium sized and have dull, soft hair. Their backs vary from brown, grayish brown, to black, with paler undersides. Their ears are by far the largest ears of any bat along the Oregon coast. Their flight membranes are dark brown and very thin.

They occur in a wide variety of habitats, its distribution tends to be geomorphically determined and is strongly correlated with the availability of caves or cave-like roosting habitat (e.g., old mines) (Pierson et al. 1999). Saul and others (1977) found Townsend‘s big-eared bats roosting in a variety of structures in southwest Oregon: caves, bridges, abandoned mines, barns and houses. Suitable roosts sites and hibernacula fall within a specific range of temperature and moisture conditions. The species may also use tree cavities for night roosting.

Moths make up the majority of the diet for *C. townsendii*, but they will also ingest beetles, true bugs, and flies. Their flight is slow, and they are able to hover at a point that interests them. In addition to foraging on the wing, it will take insects from foliage.

The proposed project does not affect caves, mines, wooden bridges, or buildings. The Eden Ridge Timber Sales Project would have "**No Impact**" on the **Townsend's big-eared bat** because suitable habitat for this species would not be impacted.

Fringed myotis (*Myotis thysanodes*)
Csuti et al. (1997) considered this species a cave-dwelling bat, even though most of the specimens they examined were from buildings. It appears to be adapted to living in areas with diverse vegetative substrates. In SW Oregon, *M. thysanodes* appears to be a snag obligate and they are known to roost within and under the bark of snags (D. Clayton, pers. obs.). Fringed myotis are suspected to occur in or near the Project Area.

Current management direction is the Northwest Forest Plan ROD page C-43. This standard and Guideline provides additional protection for caves, mines and abandoned wooded bridges and buildings that are used as roost sites for bats. There are no documented sightings for the area, however, they are known to occur in the coast range and are suspected to occur within the Analysis Area.

Northwestern Pond Turtle (*Emmys marmorata marmorata*)
Northwestern pond turtles are capable of living in a wide variety of aquatic habitats. The northwestern pond turtle inhabits marshes, ponds, lakes, reservoirs, sloughs, and slow moving portions of creeks and rivers (Nussbaum et al. 1983, Stebbins 1985, Brown et al. 1995). Pond turtles may also be found in abandoned gravel pits, stock ponds, and sewage treatment plants (Holland 1994). In the Rogue River drainage, records of pond turtle sightings are almost equally divided amongst rivers, larger-order streams, and small ponds (Holland 1994).

The size of habitats used by northwestern pond turtles is quite variable from place to place. Turtles have been observed using small ephemeral ponds only a few square meters in size (Holland 1994). On the other hand, turtles are also known to live in Upper Klamath Lake which covers an area of several dozen square kilometers. In areas where water is present only part of the year, turtles aestivate in the mud in the watercourse or in upland areas during late summer or early spring (Holland 1994). Pond turtles seem to prefer areas that possess some type of refugia such as undercut banks, submerged vegetation, rocks, logs, or mud (Nussbaum et al. 1983, Stebbins 1985, Holland 1994, Brown et al. 1995). Areas containing basking sites for thermoregulation such as rocks, logs, or emergent vegetation are also preferred (Nussbaum et al. 1983, Stebbins 1985, Holland 1994, Brown et al. 1995). Partially submerged logs, vegetation mats, mud banks, rocks, and tree branches provide areas for sunning (Nussbaum et al. 1983, Stebbins 1985).

There is habitat for northwestern pond turtles within the Analysis Area. However, it is unlikely that any Action Alternative would impact turtles because suitable habitat would not be changed, removed or degraded by the proposed activities. Therefore, a "**No Impact"** determination for **northwestern pond turtle** has been made for the project.

Foothill Yellow-legged Frog (*Rana boylii*)
Foothill yellow-legged frogs live in sections of low-gradient streams with exposed bedrock or rock and gravel substrates. They lay their eggs in late spring or early summer, and they attach them to the bottom of quiet scour-pools or riffles in gentle-gradient streams, often where there is only slight flow from the main river. Hatchlings cling to the egg mass initially, and then to rocks. Tadpoles live in pools that often have a connection to the main river flow, but little or no silt. Froglets live in pools with gravel and cobbles.

Adults live in pool edges (often in a deep pool with sedge clumps around the edge), in bedrock at the edge of the main channel or under cobbles at the bottom of the pool (Corkran and Thoms, 1996). This is mainly a frog of rocky or gravelly streams in southwestern Oregon and is seldom seen far from water. Habitat is confined to the immediate vicinity of permanent streams below 1,800 feet, including those that may be reduced to waterholes connected by trickles during the dry season (Nussbaum et al. 1983). The FAUNA database contains no records of sightings of foothill yellow-legged frog in the Eden Ridge Timber Sales Analysis Area.

The Eden Ridge Timber Sales Project would have "**No Impact**" on the **foothill yellow-legged frog** because suitable habitat for this species would not be impacted.

Mardon Skipper (*Polites mardon*)
Mardon skippers are univoltine, completing one life cycle annually. Adults typically emerge between May and July, but possibly later at higher elevations. Individuals live between five days and two weeks (Potter et al. 2002). A unique feature of this species is that it is reported as spending its entire life cycle in one location, without migration. Its dispersal distance is unknown. Eggs are laid into tufts of *Festuca* spp. bunchgrass upon which the larvae feed for approximately 3 months. Hibernation is believed to occur in the grass as well (USDA and USDI BLM 2007).

Adult skippers feed on nectar from a variety of herbaceous plants though they also make use of other grass/forbs including such species as common camas (*Camassia quamash*), western buttercup (*Ranunculus occidentalis*), and Idaho blue-eyed-grass (*Sisyrinchium idahoense*). The southern Oregon populations are reported as occupying small (0.5 – 10 ac.) high-elevation (4,500 – 5,100 ft.) grassy meadows with mixed conifer forests.

Surveys into areas neighboring known populations has expanded knowledge considerably from 37 known in 1999 to over 60 sites in 2004. Additional surveys in 2005 located approximately 11 additional sites in Oregon, and one additional site on the Cowlitz Valley Ranger District, Gifford Pinchot National Forest. In 2005, four new Mardon skipper sites were located on Rogue River National Forest lands 6.5 km north of Medford District BLM sites in the southern Oregon Cascades. The 2007 total of approximately 73 sites is almost double the number of sites known in 1999. However, this increase is likely not due to increased habitat or expanding populations, but instead due to increased survey effort in areas not previously surveyed (Kerwin and Huff 2007).

There is a historical record of the skipper from 2 miles north of Gold Beach just inland of the beach. The skipper has been found at Lone Ranch Beach in Curry County north of Brookings during surveys in 2007 (Ross, 2007). In 2008, another new site was located in the Signal Butte area on BLM land approximately 0.75 miles west of the Forest boundary (USDI, 2008). In 2009, a site was located in the Quosatana watershed on the Gold Beach Ranger District. In 2010, another site in the Signal Buttes area was discovered as well as a large site in the East Fork Pistol watershed was discovered. Occupied sites in Curry County have all been in wet serpentine meadow with adjacent dry meadow habitat. These habitat characteristics do not occur in any treatment units. No records currently exist for the Powers Ranger District.

The meadows in the Planning Area are typically sandstone, not serpentine and are not included in the proposed treatment areas. The Action Alternatives are not expected to impact Mardon skipper habitat and is very unlikely to affect individuals; therefore, the Eden Ridge Timber Sales Project is considered "**No Impact**" for **Mardon skipper**.

Johnson's Hairstreak *(Callophrys johnsoni)*
This small brown butterfly occurs in isolated pockets in the western mountains of California up into British Columbia. At lower elevations on the west slope of the Cascade Mountains and in the Coast Range, *M. johnsoni* feeds on *Arceuthobium tsugense* growing on large mature western hemlock in old-growth forests.

Butterflies fly in the forest canopy most of the time, but may nectar on flowers in open areas along roadsides. At higher elevations in the Cascade Mountains, this species feeds on *A. abietinum* growing on true firs in subalpine forests. Southward, *M. johnsoni* is particularly associated with an *Arceuthobium* growing on Brewer spruce at high elevations in the Siskiyou Mountains of southwestern Oregon and northwestern California (Miller and Hammond 2007). On the RRSNF, range maps indicate a population in the coastal mountains of Coos, Curry and Josephine counties. A second population is in northern Jackson County around Crater Lake National Park.

This butterfly is an old-growth obligate and spends much of its time in the tops of mature conifer forests, making survey efforts extremely difficult. They do nectar on some plants, like Oregon grape and males come into damp earth sites, such as seeps and springs. Caterpillars feed on pine dwarf mistletoe (*Arceuthobium campylopodum*) which grows on pines and others conifers. It is also known to use coastal hemlock mistletoe. Timber harvest of mature forests may be a potential threat to this species (NatureServe 2010).

Coronis Fritillary *(Speyeria coronis coronis)*
A relatively large (~ 3in.) butterfly that occurs in lower Rogue & Illinois River valleys of Jackson and Josephine counties. It is expected in Coos, Curry and Douglas counties and locally distributed in the Siskiyous.

The coronis fritillary inhabits lower elevation canyons and grasslands as well as mid-montane meadows and forest margins and openings (Pyle 2002). Caterpillars spend winter in first instar before feeding (Pyle 2002). In spring larvae feed mostly on Viola hallii, found in rocky serpentine habitats (Hammond pers. comm.). Adults seem to move uphill shortly after emerging, probably in search of nectar (Warren 2005). Adult‘s find nectar on bull thistle, other composites, and chokecherry (Pyle 2002). Females, at least, apparently return to basin habitats later in the season to deposit eggs. The single annual brood flies from mid-May to mid-September.

Rocky serpentine meadow habitat does not occur in the Analysis Area or within proposed units. The project is not expected to impact habitat and is very unlikely to affect individuals. The Eden Ridge Timber Sales Project is considered a **–No Impact –**~~f~~or **coronis fritillary**.

c. Direct and Indirect Effects of Alternatives

American Peregrine Falcon
The presence of humans detected by a raptor in its nesting or hunting habitat can be a significant habitat-altering disturbance even if the human is far from an active nest (Knight and Temple 1995). Some peregrine falcons are extremely sensitive and refuse to breed if humans have been in the vicinity of their aeries (Olsen and Olsen 1980). Even brief absence by parent birds can lead to missed feedings, predation on eggs or young, or to overheating, chilling, or desiccation of eggs or young (Suter and Joness, 1981).

There is one known peregrine falcon site within the Analysis Area. Three proposed treatment units (#401, #402, and #403) are within the disturbance distances and would be seasonally restricted for all activities - January 1 to July 31. Until a Site Management Plan is developed, disturbance distances for seasonal restrictions have been designated at the maximum distance for the primary management zone of 800 m radius (Pagel 1991).

However, based on the aspect, topography and location of the aerie, an additional 800 meters has been added to the NW half of the initial primary management zone radius. Maintenance activities on portions of roads 5000-200, 5000-210, and 5000-290 would also be seasonally restricted January 1 to July 31 or until it has been determined by the district wildlife biologist that either fledging has occurred or that the site is unoccupied ((see Wildlife Report PDC #10 and EIS Chapter II).

Helicopter landing locations within 1 mile of the known or any newly found peregrine falcon sites would require approval of the district wildlife biologist prior to implementation (see Wildlife Report PDC #11 and EIS Chapter II).

All Action Alternatives of the Eden Ridge Timber Sales Project "**may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide**" for the **American peregrine falcon** due to the potential for disturbance to individuals and potential limited adverse effects to prey species from treatments.

Pacific Fisher
Thinning may reduce existing canopy closure of between 70 to 100%, to between 40 and 50%, which could result in a reduction of denning, resting and foraging habitat for 10-15 years, until shrub and tree canopy closure. This would occur incrementally over the life of this project, since the proposed 3,314 acres would be broken into multiple sales over an approximate 5 year span. Some remnant trees may be felled as hazards but would be subject to Wildlife Report PDC #9 (see EIS Chapter II).

All **Action Alternatives** of the Eden Ridge Timber Sales Project "**may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide**," for **Pacific fisher** because it could result in a reduction of denning, resting and foraging habitat.

Fringed Myotis
The project does not affect caves, mines, wooden bridges, or buildings. As such, no impact is expected to these potential bat roost sites. By design, the project maintains and promotes the development of large trees, large snags and decadent trees which could serve as roosting habitat. However, a few large snags may be felled as hazard trees during this project.

Due to minor direct and indirect effects, the Eden Ridge Timber Sales Project "**may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide**," for all Action Alternatives for **fringed myotis** because there may be some impacts to existing snags or trees with cavities.

Johnson's Hairstreak
Because surveys have not been conducted in the Project Area and potential habitat may occur in treatment units, all Action Alternatives for the Eden Ridge Timber Sales Project "**may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide**" for **Johnson's hairstreak** due to the removal of overstory trees which may have mistletoe. Adverse effects are limited because the scale of impacts is very small compared to the scale of the distribution of this species and mistletoe would continue to persist within the Planning Area, as should this species if it does occur.

d. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands.

The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed Project Area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years.

Density management projects could reduce canopy closure for 10-15 years until the shrub and tree canopies return. Stands that lack remnant tree structure likely only function as foraging habitat for fisher. Density management would likely increase growth and allow young stands to become suitable for **fisher** sooner than if they were not treated. No USFS projects, which would remove or degrade old-growth/remnant trees (other than when safety hazards), are occurring or are anticipated in the Project Area or Analysis Area.

Road access around **the peregrine falcon** site is not available to the general public, because all access is through private gates, although the Forest Service has access through a cost share agreement. However, it is likely that peregrine falcons are habituated to vehicular traffic due to the nearly constant truck activity on the private timber lands. There are other potential nesting and roosting sites within the Analysis Area on private lands. It is not known whether there are any peregrine falcons utilize these areas.

Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40-50 year regeneration harvest rotation. There is little habitat on private land for **Pacific fisher** in the Analysis Area because the vast majority of it is non-forested. Jones and Garton (1994) found that fishers did not use non-forested sites while resting or hunting. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

For **fringed myotis**, no National Forest projects, which would impact caves, mines or abandoned wooded bridges and buildings, are anticipated in the Analysis Area or on the Powers Ranger District. These types of "structures" are not known to exist within the Analysis Area. Any cave or mine found within the Analysis Area or on the district would be surveyed for bats and likely fitted with a bat gate.

There is potential for some existing snags or trees with cavities to be removed as hazards in conjunction with future Forest Service activities. This could occur on future CHFT thinning projects and hazard tree removal along open roads. Hazard tree removal is likely to have minimal cumulative impact to **Townsend's big-eared bats**.

Activities on private lands within the Analysis Area are likely to have similar impacts. Past and current removal of snags as hazard trees along roads and within timber harvest units occur. There is likely little recruitment of future snags within private timber lands because of regeneration harvest practices. The amount and disposition of abandoned wooded bridges and buildings is unknown, however, the few that are known to exist would not be impacted by the Eden Ridge Timber Sales Project, or any future Forest Service project.

Since **Johnson's hairstreak** is an old-growth obligate, it is not expected to occur in any CHFT projects and no USFS projects, which would remove or degrade old-growth/remnant trees, are occurring or are anticipated in the Project Area or Analysis Area.

9. TERRESTRIAL WILDLIFE MANAGEMENT INDICATOR SPECIES

Effects of variable density management (thinning) treatments and other connected actions on Forest Plan Management Indicator Species.

Management Indicator Species (MIS) associated with the Siskiyou NF LRMP (USDA 1989) represent the issues, concerns, and opportunities to support recovery of Federally-listed species, provide continued viability of Sensitive species, and enhance management of wildlife and fish for commercial, recreational, scientific, subsistence, or aesthetic values or uses. EIS Appendix G includes a complete Wildlife Report (incorporated by reference) that contains more detail on MIS.

a. Background and Analysis Framework

Management indicators representing overall objectives for wildlife, fish, and plants may include species, groups of species with similar habitat relationships, or habitats that are of high concern (FSM 2621.1). An indicator species represents all other wildlife species which utilize a similar habitat type. Indicator species act as a barometer for the health of various habitats and will be monitored to quantify habitat changes predicted by implementation of the Forest Plan (1989 pages IV-10 and 11, FEIS page III-102).

The Forest has developed the Siskiyou National Forest MIS Forest-Wide Environmental Baseline and Species Account (Draft: USDA Forest Service) to which this document incorporates by reference. Please refer to this document for background information that includes a more exhaustive review of habitat use and ecology, distribution of the species, Forest-level habitat evaluations, and viability assessments.

Table III-35. Management Indicator Species and Determination of Effect

Species	Determination of Effects
Osprey	No Impact
Pileated Woodpecker	Minimal Impact
Woodpeckers (others)	Minimal Impact
American Marten	Minimal Impact
Black-tailed deer	Minimal Impact
Roosevelt elk	Minimal Impact

MIS and habitats include bald eagle (habitat along major rivers), osprey (habitat along large rivers), spotted owl (late-successional forest), pileated woodpecker and American marten (mature/interior forest), black-tailed deer and Roosevelt elk (early successional forest stages, and woodpeckers/cavity nesters (wildlife trees [snags]). Bald eagle and spotted owl are discussed in an earlier section .

b. Description of Species Habitat and Management Requirements

Osprey *(Pandion haliaetus)*
Ospreys are commonly observed along the South Fork Coquille River, the Rogue River, Elk River and in the Chetco fifth-field watersheds. This species is closely associated with open water (lakes, rivers, and streams). Ospreys historically have required large live trees (usually with broken tops) or large snags for nesting. However, by the mid-1970s they had begun to use artificial nest platforms, poles and other man-made structures (Marshall et al. 2003). Ospreys arrive during early spring (March), nest, and then leave for wintering grounds by October. Their primary diet includes fish and lamprey, which they hunt while in flight. Nests in Oregon are usually located within 2 miles of water and accessible fish populations (Marshall et al. 2003).

The nearest known osprey nest is approximately 1 mile from the haul route and over 3 miles from the nearest treatment unit. Road construction and thinning treatment activities are not likely to occur near any undiscovered nests, because the locations are not close to the main stem of the South Fork Coquille, where osprey are likely to nest. Removal of mature trees, unless determined a hazard, is not expected to occur during the project operations. Therefore it is unlikely that a potential nest tree would be removed or impacted. Therefore, a **"No Impact"** determination to osprey has been made for the Action Alternatives.

Pileated Woodpecker *(Dryocopus pileatus)*
Pileated woodpeckers are generally associated (feeds and breeds) with the Mixed forest habitat type, and is present in the Oak habitat type. Pileated woodpeckers use mature and older, closed canopy stands for nesting and roosting, but may use younger (40-70 years), closed-canopy stands for foraging if large snags are available; large snags and decadent trees are critical habitat components for pileated woodpeckers; down logs do not appear to be an important foraging substrate for pileated woodpeckers on the west side of Oregon and Washington (Hartwig et al. 2004, Mellen et al. 1992, Raley and Aubry 2006).

In the Coast Range of western Oregon, pileated woodpeckers prefer deciduous riparian habitats and forest stands > 40 years of age for foraging, however, nests and roosts were located only in forest stands > 70 years of age (Mellen et al. 1992). Nests were predominantly in broken topped snags; Douglas-fir was the primary species used, with a few nests in red alder. Roosts were in snags and live trees and significantly larger in dbh than nest trees; Douglas-fir was the predominant species used, but also red alder, big-leaf maple, and western redcedar (Mellen 1987).

The selected alternative for the Northwest Forest Plan was determined to meet the NFMA requirement to provide for a diversity of plant and animal communities (USDA and USDI 1994a). The pileated woodpecker was one of 36 birds determined to be closely associated with late-successional and old-growth forests, with occurrence of large snags necessary for optimal habitat (USDA and USDI 1994b; 3&4-177). A viability assessment was completed by the Forest Ecosystem Management Assessment Team (FEMAT) (1993). The viability outcome for the pileated woodpecker was 100 percent likelihood of Outcome A – "Habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize, well distributed across federal lands" (USDA and USDI 1994b; 3&4-179). This outcome determination was based on provisions of: 1) a large system of late-successional reserves, 2) standards and guidelines for Riparian Reserves, and 3) retention of green trees, snags, and coarse woody debris within the Matrix.

The Forest Service has been implementing the NWFP and monitoring late-successional habitat trends since 1994. The 10-year monitoring report (Haynes et al. 2006) states "…it appears that the status and trends in abundance, diversity, and ecological functions of older forests are generally consistent with expectations of the Plan. The total area of late-successional and old-growth forest (older forests) has increased at a rate that is somewhat higher than expected, and losses from wildfires are in line with what was anticipated." As a result, projects consistent with the NWFP should be expected to maintain viability of late-successional associated species such as the pileated woodpecker.

Woodpecker Group
The **woodpecker group** includes acorn, black-backed, downy, hairy, Lewis', and white-headed woodpeckers, as well as northern flickers and red-breasted sapsuckers. These species are generally associated (feeds and breeds) with oak woodland, Mixed forest, and/or Grassland habitat types. Woodpeckers excavate nests in snags and trees. They also forage in decayed wood. White-headed and black-backed woodpeckers are unlikely inhabitants of the fifth-field watersheds.

Acorn woodpecker *(Melanerpes formicivorus)***:** This species is common in the Rogue Valley and adjacent hills and was thought to be likely extirpated in Coos Co, although a likely wandering or vagrant individual was observed for a period of 4 days in Powers during the spring of 2011 (Lowe pers. obs. 2011). Typically restricted to oaks, mixed conifer/oak, and tanoak, but uses adjacent stands (Marshall et al. 2003).

Black-backed woodpecker *(Picoides arcticus)***:** This species is rare to locally common near the summit and on the west side of the Cascades. The westernmost extent of its range is in the Siskiyou Mountains. It has been found in most types of conifer forests but observations increase dramatically if the forest contains a high proportion of dead trees. It is most abundant in recently burned or beetle killed forests.

Downy woodpecker (*Picoides pubeseus*): This species is found mostly at low to moderate elevation in deciduous and mixed deciduous-coniferous forests, and less often in coniferous forests (Marshall et al. 2003). All but one of several nest reports from Oregon were in dead trees. A preference is shown for decayed wood for nesting, though sound wood is also utilized (Marshall et al. 2003).

Hairy woodpecker (*Picoides villosus*): This species is resident in forests throughout Oregon with the exception of juniper. It is common throughout most of range, but uncommon to fairly common along the coast and in western interior valleys. Found primarily in mixed-conifer and ponderosa pine forests, as well as adjacent deciduous stands, especially during the breeding season (Marshall et al. 2003).

Lewis' woodpecker *(Melanerpes lewis)***:** This species is associated with open woodland habitat near water. Primarily breeds in Oregon white oak, ponderosa pine, and riparian cottonwood communities and important components of this breeding habitat include open woodland canopy and large-diameter dead or dying trees. Formerly widespread, it is currently common year-round only in the white oak-ponderosa pine belt east of Mt. Hood (Marshall et al. 2003).

White-headed woodpecker *(Picoides albolarvatus)***:** This species occurs mainly in open ponderosa pine or mixed-conifer forests dominated by ponderosa pine. A small population exists in true firs in the Siskiyou Mountains southwest of Ashland. In addition to uncut old-growth, they commonly use areas which have undergone various silvicultural treatments if large-diameter ponderosa pine and other old-growth components remain (Marshall et al. 2003).

Red-breasted sapsucker *(Sphyrapicus ruber)***:** This species is found in moist coniferous coastal forest and mixed deciduous-coniferous forest west of the Cascade crest. Studies in the Oregon Cascades, Coast Range, and S. Washington Cascades showed increasing abundance with stand age and a close association with old-growth forest. Nest cavities are typically in large snags or live trees with decayed interiors (Marshall et al. 2003).

Northern flicker (*Colaptes auratus*): Northern flickers are a common resident throughout Oregon (Marshall et al. 2003). Northern flickers may be encountered in almost any terrestrial habitat, but are generally most abundant in open forests and forest edges adjacent to open country. They typically avoid dense forest (Marshall et al. 2003). Most nests in forested areas are in older open forests, along older forest edges, and in larger-diameter remnant snags (Marshall et al. 2003).

American marten *(Martes americana)*

Hargis et al. (1999) stated that in North America, American martens are closely associated with mature conifer stands with complete canopy closure, and small (<100m), limited, and interspersed openings that are used as forage areas. Thomas et al. (1993) and Forest Ecosystem Management Assessment Team (FEMAT 1993) list marten as "closely associated" with late-successional and old-growth forests and the old-growth elements of large snags and down logs.

The reports also indicate a strong relationship of marten with riparian areas. Buskirk (1992) reported that knowledge is almost completely lacking regarding behavioral or population responses of martens to such landscape attributes as stand size, stand shape, area of stand interiors, amount of edge, stand insularity, use of corridors, and connectivity.

Marten use a variety of structures for rest and den sites. Resting and denning sites offer protection from predation and thermal stress; thus, availability of quality denning sites likely increases the rates of survival and fecundity in marten (Raphael and Jones, 1997).

In northwestern California, Slauson and Zielinski (2009) found marten rest sites primarily in old-growth stands, which were used disproportionate to their availability. In serpentine habitats, rock piles and shrub clumps made up 42% of rest sites.

The diet of American marten is highly diverse. In the western United States in winter, most prey are captured beneath the snow surface, but squirrels may be caught in trees (Buskirk and Ruggiero 1994). Snags, downfall, and large woody material provide cover, denning sites, and access points to forage areas below the snow (subnivean habitat). Zielinski and Duncan (2004) found that in the southern Sierra Nevada, diets of both marten and fisher were more diverse than previously reported for North America. Of the major taxonomic groups, mammals were most common followed by insects and plants (mostly fruits).

Black-tailed Deer *(Odocoileus hemionus columbianus)*
Black-tailed deer are an edge adapted species using dense hiding cover during the day, emerging in the morning and evening to feed in more open areas (Maser et al. 1981). Throughout much of western Oregon, black-tailed deer reside year-round in relatively flat areas at mid to low elevations, on south facing slopes dominated by vine maple (*Acer circinatum*), huckleberry (Vaccinium spp), and salal (*Gaultheria shallon*) plant communities (Oregon Department of Fish and Wildlife, 2008).

Black-tailed deer rely upon several different successional stages of vegetation to meet their life needs. Areas with heavy canopy closure are used during all seasons. In summer, areas of heavy canopy closure are used to facilitate thermal regulation during periods of high temperatures. During winter, heavy canopy closure moderates temperatures and intercepts snowfall during winter storms. The reduction of snow depth under heavy canopy reduces energetic expenditure during movements of deer and provides areas of browse that would normally be under the snow surface. Areas with little or no overstory canopy cover are important for deer as forage areas. Forest gaps and natural openings provide optimal conditions for shrubs and forbs to grow, which deer depend on for forage.

Quality deer ranges provide both forested conditions for thermal regulation and hiding/escape cover interspersed with open areas for optimal foraging conditions. Decreased canopy closure in young stands should provide increased light and resources for forage plants.

Roosevelt's Elk *(Cervus elaphus roosevelti)*
Summer Roosevelt elk forage consists of a combination of lush forbs, grasses, and shrubs high in nutrients and easily digestible. Generally, higher elevation wet meadows, springs, and riparian areas in close proximity to forested stands offer these conditions for the longest period. Such areas provide nutritious forage and moist, cool places for bedding and escaping summer heat and insects (Oregon Department of Fish and Wildlife, 2003).

Elk achieve peak body condition during late summer and fall. Winter survival depends on fat reserves animals are able to store, thus, quality forage during summer and fall is crucial. Additionally, this forage is needed to meet the rigors of breeding and migration for those animals moving to winter ranges. The late summer/fall period can be critical on many elk ranges during drought years (Oregon Department of Fish and Wildlife, 2003).

Winter is when elk survival is severely tested. Day length shortens, temperatures drop, and rain and snow increase. Forage becomes less abundant and accessible, and nutritional quality declines. Elk energy requirements can be high, and during this time they are dependent on stores of body fat. At this time they increasingly seek out an environment that helps minimize energy consumption. Such areas typically provide protection against weather and offer security for minimizing harassment or disturbance. During a typical winter, elk may lose 20 to 25 percent of their body weight. Elk losing more than 30 percent body weight likely will not survive (Oregon Department of Fish and Wildlife, 2003).

Cover is an important component of elk habitat and provides both thermal and hiding properties. During summer it provides cooler, shaded areas for elk to bed during the heat of the day. During winter it provides a warmer, protected environment out of the cold, wind, rain, or snow. Lichens and other plants associated with cover can be an important source of forage for wintering animals. Adequate thermal cover reduces the energy needed by elk and contributes to over winter survival (Oregon Department of Fish and Wildlife, 2003).

c. Effects Mechanisms

Cook et al. (2004), reviewed four thermal cover studies conducted on elk and deer across North America and concluded that they indicate the thermal cover benefit attributed to dense forest cover is probably not operative across a considerable range of climate, including climates in boreal ecosystems of the northeastern United States, maritime ecosystems of the inland Pacific Northwest, and in cold, dry ecosystems of the central Rocky Mountains.

Cook et al. (2004) also concluded that the experimental studies outlined above evaluated the weather moderating influences of forest cover (i.e., influences on wind speed, ambient temperature, and long- and short-wave radiation fluxes). They did not evaluate other potentially beneficial aspects of forest cover, which under some circumstances could include enhanced security, reduced snow depth and a better foraging environment. Thus, results of these experimental studies cannot be used to categorically reject all potential benefits of forest cover to elk.

Hiding cover is also referred to as security cover and allows elk to escape and hide from intrusions or disturbances. These intrusions can be human (hunters, vehicles, hikers, etc.) or natural (predators). Factors affecting elk security are topographic relief, vegetation density, and proximity to human activity. Hiding cover becomes more important if other components that provide security are absent. This can be particularly important where predator numbers or human intrusions are high. Inadequate security or hiding cover can make elk more vulnerable to predators, harvest by hunters, or other sources of mortality that can lead to abandonment of traditionally used areas. Regulating hunters can sometimes help, however this provides little benefit if predation and/or other human disturbance are occurring (Oregon Department of Fish and Wildlife, 2003).

Roads are a major contributor to habitat fragmentation because they divide large landscapes into smaller patches and convert interior habitat into edge habitat. As additional road construction and timber harvest activities increase habitat fragmentation across large areas, the populations of some species may become isolated, increasing the risk of local extirpations or extinctions (Noss and Cooperrider 1994). Heavily roaded areas may contain fewer patches of forest cover large enough to function effectively as habitat for elk. The direct impacts of roads and associated traffic on elk can be summarized in three basic categories: 1) Elk avoid areas near open roads, 2) Elk vulnerability to mortality from hunter harvest, both legal and illegal, increases as open road density increases, and 3) In areas of higher road density, elk exhibit higher levels of stress and increased movement rates (Rowland et al. 2004).

The adverse effects of roads and traffic on both deer and elk are numerous. High road densities and the associated traffic have been shown to decrease habitat quality and increase vulnerability for both deer and elk. Deer and elk are likely to be affected by the following road or motorized trail-associated factors: collisions, hunting, poaching, displacement or avoidance, disturbance at a specific site (Gaines et al. 2003). Elk experience higher levels of stress when exposed to increased road density. Physiological indicators of stress, such as fecal glucocorticoids, have been observed in elk exposed to increased road density and traffic on roads (Millspaugh et al. 2001). Energetic costs of moving away from disturbance associated with roads may be substantial (Cole et al. 1997). During winter, when big-game species are on winter ranges, forage availability and value is generally low due to senescence of grasses and forbs. During this period open roads and the associated traffic have even greater detrimental effects on big-game due to their inability to escape harassment (disturbance) and both legal and illegal hunting pressure due to deep snow. In elk, if body fat is reduced below 9% as animals enter the winter period, the probability of surviving the winter is reduced (Cook et al., 2004).

d. Direct and Indirect Effects of Alternatives

Pileated Woodpecker
Snags that pose a hazard to project operations would likely be felled and retained (see Wildlife Report PDC #12 and EIS Chapter II). However, felled snags would still have woodpecker value as down wood foraging habitat. Trees damaged during operations may become future snags or trees with cavities. Additional snags would be created if funding is available. Non-commercial treatments that thin young stands are not expected to increase risks to pileated woodpeckers. This project is expected to have **M - minimal impacts** to these species, but there is the potential that an occasional existing snag or tree with cavities may be impacted.

Woodpecker Group
Snags that pose a hazard to project operations would likely be felled and retained (see Wildlife Report PDC #12 and EIS Chapter II). However, felled snags would still have woodpecker value as down wood foraging habitat. Trees damaged during operations may become future snags or trees with cavities. Additional snags would be created if funding is available. Non-commercial treatments that thin young stands are not expected to increase risks to cavity nesting woodpeckers. This project is expected to have **M - minimal impacts** to these species, but there is the potential that an occasional existing snag or tree with cavities may be impacted.

American Marten
The FAUNA database contains no observations of marten within the Analysis Area and only 16 for the entire Powers Ranger District between 1979 and 1997, and none since. The nearest recorded sighting is over 7.5 miles from a proposed treatment unit.

Thinning may reduce existing canopy closure of between 70 to 100%, to between 40 and 50%, which could result in a reduction of denning, resting and foraging habitat for 10-15 years when shrub and tree canopy closure increases. This would occur incrementally over the life of this project, since the proposed 3,314 acres would be broken into multiple sales over an approximate 5 year span. Remnant trees, snags and down wood suitable for denning & resting would be retained per PDC # 9 (Wildlife Report and EIS Chapter II), however some may be felled and retained. The Eden Ridge Timber Sales Project is considered **M – ~~–~~may affect some individuals or some habitat but effect is minimal**" for **marten.**

Deer and Elk
Black-tail deer and Roosevelt elk use all successional stages to meet their habitat needs for cover, forage and reproduction. Natural or created openings provide the majority of foraging habitat, which is assumed to be the most restrictive habitat component in this region (Forest Plan FEIS, III-106-107). Deer and elk represent more than 180 wildlife species that need early successional stages to meet some or all of their requirements (Brown, 1985).

Forage habitat is available within existing meadows, harvest units less than 10 years old and open canopy forested areas. Meadows and large grassy areas would be protected from disturbance. Corridors, skid trails, landings, slash piles, equipment operation and road construction would not be permitted within meadows and identified large grassy areas (see PDC # 14 in Wildlife Report and EIS Chapter II).

Forested conditions provide hiding (vegetation capable of hiding 90% of a standing adult deer or elk at 200 feet or less), thermal cover (a forest stand > 40ft tall with $\geq$ 70% canopy cover) and optimal cover (a forest stand with overstory, sub-canopy, shrub, and herbaceous strata and $\geq$70% canopy). Proposed thinning units currently provide hiding and thermal cover.

Evidence is consistent that vehicular traffic on forest roads evokes an avoidance response by elk. Even though habitat near roads is not denied to elk, it may not be fully used (Lyon, 1983). Christenson et al. (1993) reported that even primitive roads that see little summer use are often used extensively during the hunting season.

Road construction of 10.8 miles of new road, 0.3 miles of temporary road and re-construction of 6.1 miles of unclassified roads could potentially increase harassment. Although temporary roads are scheduled to be closed to motorized use after implementation and the new roads would be closed unless being used for commercial operations, they still provide a vector for additional disturbance to deer and elk during implementation. They are also likely to increase non-motorized use of the area during hunting season and during other recreational activities.

The Eden Ridge Timber Sales project has the potential to improve forage for deer and elk by reducing canopy closure which would allow sunlight to penetrate the canopy and invigorate the grass, forb, and shrub component in the understory on an estimated 3,314 acres. The non-commercial treatment of 363 acres could also provide a forage benefit to big-game. This would depend upon the spacing of the residual stand. More open spacing would provide a greater benefit to big-game by allowing the understory forage component to grow which would increase forage.

The proposed treatment is considered **M –may affect some individuals or some habitat but effect is minimal** for **blacktail deer** and **Roosevelt elk** because of loss of thermal cover and adverse effects due to potential increased harassment from new and temporary roads. The increase in available forage would provide a beneficial effect.

e. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the wildlife Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years. Density management projects could reduce canopy closure for 10-15 years until the shrub and tree canopies increase. Density management would likely increase growth and allow young stands to become suitable for woodpecker foraging and/or nesting sooner than if they were not treated. No USFS projects, which would remove or degrade old-growth/remnant trees (other than safety hazards), are occurring or are anticipated in the Project Area or Analysis Area.

Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40-50 year regeneration harvest rotation. There is little snag habitat on private lands for woodpeckers in the Analysis Area because the vast majority of it is non-forested and most snags are felled for safety purposes during regeneration harvest activities. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

The Eden Ridge Timber Sales project has the potential to cumulatively impact foraging habitats for pileated woodpeckers and other cavity nesting woodpeckers due to the potential of reducing snag density for operator safety requirements.

Stands that lack remnant tree structure likely only function as foraging habitat for **American marten**. Density management would likely increase growth and allow young stands to become suitable for marten sooner than if they were not treated. There is little habitat on private land for marten in the Analysis Area because the vast majority of it is in an early successional stage.

10. RARE AND UNCOMMON TERRESTRIAL WILDLIFE SPECIES

Effects of variable density management (thinning) treatments and other connected actions on other Rare or Uncommon terrestrial wildlife species and habitats.

EIS Appendix G includes a complete Wildlife Report (incorporated by reference). This section discusses other Rare or Uncommon terrestrial wildlife species and habitats, as with the Siskiyou NF LRMP (USDA 1989) as amended by the Northwest Forest Plan (USDA/USDI 1994), and other Forest Plan amendments.

a. Background and Analysis Framework

Survey and Manage Species

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in Conservation Northwest, et al. v. Sherman, et al., No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the Final Supplemental to the 2004 Supplemental *Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007). In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011.

Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement. The Eden Ridge Timber Sales Project is consistent with the Siskiyou National Forest Land and Resource Management Plan as amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD), as modified by the 2011 Settlement Agreement.

The Eden Ridge Timber Sales Project applies a 2006 Exemption from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in *Northwest Ecosystem Alliance v. Rey*, No.04844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management. Also known as the Pechman Exemptions, the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

a. Thinning projects in stands younger than 80 years old:
b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and
d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Per the 2011 Settlement Agreement, the 2006 Pechman Exemptions remain in force:

"The provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash. Oct. 10, 2006), shall remain in force. None of the following terms or conditions in this Settlement Agreement modifies in any way the October 2006 provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04844-MJP (W.D. Wash. Oct. 10, 2006)."

The Eden Ridge Timber Sales Project meets Exemption a. because it entails no regeneration harvest and entails thinning only in stands less than 80 years old (USDI and USDA 2011).

Currently all treatment stands for all Action Alternatives are under 80 years of age and do not require Survey and Manage surveys. Based on the Silvicultural Report (Appendix B) and stand exams, the proposed stands range from 53 to 73 years of age in 2011 (also see stand exam information in EIS Chapter II).

The 2011 Settlement Agreement states:

"For projects with signed Records of Decision, Decision Notices, or Decision Memoranda from December 17, 2009, through September 30, 2012, the Agencies will use either of the following Survey and Manage species lists:

- ***a.*** *The list of Survey and Manage species in the 2001 ROD (Table 1-1, Standards and Guidelines, pages 41-51).*
- **b.** *The list of Survey and Manage species and associated species mitigation, Attachment 1 to the Settlement Agreement."*

The Eden Ridge Timber Sales Project applies the Survey and Manage species list in the 2001 ROD (Table 1-1, Standards and Guidelines, pages 41-51) and thus meets the provisions of the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, as modified by the 2011 Settlement Agreement.

Protection Buffer Species

Under the 2001 ROD, Standard and Guidelines for certain cavity nesting birds, Canada lynx, and some bat roosts (protection buffer species) were identified as in the NWFP, 1994. Species potentially in the Project Area include bats that use caves, mines, and abandoned wooden bridges and buildings. Other protection buffer species: Canada lynx (*Lynx canadensis*), white-headed woodpecker (*Picoides albolarvatus*), black-backed woodpecker (*Picoides arcticus*), flammulated owl (*Otus flammeolus)*, and pygmy nuthatch (*Sitta pygmaea)* were not considered because the Eden Ridge Timber Sales Project is outside the known range for their species.

b. Description of Species, Habitat and Management Requirements

Del Norte Salamander *(Plethodon elongates)*
This species occurs in talus slopes protected by overstory canopy that maintains cool, moist conditions on the ground. The species is a slope-valley inhabitant, and sometimes occurs in high numbers near riparian areas. Riparian Reserves, in combination with Late-Successional Reserves and other reserves, will offer some protection to the species but substantial numbers also occur in upland areas. Additional mitigation options in this upland matrix include identifying locations (talus areas inhabited by the species) by using a standardized survey protocol [no longer required; the species is in Category D], then protecting the location from ground-disturbing activities.

Designate a buffer of at least the height of one site-potential tree or 100-feet horizontal distance, whichever is greater, surrounding the location. Within the site and its surrounding buffer, maintain 40 percent canopy closure and avoid any activities that would directly disrupt the surface talus layer. Partial harvest within the buffer may be possible if 40 percent canopy closure can be maintained; in such cases, tree harvest must be conducted using helicopters or high-lead cable systems to avoid compaction or other disturbance of talus (see Wildlife Report PDC #4 and EIS Chapter II).

Oregon Red Tree Vole (*Arborimus longicaudus*)
The Oregon red tree vole is a nocturnal, arboreal mammal specialized in feeding on needles of Douglas-fir and other coniferous trees (Maser 1998). The species is endemic to western Oregon (Verts 1998) primarily in coniferous forests of western Oregon (Csuti et al. 1997, Maser 1998). Red tree voles are most commonly found in Douglas-fir but may also be found inhabiting Sitka spruce and western hemlock in coastal areas. Red tree voles are usually associated with old-growth forests; however, they may occur in younger stands and may not be dependent on old-growth for survival (Aubry et al. 1991, Corn and Bury 1991, Gilbert and Allwine 1991).

Nests are constructed of twigs and discarded resin ducts in the canopy of larger trees (Csuti et al. 1997, Maser 1998). Larger trees, at least 25 to 30 years old, are selected because they can provide the structural support for nests as well as adequate protection from inclement weather. In southwestern Oregon, the largest available trees are selected for nesting, even in old-growth (Carey 1991). Abandoned nests of birds and other small mammals are also used (Maser 1998). The home range of the red tree vole is one or more trees (Brown 1985) and they can spend their entire lives in the forest canopy (Carey 1991).

Portions of the Eden Ridge Timber Sales Project were surveyed to protocol in 2001. Eighteen of 24 nest trees confirmed in the Planning Area were found in proposed treatment units. Current Survey Protocol states: "Survey results using this protocol should be considered valid for 5 years after completion of the survey." Although the surveys are no longer valid, all confirmed nest trees have been identified and marked as Wildlife Trees to Protect.

Great Gray Owl *(Strix nebulosa)*
Within the range of the northern spotted owl, the great gray owl is most common in lodgepole pine forests adjacent to meadows. However, it is also found in other coniferous forest types. In some locations, such as on the Willamette National Forest west of the crest of the Cascade Range, at least some shelterwood harvesting seems to be beneficial for the species by opening up otherwise closed canopy cover for foraging. In doing so, consequences to species such as northern goshawk and American marten must be evaluated. Specific mitigation measures for the great gray owl, within the range of the northern spotted owl, include the following: provide a no-harvest buffer of 300 feet around meadows and natural openings and establish 1/4-mile protection zones around known nest sites. Protect all future discovered nest sites as previously described.

Great gray owls forage in relatively open, grassy habitat including bogs, natural meadows, open forests and selective/regeneration harvest areas. Diet in western US is primarily pocket gophers and voles. Great gray owls tend to select nest sites in mature or remnant old-growth mixed-conifer forests near openings (within 200m of openings) that have sufficient prey numbers (Platt & Goggans, 1992). Suitable nesting habitat adjacent to natural openings 10 acres and larger is necessary to be surveyed.

c. Direct and Indirect Effects of Alternatives

Survey and Manage Species

Del Norte Salamander
There are 46 known Del Norte Salamander locations within the proposed units and one within a proposed non-commercial unit (Table III-36). All historical locations would be identified and given a protection buffer as described above. These buffers overlap multiple proposed treatment units in some cases. This Project (all Action Alternatives) is considered **M –may affect some individuals or some habitat but effect is minimal**.

Table III-36. Known Del Norte Salamander Locations

Alt 2 – Unit #	Del Norte Sites		Alt 3 – Unit #	Del Norte Sites		Alt 4 – Unit #	Del Norte Sites
006	1		006	1		006	1
211	1		211	1		211	1
303	1		215	6		215	7
308	2		303	1		322	3
322	3		307	2		323	6
323	2		322	3		326	8
326	8		323	2		331	2
329	6		326	8		332	1
331	2		329	6		334	2
332	1		331	2		341	4
333	6		332	1		342	2
334	7		333	6			
340	7		334	4			
341	5		341	4			
342	2		342	2			
Alt 2 – Road #Q4: 1 site							
Non-Commercial Unit #906: 1 site							

Note: Some Protection Buffers overlap multiple units

Oregon Red Tree Vole (*Arborimus longicaudus*)
Proposed treatments are expected to impact 3,314 acres of potential red tree vole habitat. Trees with undiscovered red tree vole nests may be cut or blown down following treatment. Thinning would isolate individual tree canopies and reduce the current inter-connected tree canopies. This Project (all Action Alternatives) is considered **M –may affect some individuals or some habitat but effect is minimal**.

Great Gray Owl *(Strix nebulosa)*
The FAUNA database contains one incidental sighting of a great gray owl within the Siskiyou portion of the Rogue River-Siskiyou National Forest. This location is over 2 miles from the nearest proposed treatment unit and over 4 miles from the nearest meadow or natural opening within the Project Area. There are no natural meadows 10 acres or larger within the Planning Area.

This project will have **NI – no impact** to great gray owl because suitable nesting/foraging habitat does not occur within or near the Project or Planning Areas.

Protection Buffer Species

Bats use caves, mines and abandoned wooden bridges and buildings. The project does not affect caves, mines, wooden bridges, or buildings. As such, no impact is expected to these potential bat roost sites. By design, the project maintains and promotes the development of large trees, large snags and decadent trees which could serve as roosting habitat. However a few large snags may be felled with this project (i.e., hazard trees). This project is **M –may affect some individuals or some habitat but effect is minimal to these species**. There may be some impacts to existing snags or trees with cavities.

d. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands.

The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed Project Area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Project Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years. No USFS projects, which would remove or degrade old-growth/remnant trees, are occurring or are anticipated in the Project Area or Analysis Area. Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40-50 year regeneration harvest rotation. There is little habitat on private land for other rare and Uncommon species in the Analysis Area. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

11. NEO-TROPICAL MIGRATORY BIRDS

Effects of variable density management (thinning) treatments and other connected actions on other neo-tropical migratory bird species or habitats.

EIS Appendix G includes a complete Wildlife Report (incorporated by reference). That report and this sub-section discuss neo-tropical migratory birds/land bird focal species.

a. Background and Analysis Framework

In 1918 the Migratory Bird Treaty Act (MBTA) was passed to enforce a treaty between the United States, Mexico, and Canada. This law addressed the issue of poaching migratory birds - Under the M33TA, except as permitted by regulation, it is unlawful at anytime, by any means or in any manner, to pursue, export, import, transport, or carry any migratory bird. It is the position of the Federal Government that the prohibitions of the MBTA do not apply to land management activities of Federal agencies or their employees acting in their official capacities.

In September, 2000, the USDA Forest Service Land Bird Strategic Plan was distributed. This plan set forth goals and actions to assist meeting the Forest Service commitment to provide habitat for sustainable resident and migrant landbird populations and monitor their populations through time. An Executive Order (EO) 13186) was signed in 2001. Provisions within this document directed agencies to integrated bird conservation principles, measures, and practices into agency planning process, restore and enhance habitat of migratory birds as practicable, and ensure that analysis evaluates the effects of actions on migratory birds, especially species of concern.

In December, 2008, the USDA Forest Service and USDI Fish and Wildlife Service signed a Memorandum of Understanding (MOU) to Promote the Conservation of Migratory Birds (USDA, USDI 2008). The purpose of this MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds. Focus first on species of management concern along with their priority habitats and key risk factors. Within the National Forest System, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales. The Rogue River-Siskiyou NF is within Bird Conservation Region 5 (Northern Pacific Forest).

b. Description of Species, Habitat and Management Requirements

This analysis is based on neo-tropical migratory birds/land bird focal species identified by Partners in Flight (PIF): Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington. As per the Partners In Flight Bird Conservation Plan —. if you provide all of the habitats to some degree over some landscape, then you will probably be taking care of most if not all of the landbirds in that habitat. The conservation emphasis is on ecosystems, habitats, and habitat conditions, not species."

Table III-37. Focal Migrant Bird Species and Associated Habitat

Habitat	Condition	Habitat Attribute	Bird Species
Coniferous forest	Old-growth / Mature	Large snags	Vaux's swift, pileated woodpecker
Coniferous forest	Old-growth / Mature	Large trees; conifer cones; mid-story tree layers	Brown creeper; red crossbill; varied thrush
Coniferous forest	Mature / Young	Varied canopy closure; deciduous canopy & understory; complex forest floor	Hermit warbler, Hammond's flycatcher; Pacific-slope flycatcher; Wilson's warbler; winter wren, Northern goshawk, purple finch
Coniferous forest	Young / Pole	Deciduous canopy	Black-throated gray warbler
Coniferous forest	Pole	Deciduous subcanopy / understory	Hutton's vireo
Coniferous forest	Early-seral	Residual canopy trees, snags, deciduous vegetation; nectar-producing plants	Olive-sided flycatcher; western bluebird; orange-crowned warbler; rufous hummingbird
Coniferous forest	Unique	Mineral springs	Band-tailed pigeon
Coastal scrub	Early-seral	Coastal fog belt, dense riparian shrub.	Allen's hummingbird
Oak woodlands (including non-forested prairie)	Unique		California quail, western screech-owl, Nutall's woodpecker, oak titmouse, wrentit, California thrasher, black-chinned sparrow, Oregon vesper sparrow, horned lark
Cliffs, waterfalls & forest	Unique	Cliffs near waterfalls within forested habitat.	Black swift
Riparian	Riparian	Large trees adjacent to major rivers. Dense shrub habitat.	Bald eagle, willow flycatcher
Large cliffs	Unique		Peregrine falcon

c. Direct and Indirect Effects of Alternatives

Vaux's swift and pileated woodpecker are associated with large snags; effects to these species would be minimal as Project Design Criteria would retain snag components in units and if funding is available, more would be created following treatment. The brown creeper; red crossbill and varied thrush are identified as old-growth/mature obligate species. Remnant trees and minor species including hardwoods would be retained thus having minimal effect to this species grouping. Hermit warbler is closely associated with a densely closed Douglas-fir canopy.

Thinning treatment impacts have been reported as a 1-3 year slight reduction in relative abundance and abundance levels are similar to those in untreated stands in 5-15 years (PIF, 1999). Hammond's flycatcher; Pacific-slope flycatcher, Wilson's warbler, winter wren, Northern goshawk and purple finch are most closely tied to deciduous canopy and complex forest floor/understory habitat which would be retained /increased in treatment prescriptions, therefore having minimal to beneficial effects to the species overall.

Some species such as Olive-sided flycatcher; western bluebird; orange-crowned warbler; Rufous hummingbird may decrease in the short term because habitat may be removed during landing clearing and temporary road construction. Effects to the peregrine falcon and bald eagle are addressed in the Sensitive Species section of this document.

Because of the limited acres of dry land grass sites, the biggest concern with NTMB on Forest Service lands may lie in degradation of riparian habitat, and subsequent loss of brush cover favored by many species (Bock et al. 1992). Riparian habitat in the Project Area would not be altered or impacted by the proposed activities since the Rogue River-Siskiyou National Forest Riparian Guidelines (USDA FS 2006) provide protection (no treatment within 25 feet) of riparian habitat. Since the majority of the species occupy or require a riparian habitat component; the proposed project would not be impacting this habitat type.

Overall, potential population numbers for grass and shrub nesting birds are expected to increase. The long term impacts of fuels reduction may have beneficial impacts by maintaining grasses by reducing brush competition for available space.

Another benefit is the creation of some snag trees (usually 0.5 - 1 per acre) caused by logging activities or scorching from burning; although there are mitigations to help limit this, some may occur; thus creating some foraging and nesting habitat for woodpeckers and secondary cavity nesters. For those species dependent on acorns, reducing conifer encroachment on oaks helps to maintain and increase growth of oaks, thus benefiting bird foraging habitat. Lastly, the remnants of some unburned or partially burnt piles may benefit nesting and cover habitat in areas that currently lack these components.

Disturbance from operations and smoke during the nesting period is also a concern for NTMBs. Efforts should be made to reduce impacts to nesting birds that may be present in the Project Area that may be directly impacted by operations. Timing of operations should occur outside of the spring breeding/nesting season as much as possible (May 15 to July 15).

Effects to NTMBs from the Action Alternatives are variable depending on the habitat associations of the individual species. Impacts to habitat for some species may occur from commercial thinning of mature and younger forests, hazard tree felling, landing clearing/road construction. However, due to the limited amount of area affected by these projects, relative to the availability of habitats within the watersheds and forest, effects to NTMBs are expected to be (**M) minimal.**

d. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed Project Area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Project Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years. No USFS projects, which would remove or degrade old-growth/remnant trees, are occurring or are anticipated in the Project Area or Analysis Area. Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40-50 year regeneration harvest rotation. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

12. AQUATIC SPECIES AND HABITATS

Effects of variable density management (thinning) treatments and other connected actions on aquatic species and habitats, including Threatened or Sensitive species and/or Critical Habitat/Essential Fish Habitat.

In compliance with Section 7 of the Endangered Species Act (ESA) and the Forest Service Biological Evaluation (BE) process for Endangered, Threatened, Proposed or Sensitive fish species (Siskiyou LRMP S&G 4-2; page IV-27). EIS Appendix H includes a complete Aquatic Biota Report and Biological Evaluation (incorporated by reference). Forest Service Manual (FSM) Chapter 2670 outlines the policy and direction for the management of Endangered, Threatened, Proposed or Sensitive fish species.

a. Background and Analysis Framework

The Biological Evaluation process (FSM 2672.43) is intended to conduct and document activities necessary to ensure Proposed Actions will not likely jeopardize the continued existence or cause adverse modification of habitat for:

A. Fish species listed or proposed to be listed as **Endangered** (E) or **Threatened** (T) or **Proposed** for Federal listing (P) by the National Marine Fisheries Service.

B. Listed as **Sensitive** (S) by USDA, Forest Service.

The USDA Forest Service Region 6 Sensitive Species List (January 31, 2008) was reviewed and field reconnaissance was conducted in regard to potential effects on any of these species by actions associated with the Eden Ridge Timber Sales. The results are summarized in the Table III-38 below.

Table III-38. Potentially Affected Species, Status, and Habitats Assessed

Species/Habitat		Pre-field Review	Field Surveys
Common name	Scientific Name	Existing Sighting or Potential Habitat (Yes*/No**)	Habitat or Species Confirmed (Yes*/No**)
Threatened Species			
OC Coho Salmon	*Oncorhyncus kisutch*	Yes	Yes
Critical Habitat			
OC coho salmon	*O. kisutch*	Yes	Yes
Essential Fish Habitat			
Coho salmon	*O. kisutch*	Yes	Yes
Chinook Salmon	*O. tshawytscha*	Yes	Yes
Sensitive Species			
SONCC Chinook salmon	*O. tshawytscha*	No	No
PC chum salmon	*O. keta*	No	No
OC Steelhead	*O. mykiss*	Yes	Yes
Inland redband trout	*O. mykiss*	No	No
Pit sculpin	*Cottus pitensis*	No	No
Western ridged mussel	*Gonidea angulata*	No	No
Klamath rim pebblesnail	*Fluminicola sp.*	No	No
Highcap lanx	*Lanx alta*	No	No
Scale lanx	*Lanx klamathensis*	No	No
Robust walker	*Pomatiopsis binneyi*	No	No
Pacific walker	*Pomatiopsis californica*	No	No
Pristine springsnail	*Pristinicola hemphilli*	No	No

***Yes** – The proposed project's potential effects on these species will be further analyzed in this document.
****No** – No further analysis is necessary, and a determination of "No Impact" is rendered.

b. Status of Listed Species, Essential Fish Habitat, and Critical Habitat

Oregon Coast Coho Salmon and Critical Habitat (Threatened)
Oregon Coast (OC) coho ESU was listed as Threatened on August 10, 1998 (63 FR 42587). This listing was reevaluated and National Marine Fisheries Service (NMFS) determined listing OC coho was not warranted on January 17, 2006. The listing was once again reevaluated and NMFS determined a listing of threatened was warranted on February 4, 2008 (73 FR 7816). OC coho salmon critical habitat was designated as threatened also on February 11, 2008 (73 FR 7816). Final protective regulations for OC coho salmon were issued on February 11, 2008 (73 FR 7816). On April 28, 2009 NMFS announced that it was initiating a status review of OC coho. On May 26, 2010, NMFS affirmed the listing of the OC coho salmon as Threatened (75 FR 29489).

Critical habitat is defined in Section 3(5)(A) of the ESA as "the specific areas within the geographical area occupied by the species Oregon Coast Coho on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection." Section 7 of the ESA prohibits the destruction or adverse modification of designated critical habitat (CCH).

On the RRSNF, the South Fork Coquille River, though occupied by OC coho, is exempt from Critical Habitat designation due to economic benefits of exclusion outweighing the benefits of designation. Further, marine habitats are not included as Critical Habitat due to the difficulty in identifying specific areas critical to the species. The habitat indicators addressed in this analysis that are pertinent to aquatic habitat health, also represents the primary constituent elements of proposed CH for OC coho salmon. Therefore, this analysis is sufficient for consultation of proposed CH as well.

NMFS developed a list of Primary Constituent Elements (PCEs) that are essential for the conservation of OC coho, and which are based on the life history of the coho salmon. These PCEs are: freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, nearshore marine areas, and offshore marine areas. These PCEs in concert with OC coho distribution data, were used to delineate the spatial extent of the critical habitat. The lateral extent of this designation is limited to the ordinary high water mark (i.e., bankfull elevation). For the purposes of this analysis, the PCEs are cross referenced with the respective Habitat Indicators in Table III-39 below.

Table III-39. OC Coho Critical Habitat Essential Habitat Features and Habitat Indicators

PCEs of OC coho Critical Habitat	Habitat Indicator
Freshwater Spawning Sites	Change in Peak/Base Flows, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Substrate
Freshwater Rearing Sites	Change in Peak/Base Flows, Floodplain Connectivity, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Water Quality Indicators, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Off-channel Habitat, Streambank Condition
Freshwater Migration Corridors	Physical Barriers, Change in Peak/Base Flows, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Floodplain Connectivity, Off-channel Habitat, Streambank Condition
Estuarine Areas	Physical Barriers, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Change in Peak/Base Flows, Water Quality Indicators, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Floodplain Connectivity, Off-channel Habitat, Streambank Condition
Nearshore Marine Areas	N/A to RRSNF Actions
Offshore Marine Areas	N/A to RRSNF Actions

Essential Fish Habitat

Interim final rules for Essential Fish Habitat (EFH) under the Magnuson-Stevens Act (16 U.S.C. 1855(b)) were published in the Federal Register/ Vol. 62, No. 244, December 19, 1997 and final rules published in the Federal Register/ Vol. 67, No. 12, January 17, 2002. These rules are pertinent to Chinook salmon and coho salmon habitat within the Southern Oregon Coastal Basin. Essential Fish Habitat has been defined by NMFS as ~~"t~~hose waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition includes all waters historically used by anadromous salmonids of commercial value.

Because federally listed Threatened fish species and/or critical habitat are present as associated with this project, consultation requirements were conducted in accordance with the Endangered Species Act (ESA), (SIS LRMP S&G 4-2). A Biological Assessment was prepared for consultation purposes and is contained in EIS Appendix H (and incorporated by reference into this EIS).

Action Area

The Action Area, as defined by the Endangered Species Act, is all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action [50 CFR § 402.02]. The Action Area not only includes the immediate footprint of the harvest and road related activities, but any downstream reaches which may be affected indirectly. The ESA Action Area is also analyzed for Forest Service Sensitive Species.

The Proposed Action (Alternative 2) is located within portions of the South Fork Coquille River 5th field and the Middle Fork Coquille River 5th field. Timber harvest, timber hauling and new road construction would occur primarily in Coal Creek 6th Field watershed and in the upper headwaters of 6th Field Watersheds: Headwaters S. Fork Coquille River, Lower Rock Creek and Myrtle Creek. Only timber haul activities adjacent to units would occur within the headwaters of Mill Creek -South Fork Coquille 6th field watershed.

OC Steelhead (Sensitive)
On the RRSNF, Oregon Coast (OC) steelhead occurs within the South Fork Coquille River, and Sixes River drainages. The OC steelhead trout distinct population segment (DPS) was proposed as threatened under the ESA on August 9, 1996 (61 FR 41541), but was found not warranted for listing. OC steelhead is currently listed as a species of concern by NMFS and as a Sensitive Species by USFS Region 6.

Other Species (Sensitive)
PC chum salmon, inland redband trout, pit sculpin, western ridged mussel, Klamath rim pebblesnail, highcap lanx, scale lanx, robust walker, pacific walker, and pristine springsnail, are not known to occur or have suitable habitat within proximity to any of the proposed changes included within any of the Action Alternatives. As such, a **No Impact** determination is rendered and these species will not be discussed further within this document.

MAP III-5 (below) shows fish distribution, streams and stream class, proposed treatment units and areas for Alternative 2, roads and haul routes.

Description of Habitat Environmental Baseline
Information used in this analysis includes Geographic Information System data and Aquatic Habitat Inventories (Forest Service 2010). Properly Functioning Condition ratings are based on the NOAA Table of Population and Habitat Indicators, as modified by the Rogue River/South Coast Level 1 Team for the Klamath Province/Siskiyou Mountains.

Refer to Eden Ridge Timber Sales Biological Assessment, August 2011 for a complete description of the environmental baseline conditions.

This analysis evaluates the direct and indirect potential effects of proposed actions on Oregon Coast coho, CCH, EFH and OC steelhead trout. There is no potential to affect CCH 8.8 miles downstream, while there is potential to affect EFH and OC steelhead trout. EFH and OC steelhead are located in the Action Area, so any potential effect to one (i.e., EFH) would obviously result in an effect to the other (OC coho).

c. Effects Mechanisms

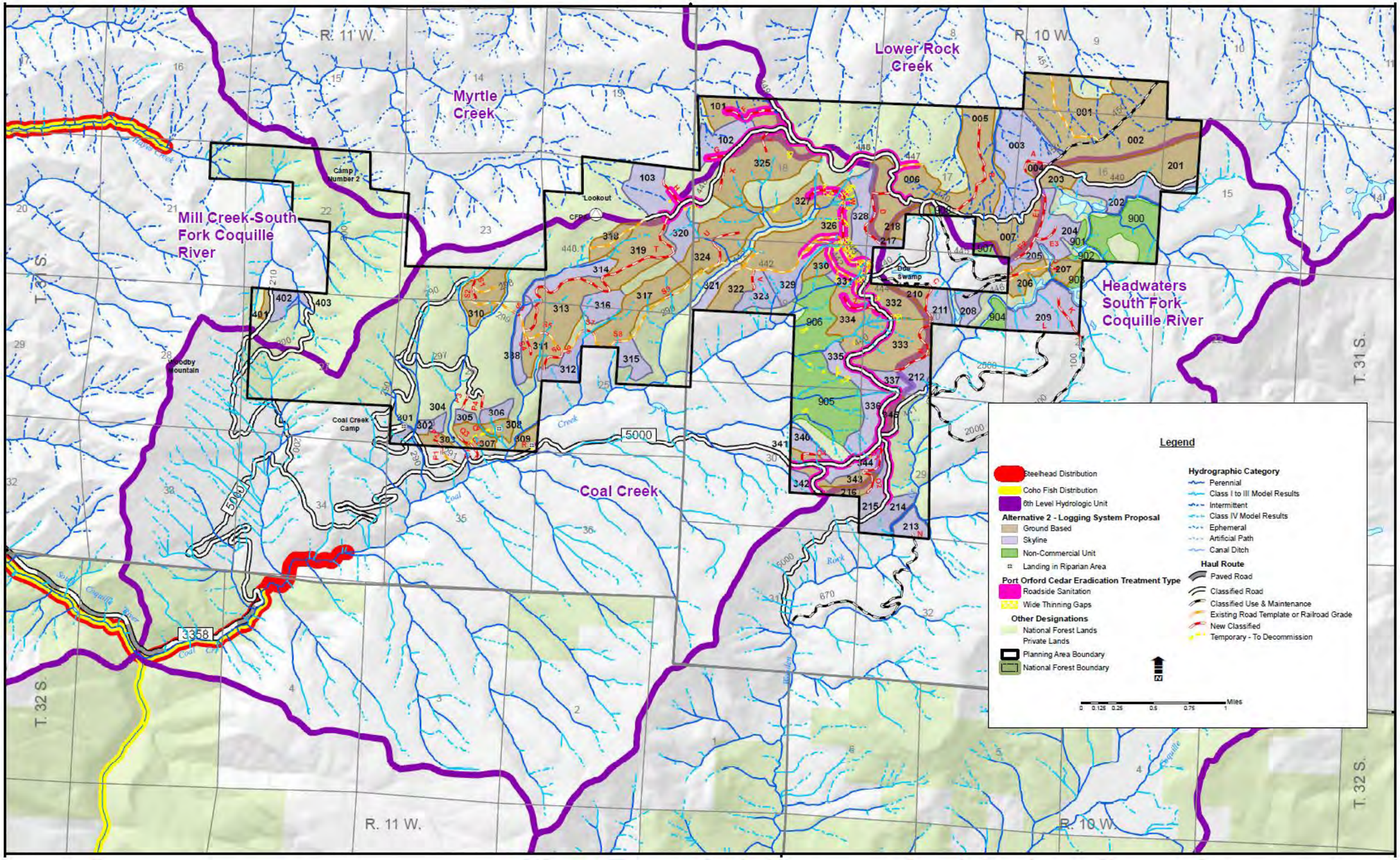
The actions of the project alternatives can be divided into five Project Elements:

1. *Timber Felling and Yarding*
2. *Timber Hauling*
3. *Fuels Treatment*
4. *Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, and New Road Construction*
5. *Other Enhancement Activities*

Timber Felling and Yarding
Thinning treatments within Riparian Reserve are designed to enhance development of late seral conditions as recommended in the South Fork Coquille Watershed Analysis (1995) by moving stand structure forward by increasing tree growth through density management, creating structural diversity through skip and gap treatments, and to improve forest health and resistance to forest pathogens.

Site-specific silvicultural prescriptions would be developed for each individual stand identified for treatment and address each land allocation classification (Matrix, Riparian Reserve) during implementation. Silvicultural prescriptions would describe the desired future condition; specify tree spacing, target residual density (RD), preferred species, canopy retention, post-harvest treatments and other key stand components. Final silvicultural prescriptions would be approved by a Region 6 certified silviculturist.

MAP III-5. Fish Distribution and Project Activities –Alternative 2



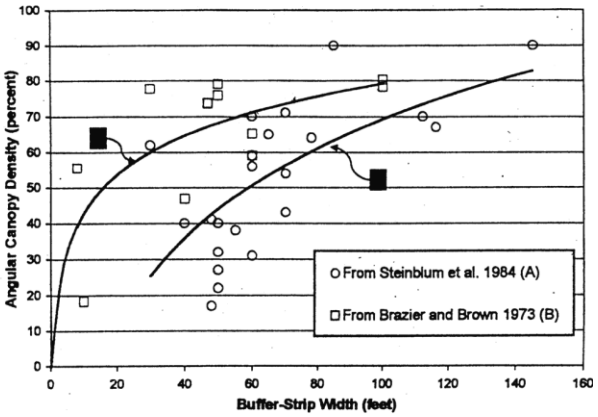
Project Design Criteria for Riparian Reserves (PDCRR) (Park 2005) are used to prevent shade reduction in riparian areas. Density management thinning is designed to improve stand health with treatments and/or commercial extraction while allowing attainment of or restoration of Aquatic Conservation Strategy (ACS) objectives under the Northwest Forest Plan. Riparian buffers originally estimated were adjusted slightly wider for ephemeral and intermittent non-fish bearing streams with medium and heavy thin buffers, a change from 25 feet to 35 feet and 40 feet respectively, as suggested by NMFS in order to facilitate an expeditious consultation. NMFS suggested that the buffer change would reflect their concern for addressing activities in riparian areas in relation to riparian buffer adequacy and loss in the short-term of small wood contribution to streams.

Exposure to direct solar radiation, as described in the PDCRR will often cause a dramatic increase in stream temperatures. When shaded throughout the entire day, far less heat energy would be transferred to the stream. The ability of riparian vegetation to shade the stream depends on vegetation height, density, stream width and position relative to the stream.

Thinning can affect stream temperature by removing shade trees. The amount of shade lost depends on stream width, tree height and stream orientation. The following figure display thinning effects similar to those proposed under this project, for one mile of stream. Most daily solar radiation occurs between 10am and 2pm. Trees that provide stream shade during this time are considered "primary shade trees". Primary shade trees would not be removed. Figure III-4 displays buffer width as a function of angular canopy density for mature trees. A mature tree is defined an individual tree that has reached most of its potential height growth.

At a point the shade density increases very little as the sun's angle decreases or the sun gets lower in the sky. This is the secondary shade zone. The primary shade tree zone for mature trees varies from 50 to 60 feet in width. Very little additional shade is gained when the sun is low enough to intercept the secondary shade trees. Therefore, in dense stands such as the plantations proposed for treatment, trees outside the "primary shade zone" can be thinned with a neutral effect on stream shade.

Figure III-4. Buffer Widths and Angular Canopy Density



Timber Hauling

The only haul route segment adjacent to EFH with a gravel-surface is the remaining 200 feet of NFSL Road 5000 with a 12 percent slope, which parallels Coal Creek. This section of road is crowned, has two ditch relief culverts which drains into an 80 feet vegetated buffer. The remaining road segment of haul route coming from the gravel-surface road is a 50 feet asphalt-surfaced segment, which drains around a corner into a well vegetative buffer before reaching the stream. The haul routes from the units are gravel surfaced roads down to the paved NFSL Road 3300 adjacent the South Fork Coquille River.

Table III-40 displays the amount of haul occurring over perennial stream crossings within the most impact being in the Coal Creek 6th Field. At the junction of the NFSL Road 5000 and NFSL Road 200, the entire haul merges into the NFSL Road 5000 for approximately one mile. The timber haul would average about 14 truckloads daily from this location down the 5000 Road.

Table III-40. Summary of Perennial Stream Crossings That Would Occur during Haul

Watershed	Number of Perennial Stream Crossings
South Fork Coquille 5th Field ,Headwater South Fork 6th Field watershed	3
South Fork Coquille 5th Field, Coal Creek 6th Field watershed	22
South Fork Coquille 5th Field, Mill Creek 6th Field watershed	4
TOTAL	29

Fuels Treatment

Activity fuels treatment refers to the slash and accumulated fuel resulting from the proposed density management treatments. While there may be some slash from previous harvesting or from natural conditions, the majority of material would be generated through density management treatment and commercial removal. Activity fuels treatments proposed for this project include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk. Several methods of activity fuels treatment are being proposed, and include the following: burning tree tops that were yarded to landing site, burning materials accumulated by harvest activity that is piled (by hand or mechanical equipment).

Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, and New Road Construction

The Eden Ridge Planning Area currently has a minimal existing road network, because it has not been vegetatively managed for many decades, and when the logging that created the candidate stands of today were created, most of the area was logged by railroad systems. Most of the existing roads evolved from these early railroad grades but do not adequately serve the Planning Area for today‘s needs and systems. The current existing road system within Eden Ridge, overall, is currently managed and maintained.

Refer to EIS Chapter II for the general locations of road use, proposed reconstruction/road decommissioning, road reconstruction and maintenance needs associated with the 6th field watersheds. There would be 23 Intermittent/Ephemeral Non Fish bearing crossings built and 12 perennial crossings in the 3.19 miles of road activities that would occur in Riparian Reserve.

In order to adequately and efficiently access the Planning Area for today‘s management systems, there is a need for additional classified roads. Given the current situation, these new access roads could not be developed without the need to cross some drainages designated as Riparian Reserve. A total of approximately 11.1 miles of new road construction is proposed. Of the 11.1 miles of road, 0.3 miles would be temporarily contructed, used then decommssioned. The remaining new road construction would include approximately 10.8 miles, in 43 segments, ranging from 0.11 miles to 1.93 miles. Most of the new roads would be managed as Maintenance Level 1 (closed until further need). ***New permanent roads within Riparian Reserve total 1.58 miles.***

Table III-41. Summary of All Road Activity in *Riparian Reserves*

Road System – By Road Type	Road Number or Unit	Number of Intermittent/Ephemeral Non-fish Bearing Road Crossings	Number of Perennial Road Crossings	Total Road Segments Miles	Distance from CCH/EFH
Temporary Road (Access) Construction – New Roads to be Built in Riparian, No Existing Template. Decommission Afterwards					
	Q4	1	1	0.21	9.3/2.3
	R	0	0	0.03	9.4/2.4
Total Crossings/Miles		**1**	**1**	**0.25**	**Total Miles**
Road Reconstruction					
	5000299	0	1	0.57	11.7/4.7
	5000442	1	0	0.25	11.0/4.0
	5000442.1	1	0	0.07	11.0/4/0
	5000443	2	0	0.28	11.7/4.7
	5000446	1	0	0.09	11.8/4.8
	5000451	2	0	0.11	4.2/5.2
Total Crossings/Miles		**7**	**1**	**1.36**	**Total Miles**
New Permanent Road Construction					
	B	2	0	0.16	8.8/8.8
	F	1	0	0.17	11.7/11.7
	J	0	1	0.05	23.6/4.6
	O4	4	0	0.10	14.5/7.5
	S1	0	1	0.06	9.8/2.8
	S3	0	1	0.06	9.7/2.7
	S5	0	1	0.05	10.3/3.3
	S6	1	0	0.06	10.3/3.3
	S7	0	2	0.11	11.0/4.0
	S8	1	0	0.04	10.3/3.3
	S9	3	0	0.05	12.0/5.0
	T	1	0	0.10	17.5/10.5
	U	0	1	0.12	14.5/7.5
	W	1	3	0.33	15.4/8.4
	Z	1	0	0.13	15.6/8.6
Total Crossings/Miles		**15**	**10**	**1.58**	**Total Miles**
Grand Total – Proposed Crossings and Miles of Roads to be Built in Riparian Reserves		**Intermittent/Ephemeral Crossings 23**	**Perennial Road Crossings 12**	**Total Miles 3.19**	

All proposed new system roads would be rocked as needed to minimize erosion and allow for extended use during wet conditions. All new roads (including those crossing Riparian Reserve) would be engineered and designed to minimize environmental impacts. Designed roads constructed on NFSL would be accomplished to standards appropriate for the intended uses; considering safety, cost of transportation, and impacts on lands and resources. Designed roads would be constructed as stable and durable structures to facilitate maintenance during and after use and monitored every five years.

This design would include necessary drainage facilities, adequate erosion control, closure devices, and resource protection devices. Closure of all new construction of system roads would typically be accomplished via a road entrance closure of native materials (logs, earth, boulders) after timber sale activites had occurred, placing them into Maintenance Level 1 Status.

Other Enhancement Activities
In areas where past management has resulted in a lack of large snags needed for cavity nesting species, snags may be created from live trees left in stands. Creation can be through girdling, topping the trees with chain saws, blasting, inoculation with heart rot fungi, or deliberate injury.

Snags and down large wood would be retained to support forest function. This project is planned for down logs to be retained and are considered excess only when all site considerations have met and in accordance with Forest Plan Standards and Guidelines.

Large woody material (LWM) fulfills a number of important ecological functions such as stabilizing surface soils, increasing organic content in soils over the long-term, providing habitat for the many organisms that depend on snags and down logs in various stages of decay, and ensuring adequate large woody material recruitment to meet the ecological needs of aquatic systems over time.

The Eden Ridge Project proposes to place 150 large trees in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Live and dead trees may be removed from riparian areas to provide wood for enhancement projects, under special conditions described in the Design Criteria. This action would involve the use of log trucks and dump trucks for transport and excavator-type machinery, spyders, cable yarders, draft horses, or helicopters for placement. Plans and designs would be consistent with Forest Plan direction, K-V opportunities, and watershed restoration plans (e.g., USDA FS 2006).

Exposed mineral soil (landings and temporary roads) may be seeded with native grass seed to restore and improve forage for wildlife that benefit from grasses and forbs; e.g., deer, elk, mice, rabbits and their predators. Seeding may also reduce the opportunity for non-native plants (including noxious weeds) to invade disturbed sites and reduce erosion.

Monitor and treat invasive plants within project area boundaries to reduce/eliminate current populations and reduce the future spread of non-native vegetation. Treatment would be completed in disturbed areas within the watersheds by hand pulling only.

d. Direct and Indirect Effects of Alternatives

No Action Alternative
With this alternative, no activities would occur; there would be no direct (or indirect) effects from this alternative. The consequences of this alternative would be that riparian stands would continue to have natural suppression occurring, and younger non-dominant trees would continue to die off. The stands would continue on the same trajectory of attaining late-successional habitat characteristics of large diameter trees, multi-storied canopy, and a diverse species component, but it could take several hundred years for this to occur through the natural process of stand development.

Proposed Action (Alternative 2)
The overall effects of Alternative 2 have been analyzed for ESA listed coho salmon and its critical habitat and coho and Chinook essential fish habitat in the 2011 Eden Ridge Timber Sales Biological Assessment. The effects for listed aquatic species and their habitat are similar to the effects for OC steelhead since they occupy similar habitat. The effects analysis from the Biological Assessment is summarized in this section; refer to the August 2011 ER Thin Fish BA for a complete analysis.

As stated earlier, the proposed activities under the ER Timber Sales were split into five project elements: 1) Timber Felling and Yarding, 2) Timber Hauling, 3) Fuels Treatment, 4) Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction and New Road Construction, and 5) Other Enhancement Activities. Below is a table which displays proximity of project activities in relation to EFH.

Table III-42. Proximity of Project Elements to EFH within Coal Creek 6th Field Watershed

Project Elements (PE)	Distance to EFH*
Timber Felling and Yarding	1.8 miles > 10.5 miles
Timber Hauling (Gravel Roads)	*50 feet to100 feet > 10.5miles
Fuels Treatment	1.8 miles > 10.5 miles
Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction and New Road Construction	1.8 miles > 10.5 miles
Other Enhancement Activities	1.8 miles > 10.5 miles

***OC Steelhead habitat is one mile above EFH.**
****This section of road is about 200 feet long and immediately leaves the EFH and travels up the ridge where it normally is about 1.8 mile > 10.5 miles above EFH.**

The Proposed Action for Eden Ridge Timber Sales has only stream enhancement activities occurring directly within the stream channels that contain fish or fish habitat. The direct effects from the Proposed Action are expected to be on resident fish only (non-Endangered, Threatened, Proposed or Sensitive fish species). Therefore, there would be no direct impact to any Endangered, Threatened, Proposed or Sensitive fish species.

The Proposed Action for Eden Ridge Timber Sales would be removing some trees within the Riparian Reserve. In the Project Area, only Unit 309 is adjacent a fish bearing perennial stream channel in the Coal Creek Drainage. The harvesting that is occurring within this Riparian Reserve would be providing a 25-foot Stream Channel Protection Zone and an additional 25-35 foot Primary Shade Zone for the Perennial Stream Channel. These zones would not allow any removal of vegetation for timber harvest. There is a small chance that during project implementation that a few trees may be felled within these two zones, however the project is designed to not allow tree removal within these two zones. With the possibility that a few trees are removed from the Primary Shade Zone or the Stream Channel Protection Zone, it is unlikely to affect water temperatures in stream reaches. Much of the streams in the Project Area are small systems that are heavily vegetated, and have a large groundwater influence on water temperature.

All the other units are upstream of the fish bearing perennial stream or they are located on non fish-bearing ephemeral or intermittent stream channels. The harvesting that is occurring within the Riparian Reserve would be at least providing a 25-foot Stream Channel Protection Zone for all channels, and an additional 30-40 foot Primary Shade Zone for Perennial Stream Channels. These zones would not allow any removal of vegetation for timber harvest.

The harvesting of timber within Riparian Reserves is designed to promote growth of larger trees as well as allow the growth of understory species to provide for diverse, healthy, riparian vegetation. By allowing other species to come in under the current Douglas-fir dominated stand, the project would put these stands on a trajectory of attaining late-successional characteristics sooner within the Riparian Reserve.

The Stream Channel Protection Zone (25 foot no cut buffer on either side of the channel) is a buffer designed to protect the actual riparian area that occur along stream channels. This buffer width provides protection from ground based activities and harvesting of vegetation. These buffers would protect all species that utilize the riparian areas within the project.

This area of protection would ensure that water temperatures in these areas would not be affected, and that there would be a source of small woody material for aquatic species that depend upon the riparian areas, along with ensuring that groundwater flow would continue to maintain the riparian zones at the project scale.

The proposed timber harvest would not impact shade producing trees, nor would it be impacting future large wood recruitment to fish habitat. The stream channels within the Project Area are on average 3 feet wide for ephemeral and intermittent channels and 8-feet wide for perennial stream channels. If any of the trees cut by thinning harvest were to fall into a channel, they are 10 times greater in length than the streams are wide, and would not move with the flows typically occurring in these channels. Much of these pieces of LWD would not have naturally made it downstream to stream reaches where fish are present.

Effects Regarding Project Elements – Alternative 2

There is a causal mechanism for *Timber Hauling and Road Maintenance* since these activities would occur near EFH. Specifically, along the haul road (NFSL 5000) where two relief culverts are located along a rocked road that parallels EFH for about 200 feet. There are no stream crossings or bridges along the haul route in proximity of EFH. The haul route does cross perennial streams that flow into Coal Creek; which are well over two miles upstream of EFH if sediment from haul was to reach the stream the sediment would not move downstream to EFH. The remaining 11 miles of the haul route are not in proximity with EFH. There is approximately 50 million board feet of timber that could be removed with this project. On average one truckload of timber would contain 5,000 board feet. This would equate to approximately 11,000 truckloads of timber to be hauled over the haul route that exits along Coal Creek over an approximate five year period (seasonal hauling of approximately 14 truckloads per day).

The activities of *Timber Hauling* and *Road Maintenance* are extremely unlikely to deliver sediment to EFH. The main haul route for the project consists of maintained, gravel surfaced roads with an engineered drainage system. These roads are designed for all-weather use and carry year-round truck traffic generated by private timber harvest. The Forest Service is currently implementing the Coastal Healthy Forest Treatments Project 2007 along this same haul route. Existing traffic levels have resulted in no known detrimental sediment contributions to Coal Creek. Haul traffic in support of the proposed action is well within the design limits of the haul route.

Approximately 200 feet of NFSL Road 5000 is adjacent to EFH. This section of road is relatively steep, well maintained gravel surfaced road, with a crown. Approximately 800 feet of the road in this section (which contains a tight switchback) receives surface water from itself and about six acres of adjacent hillside. Drainage of this area is provided by the two relief culverts onto naturally vegetated slopes adjacent to Coal Creek. These relief culverts on the crowned road, partially drain to vegetative buffers (50-80 feet), while the other part of the road crown drain onto steeply sloped dissipater transporting onto a steep slope that ends at the channel. Sediment delivery could occur from runoff during rain events and deliver to EFH. At this time, there is no indication that sediment is being delivered to the stream in the 200 feet of the haul route that is adjacent Coal Creek. Project Design Criteria and Mitigation Measures would minimize road generated sediment entering EFH.

The amount of sediment which could reach EFH would be insignificant and indistinguishable from background levels. Sediment derived from *Timber Haul* would be primarily directed to ditch lines and then out of the ditch lines via ditch relief culverts to the forest floor with little to no sediment above existing levels. Sediment could be transported to stream channels along the two hundred feet of road adjacent Coal Creek where the road and ditch line are connected to streams. *Road Maintenance* work completed prior to haul and *Road Maintenance* work conducted after haul would further reduce the amount of off-site sediment movement after hauling. Any sediment generated as a result of the proposed haul would be immeasurable. Lastly, a restriction on when log haul can occur would minimize sediment generation on the surface of the road where it could wash into the ditch lines.

Timber Hauling and Road Maintenance design criteria in conjunction with the distance from EFH would minimize sediment effects to OC coho. The criteria have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek from *Timber Hauling and Road Maintenance* under the Proposed Action would be undetectable from the small amounts already generated at this location, and therefore insignificant.

There is a causal mechanism for sediment generation on units since *Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities* are occurring near perennial streams approximately two miles to 11 miles above EFH. The stream enhancement component of *Other Enhancement Activities* would occur within Coal Creek approximately three to eight miles upstream of EFH. *New Road Construction* would consist of 12 perennial crossings and at least 23 intermittent channels crossings in the Coal Creek subwatershed. The closest perennial crossing associated with a proposed activity unit is over two miles above EFH. This crossing is on a small channel that is approximately two feet wide and flows intermittently below the road crossing for approximately 1,500 feet before flowing into Coal Creek approximately two miles above EFH. The remaining crossings are approximately three miles above EFH and the remaining nine perennial crossings are over two miles upstream from EFH and will not be further analyzed.

Landing Construction/Reconstruction would occur within Riparian Reserves at two locations, L-13 and L-14 (Units 307 & 309). L-13 is an existing landing site located mostly uphill (90%) of the main haul road, approximately 50 feet from a non-fish bearing perennial stream and two miles from EFH. HL-14 is new landing located immediately uphill of the main haul route road. Downhill of the main haul route is a resident fish bearing section of Coal Creek approx. 80 to 100 feet downslope, and 2.4 miles from EFH.

The activities of *Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities* are extremely unlikely to deliver sediment to EFH approximately two miles to 10.5 miles downstream to EFH in Coal Creek. The closest perennial crossing associated with a proposed road activity unit is over two miles above EFH. The next two closest crossings are approximately two miles above EFH and the remaining nine perennial crossings are over two miles upstream. There is no probability construction of roads would modify peak or base flows, because openings created by new roads would be of insufficient size to affect flows.

All but two landings would be located outside of the Riparian Reserves. *Landing Construction/Reconstruction* would have adequate vegetative cover or mulch material to prevent erosion and retain local sediment. The two landings located inside of the Riparian Reserve have been field reviewed by a hydrologist and an engineer. These landings are not within areas occupied by flowing water or riparian-dependent vegetation. Trees yarded to the landings could disturb slopes of the landing and generate sediment that would wash into stream channels. In order to prevent this, landing slopes would be armored with logs or other woody material capable of protecting the slope surface. Landing surfaces would drain away from the stream channel during and after use, and, would be revegetated and mulched after use. All landings are subject to use restrictions. These design features in addition to the two mile+ distance from EFH ensure that sediment would not be delivered to EFH.

Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities design criteria in conjunction with the distance from EFH would minimize sediment effects to EFH. The criteria have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek from *Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities* under the Proposed Action would be undetectable from the small amounts already generated at this location, and therefore insignificant.

Overall, the Eden Ridge Timber Sales Project Proposed Action has been designed to minimize impacts to aquatic habitats. Field reconnaissance during implementation by Interdisciplinary Team specialists would refine this project to only apply Riparian Reserve vegetation management where needed. Project Design Criteria and Mitigation Measures were developed to minimize impacts to water quality, Riparian Reserves, and aquatic habitats.

Alternative 3 and 4
Alternative 3 and 4 for Eden Ridge Timber Sales would have only stream enhancement activities occurring directly within the stream channels that contain fish or fish habitat. The direct effects from these alternatives are expected to be on resident fish only (non-Endangered, Threatened, Proposed or Sensitive fish species). Therefore, there would be no impact to any Endangered, Threatened, Proposed or Sensitive fish species.

Indirect effects from these alternatives are expected to be similar to the effects of the Proposed Action. These alternatives would reduce the number of trucks hauling down the road but since the amount of sediment that may enter the stream channel due to log haul activities and road maintenance activities is not measurable, the effects are similar to the Proposed Action.

There would be less riparian vegetation treated with Alternative 3 as compared to Alternative 2; even less for Alternative 4. Treating fewer riparian acres would promote less growth of larger trees as well as allow the growth of understory species to provide for diverse, healthy, riparian vegetation. By treating less riparian vegetation acres as compared to Alternative 2, other species would not come in under the current Douglas-fir dominated stand and would result in slowing down attainment of late-successional characteristics within the Riparian Reserve. This could result in an increase of future small diameter instream recruitment in perennial, intermittent, and ephemeral streams instead of mature, large woody material.

d. Cumulative Effects

Past activities that have occurred on National Forest System lands are documented in the Silvicultural Diagnosis Report (EIS Appendix B). Table B-7 (of that report) lists previous commercial timber sale activity within the Planning Area (since historical railroad logging in the 1920s and 1930s). None of the candidate stands for Eden Ridge Timber Sales are located within these previous contemporary timber sale units.

The most recent activity is primarily commercial thinning and has not been observed to result in increased measurable sediment delivery to streams within the Coal Creek Watershed. These projects would have no adverse cumulative effects when combined with the effects of the Eden Ridge Timber Sales Project. In general, there are several different types of foreseeable projects that occur across the landscape in these watersheds such as non-commercial thinning for fuels reduction and meadow restoration. These projects are designed to avoid treatments in Riparian Reserves. There would be some prescribed burning associated with these projects that would not impact Riparian Reserves or aquatic habitats. The 2005 Coastal Healthy Forest Treatments Project has one or two candidate stands within the Eden Ridge Planning Area that may be thinned (but is not as yet, planned or scheduled).

Activities that occur off forest are primarily timber harvests within private timberlands and are seen to be impacting upstream reaches of the Coal Creek Drainage. Under the Oregon Forest Practices Act, timber harvest is allowed to occur within riparian areas; however a one tree buffer is necessary along fish bearing streams. These restrictions reduce the amount of sedimentation that occurs on private lands. Some sedimentation may occur from areas where there are intermittent stream channels or where perennial non-fish bearing streams are found. This increase in sedimentation could impact fish habitat by filling in pool habitat and reducing spawning habitat.

In general, the Oregon Forest Practices Act provides direction for protection and maintenance of important aquatic habitats across the state. Currently on private lands, small landslides have been observed to be contributing sediment to the immediate channel but no observed sediment has been reaching listed species habitat.

Overall, cumulative effects on NFS and private lands from past and present project actions have impacted large woody material that would provide habitat to fish within these watersheds; the Eden Ridge Project does not propose to impact riparian areas adjacent to stream channels with listed species present. Although there is a slight chance that sediment might be delivered to fish habitat from roads and the haul route, the amount of sediment delivered is expected to be of a small quantity, and during a time of year when the amount of sediment being created by this project would not be measurable beyond background levels naturally within the stream channels.

The overall predicted cumulative effect for the affected watersheds for all Action Alternatives would be an immeasurable contribution of sediment from landslides from private land and above Endangered, Threatened, Proposed or Sensitive fish species habitat. This effect is likely to occur only when the winter rains come and it would be part of the background sediment.

e. Conclusions And Determinations

Table III-43. Comparison of Effects to Fish Species by Alternative and Activity Type

Alternative	Timber Felling and Yarding	Timber Hauling	Fuels Treatment	Road Maintenance, Construction and Decommissioning	Stream Enhancement
1	Neutral	Neutral	Neutral	Neutral	Neutral
2	Neutral	Potential sediment from haul route	Neutral	Potential sediment from haul route	Neutral
3	Neutral	Potential sediment from haul route	Neutral	Potential sediment from haul route	Neutral
4	Neutral	Potential sediment from haul route	Neutral	Potential sediment from haul route	Neutral

The **No Action** Alternative would not alter the project area on National Forest System land. Thus, no effect to aquatic species or habitat would occur.

All of the **Action Alternatives, 2 through 4**, would have a similar effect to Endangered, Threatened, Proposed or Sensitive aquatic species due to the potential of sediment entering the stream channel from the *"Timber Hauling and Road Maintenance"* activities along the haul route. This amount of sediment for all Action Alternatives is non-measurable.

All of the Action Alternatives, 2 through 4, would have similar effects to aquatic habitats and a neutral effect on Endangered, Threatened, Proposed or Sensitive aquatic species from the *"Stream Enhancement and Fuels Treatment*" activities.

Specific to Alternatives 3 and 4, there would be less riparian vegetation treated from *"Timber Falling*" as compared to Alternative 2. Falling fewer trees in the riparian areas would promote less growth of larger trees as well as less growth of understory species to provide for diverse, healthy, riparian vegetation. By falling less riparian vegetation as compared to Alternative 2, other species would not come in under the current Douglas-fir dominated stand and this would result in a longer timeframe to attain late-successional habitat characteristics within the Riparian Reserve, when compared to Alternative 2. This could result in a smaller average size of future LWD recruited within the project's perennial, intermittent, and ephemeral streams above fish habitat, when compared to Alternative 2.

Effects to Endangered, Threatened, Proposed or Sensitive aquatic species are similar under all of the Action Alternatives, 2 through 4. This is due to the same site specific design elements being included in all of these alternatives. The differences in activities between Action Alternatives are not large enough to create any measurable difference downstream on aquatic species.

Determinations - Action Alternatives
The indirect and cumulative effects from Alternative 2, 3 and 4 would result in an overall non-measureable negative sediment effect to OC coho salmon and its critical habitat and OC steelhead on the Powers Ranger District. Thus, a **May Affect, Not Likely to Adversely Affect** determination is rendered for OC coho salmon, **No Effect** determination to OC coho salmon critical habitat, **Will Not Adversely Affect** Essential Fish Habitat for coho salmon or Chinook salmon and **May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species** for OC steelhead trout due to the non-measureable sediment delivery of the hauling and road maintenance activities.

These Alternatives would have a **No Impact** to PC chum salmon, inland redband trout, pit sculpin, western ridged mussel, Klamath rim pebblesnail, highcap lanx, scale lanx, robust walker, pacific walker, or the pristine springsnail because these species are not known to occur or have suitable habitat within proximity to any of the proposed activities.

13. THINNING SHOCK AND WINDTHROW POTENTIAL

Effects of variable density management (thinning) treatments and other connected actions on changed environmental conditions for residual trees causing shock (change in light conditions), and/or leading to increased wind throw (trees broken off or uprooted by wind).

This issue is based on the concern for residual trees remaining after treatments that reduce density, tree spacing and crown spacing that could cause trees to experience a change in light conditions, causing shock (or death), and/or break off or be uprooted by wind (termed windthrow).

a. Background

Any treatments that open up currently dense stands, could cause the residual trees in these stands to experience poor health, due to change in light conditions, for which these trees are not adapted. This change could cause shock or death to individual or groups of trees.

Windthrow and effects from shock are an indirect effect of density management treatments; there are no direct effects regarding this issue. The risk of windthrow increases as stands become more open on landforms more exposed to prevailing winds, particularly on shallow soils, that are subjected to increased wind flow conditions following stand treatments.

Candidate stands with mapped soils in General Soil Map Unit 13 - Umpcoos-Rock Outcrop-Digger have hazard of windthrow (USDA SCS 1989). The Umpcoos-Rock Outcrop map unit in particular is described as having potential for windthrow due to shallow soil depths and is associated with the presence of rock outcrops and steeper slopes.

Root rot infection caused by laminated root (*Phellinus weirii*) contributes more localized pockets of down wood particularly in the northern half of the ER Planning Area. Infected areas resemble between 1-DF-3 and 2-DF-3 in the Pacific Northwest photo series (Maxwell 1980) which estimates 59 to 111 tons per acre of forest residue respectively. Laminated root rot centers are more susceptible to windthrow (Hadfield et al. 1986) and may supply important concentrations of down woody material as infected dead trees do not remain standing for very long.

Disease infection extensively decays roots of susceptible host trees and either makes them susceptible to windthrow or causes mortality by destroying the tree's ability to take up water and nutrients (Hadfield et al. 1986). Windthrow is more common with laminated root rot than other root pathogens. Laminated root rot spreads by root contact between uninfected trees when living roots penetrate infected roots. In pole-sized and larger trees, the root disease can spread outwards an average rate of one (1) foot per year. This pathogen can live saprophytically in infected dead roots for fifty (50) years or more.

In addition to laminated root rot centers, existing windthrown trees are evident along the perimeter of the Planning Area adjacent to large openings created by timber harvest on private timber company lands. Windthrow creates pockets of variable-sized down wood, particularly where susceptible forest stands have a high percentage of western hemlock in the overstory tree species composition (e.g., Unit 213).

b. Direct, Indirect, and Cumulative Effects

Under the **No-Action Alternative**, there would be no additional concern or effects due to density management which could open up stands to shock and/or windthrow potential. Overly dense stands tend to develop conditions that make them less stable during wind events; the risk of windthrow remains in un-thinned stands.

Under the **Action Alternatives**, increased risk of windthrow along ridges may be a concern. If shallow rooted species (e.g., western hemlock) are present, site-specific prescriptions would favor leaving Douglas-fir or hardwoods and increasing the number of trees to be retained.

Thinning shock and windthrow are not expected to be a substantial concern due to consideration for feathering and special treatments along the edges of stands, leaving all hardwoods where possible, and thinning to a higher relative density to allow residual trees to become more wind firm. Threat of insect and disease is expected to be reduced by decreasing stand densities, overall increased vigor of the vegetation, and treatment of activity fuels with fire.

Under the Action Alternatives, thinning shock and windthrow are not expected to be substantial as associated with dominant tree release or gap development, as openings would be irregular shaped with topographic exposure, proximity to existing openings and thinning intensity being considered in the surrounding stand. All treatments include an overriding objective of leaving the larger residual stems within the entire stand; these trees would most likely be the healthiest and wind-firm trees in the stand, and would ameliorate the potential for windthrow.

14. OTHER UNDEVELOPED AREAS

Effects of variable density management (thinning) treatments and other connected actions on changed environmental conditions within non-inventoried "roadless" areas generally free of developments such as forest roads, or timber harvest units that may have undeveloped character.

Comments were received during scoping suggested that some of the Eden Ridge Planning Area may contain areas that possess ~~"u~~nroaded" character or unique values provided by unroaded areas such as watershed protection, snag recruitment, carbon storage, and natural successional development.

This issue evaluates conditions and character associated with potential unroaded or undeveloped areas within the Eden Ridge Planning Area and if they may be affected by proposed actions.

a. Background

The term "Other Undeveloped Areas" is a generic catch-all term often loosely used to describe areas that are generally free of developments such as forest roads or timber harvest units. This term is not nationally defined or endorsed, but the term does facilitate discussion of this concept in this project scale NEPA evaluation. This term is used as part of a project-level NEPA analysis and reflects the concerns and values expressed during project scoping; furthermore, it is not meant to satisfy any one particular set of values as received from any one person or organization.

A working definition for this term is areas that are generally free of developments such as forest roads or timber harvest units, but are not Inventoried Roadless Area (IRA) and also do not meet FSH criteria for Potential Wilderness. It is recognized that these areas may have special resource values due to their undeveloped character that may cause an evaluation the resources and project effects on those resources differently than in other parts of the Panning Area. The discussion of "Other Undeveloped Areas" also allows consideration and documentation of areas mapped by external parties, and an evaluation against Forest Service criteria for potential wilderness.

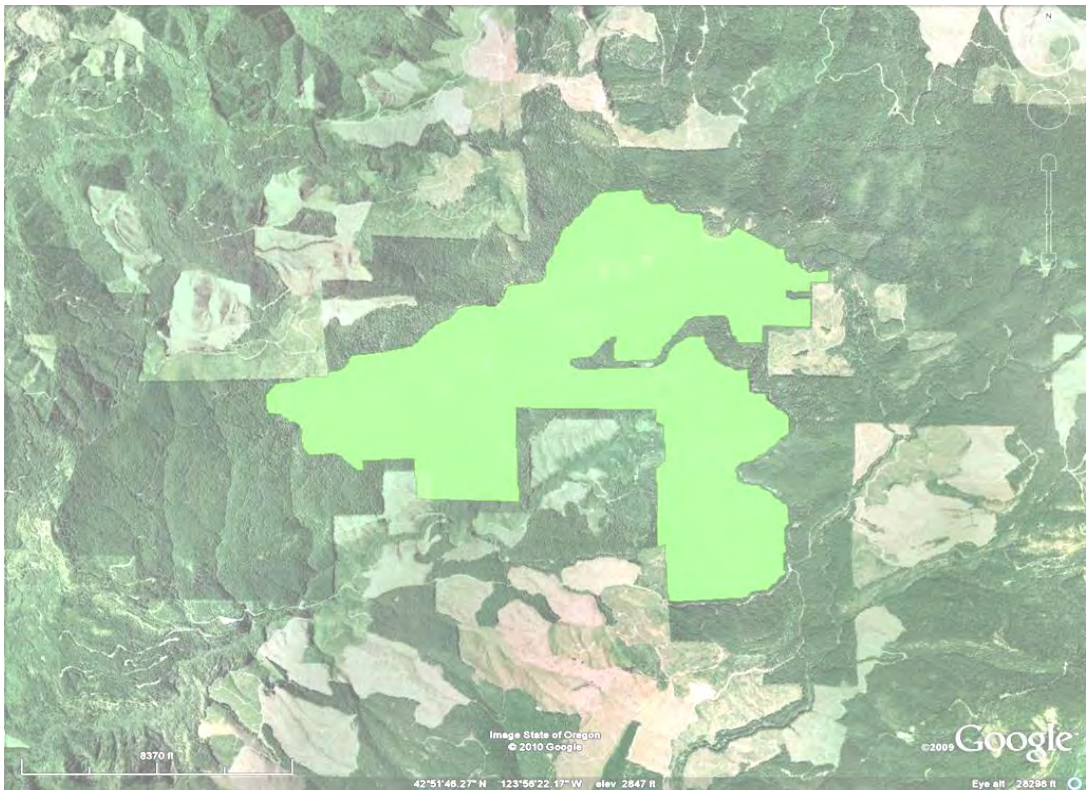
Roadless area management became a national issue in 1972 when the Forest Service initiated a review of National Forest System Lands (NFSL) greater than 5,000 acres to determine their suitability for inclusion in the National Wilderness Preservation System. The second and final review process, the Roadless Area Review and Evaluation II (RARE II), resulted in a nationwide inventory of roadless areas.

In the 37+ years since the completion of RARE II, Congress has designated some areas to Wilderness or other protective status, including portions of the Powers Ranger District. The southern-most edge of the overall Eden Ridge Planning Area is approximately seven air-miles north of the Wild Rogue Wilderness Area (FS and BLM) and approximately 12 air-miles north-west of the grassy Knob Wilderness Area. The Planning Area is also approximately 6 air miles from the Mule Creek Inventoried Roadless Area. There are no lands designated as Wilderness or inventoried as Roadless within the Eden Ridge Timber Sales Project Area.

Scoping Comments
During Scoping, comments were provided that portions of the Eden Ridge Planning Area and areas proposed for treatment are within an unroaded area. One comment provided a photo (Figure III-5, shown below) and called the shaded area Coal Ridge Creek. The comment further called for avoidance of logging in this area, or full disclosure the adverse impacts of logging on the unique values provided by unroaded areas such as watershed protection, snag recruitment, carbon storage, and natural successional development.

The area referenced is within the Eden Ridge Timber Sales Planning Area, but was found to currently contain several unclassified roads, previously existing spur roads, skid roads, and/or old railroad grades. Further, this area was clearly part of the intensive clear-cut harvest associated with historical railroad logging. As seen in the photo above, much of the Eden Ridge Planning Area appears to be heavily forested and existing roads are difficult to see. This reflects the actual current conditions of a heavily stocked and well-growing second growth forest; the thinning of which is the subject of the Eden Ridge Proposed Action.

Figure III-5. Potential Unroaded Area Identified During Scoping



Other comments received during Scoping suggested that since much of the area was railroad logged, damaging aspects of roads are absent. It was claimed that the old railroad corridors do not have road-side ditches, culverts, cutbanks, or other aspects of roads, so that some roadless area characteristics are retained. The comment suggested consideration of any area over 1,000 acres without roads as important interior habitat, even if it contains old railroad lines.

b. Effects Mechanisms and Analysis Framework

The first step for analysis of a potential unroaded or undeveloped area is the consideration whether the project is adjacent to and/or could it affect an area with 5,000 acres that does not contain forest roads? Is there an inventory of Potential Wilderness (use FSH criteria: 1909.12 Chap 70)?

> *As noted above, the Eden Ridge Timber Sales Project and its Planning Area are not adjacent to any inventoried roadless areas (IRAs) or any areas of 5,000 acres or greater without roads, not adjacent to a Potential Wilderness Area, nor would it affect such areas.*

Is the project adjacent and/or could it affect an area with less than 5,000 acres but which is contiguous to existing Wilderness, primitive areas, administration-endorsed wilderness, or potential wilderness in other federal ownership, regardless of size?

> *As noted above, the Eden Ridge Timber Sales Project and its Planning Area are not adjacent to any existing or potential wilderness areas, nor would it affect any such area.*

Is the project adjacent and/or could it affect an area that can be preserved due to physical terrain and natural conditions? Examples of this type of an area are: deep canyons, mountain peaks, etc. Is the project adjacent to a State or National Park and could it affect any values associated with that area? Is the project adjacent and/or could it affect a Wild or Scenic river corridor?

The Eden Ridge Timber Sales Project and its Planning Area do not contain outstanding physical terrain or natural conditions, is not adjacent to a State or National Park, is not adjacent to a Wild or Scenic River, nor would it affect any such areas.

Undeveloped/Unroaded Area Analysis

There are small areas on NFSL within the Eden Ridge Timber Sales Planning Area that were not identified in the RARE II inventory, but currently have few or no classified roads. These other "unroaded areas" may contain roadless characteristics similar to inventoried roadless areas. There is an opportunity and obligation under NEPA to respond to the public input received during scoping for this project. Note that areas identified under the Eden Ridge Timber Sales Project analysis as having semi-primitive unroaded values have not been identified as an inventory in conformance with Interim or Final Rules associated with any Forest Service Roadless Area Conservation policy.

Criteria for Identification of Undeveloped/Unroaded Areas – Eden Ridge Planning Area

Below, is the criteria used to identify semi-primitive unroaded areas in the Eden Ridge Timber Sales Planning Area. Note: Under this process, in order to be considered as semi-primitive unroaded areas, areas should simultaneously meet all of the criteria, as applicable. For the Eden Ridge Timber Sales Planning Area, those criteria include:

SIZE

Identification of areas of any reasonable size 1,000 acres or larger for any one individual area, non-contiguous to any other area. "Reasonable" is further defined as having habitat value and character; a criterion of 500 feet was used to define any area in width at its narrowest point. This figure is derived from an assumption that a viable habitat "corridor" could be 300 feet with an additional 100 feet as an ecotone on either edge (300 ft. plus 200 ft.).

ROADS and DISTANCE FROM ROADS

Each area shall not include any managed or unmanaged, "classified" or "system" road currently on the Forest Transportation system. A "road" is defined as a motor vehicle travelway over 50 inches wide. A "classified" road is a road within NFSL planned or managed for motor vehicle access including State roads, County roads, private roads, permitted roads, and Forest Service Roads (36 CFR 212.1).

An area could be adjacent to a Maintenance Level 1 system road; it should be no closer than one tree height from Maintenance Level 2, 3, 4 or 5 roads (as road maintenance includes falling hazard/danger trees).

VEGETATION CONDITION

Based on average natural stand conditions, stands should be at or near to late seral or late-successional stage conditions for the Planning Area or sub-watershed.

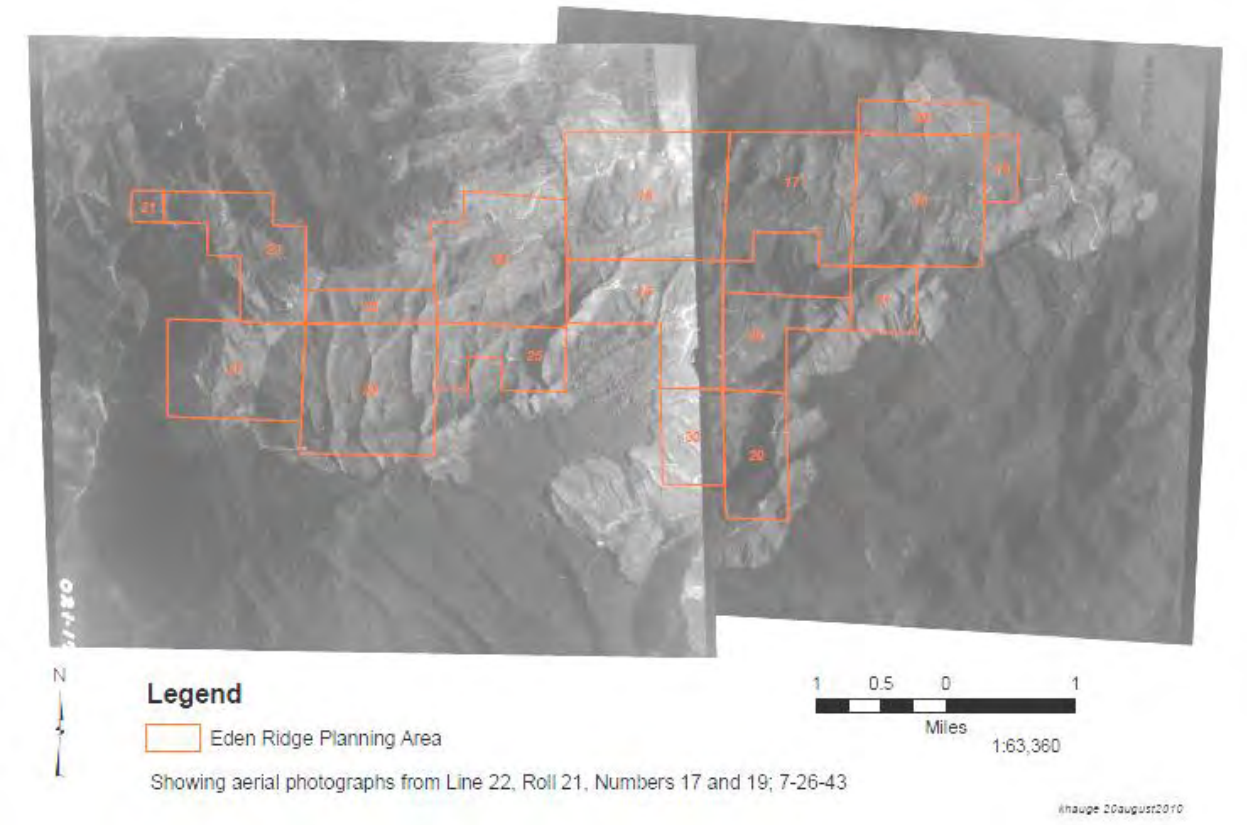
For the Eden Ridge Timber Sales Planning Area, this has been determined to be stands ages of approximately 120 – 140 years or more. Forest structure should include some multi-layering. Densities should be at or greater than 100 square feet of basal area and have approximately 50% in overstory crown closure as well as late seral forest characteristics. Vegetative areas can also include contiguous natural, non-forested or sparse vegetation types and plant communities, e.g., meadows.

DEGREE OF PAST MANAGEMENT

Areas should be relatively un-entered and un-managed; minimal past salvage activity would be acceptable. Areas should not include any areas that were managed as regeneration in the last 100 years (e.g., clear-cut or shelterwood silvicultural treatments).

Based on the above criteria, there were no areas located of any reasonable size 1,000 acres or larger for any one individual area, non-contiguous to any other area. Existing roads, grades or skid trails were found to bisect even the larger areas. Many of the old railroad grades have evolved or have been turned into vehicle access roads. Within the entire Planning Area, only a few areas (200 contiguous acres or less) were found to at or near to late seral or late-successional stage conditions; almost all of the Planning Area was clear-cut during the 1930s and 1940s for it large old-growth timber, and railroad logging activities are still readily apparent today. The conditions that created this situation are readily apparent as seen in the 1943 aerial photos (MAP III-6).

MAP III-6. Composite of 1943 Aerial Photos and Eden Ridge Planning Area



c. Direct, Indirect, and Cumulative Effects of Alternatives

Commonly associated with roadless area interests is the interest by some in lands spoken of as being unroaded. Analysis as documented above has determined that there are no large areas within the Eden Ridge Planning Area that were not identified in the RARE II inventory but currently have few or no classified roads, or lack evidence of past management. There are very small areas within portions of the Planning Area that was not intensively regenerated via historical railroad logging. The largest of these, however, is only about 200 acres, and none are contiguous with any designated Wilderness or Inventoried Roadless Areas. A 1,000-acre size minimum for consideration of such areas is consistent with parameters used for the national roadless policy and was applied here. As a result, there are no —unroaded areas" that contain roadless characteristics similar to inventoried roadless areas.

Since there are no undeveloped areas, there is no cause/effect relationship that can occur regarding this issue. There would be direct effect to current vegetative conditions (thinning) from the Action Alternatives that would change eventual vegetative succession. The Planning Area would see additional roads or improvement to existing roads under the various Action Alternatives. The area is primarily allocated to Matrix, with no current emphasis or management direction to change or allow the area to become late-successional forest or roadless.

15. HERITAGE RESOURCES

Effects of variable density management (thinning) treatments and other connected actions on Heritage (cultural) resources.

EIS Appendix J includes a complete Heritage Report (incorporated by reference) that contains more detail on the history of the Eden Ridge Planning Area.

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies, such as the Forest Service, to take into account the effects of their actions, or undertakings, on historic or archaeological properties. This act also establishes the Advisory Council of Historic Preservation (ACHP) as the oversight agency which consults with federal agencies to review undertakings which have the potential to affect significant historic properties, although generally, this consultation and review capacity is delegated to State Historic Preservation Offices (SHPO)**.** The *NHPA* also provides for Native American groups to be included in consultations where prehistoric sites are involved.

a. Background and Analysis Framework

Project area inventories and consultation under *Section 106 of the NHPA* must be completed prior to project implementation. In some cases the consultation process has been streamlined or by-passed by agreement to facilitate project completion when certain conditions are met. Generally, these conditions include adequate inventories where no sites are located in a project's area of potential effect (APE), or particular site and project types which have recurring similar impacts which have allowed predetermined mitigation measures to be developed by agreement with SHPO, or projects with a low likelihood to impact historic properties. Documentation under these agreements are submitted to the SHPO in an annual report, and may or may not be submitted prior to project implementation. Section VII below includes a list of such agreements which affect the consultation process for projects on the Gold Beach and Powers Ranger Districts.

Both *NHPA* and the *Archaeological Resources Protection Act (ARPA)* prohibit the disclosure of the nature and location of cultural resource sites where a likelihood of harm to the sites could occur through disclosure. The intent of this prohibition is to protect sites from vandalism and looting, and to retain confidentiality of sites culturally significant to American Indian Tribes. *ARPA* also establishes civil and criminal penalties for individuals removing or damaging archaeological resources on federal lands.

Analysis Methods
The analysis methods used for cultural resources consist of a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the project and surrounding areas, and generally bounded by the Planning Area. This information includes not only that available from a variety of generalized sources, but also that information resulting from several years worth of Forest Service heritage resource inventories conducted within and adjacent to the Planning Area. The information on the results of these previous inventories and previously documented cultural resources also allows some idea of the type, frequency and location of cultural resources likely to be found within the Planning Area.

This synthesis of past data is then used during field inventories conducted of the proposed activities' areas of potential effect (APE) and adjacent areas of high site probability. Information from past inventories may be used to cover a current APE if upon review it meets current inventory standards. Additional inventory is then conducted of the APE in areas where no previous inventory was conducted, where previous inventory was not adequate or around known sites to relocate and verify their location.

Once field inventory is complete, identified cultural resources within the project's APE are analyzed to determine their eligibility to the National Register of Historic Places as historic properties. For those considered eligible, the potential effects of the project on that historic property is analyzed. Where adverse effects may occur to a historic property, measures are designed to mitigate these effects. The State Historic Preservation Office is consulted for concurrence on each of these three steps. The consultation on all three steps is usually conducted simultaneously.

When no cultural resources are located within the project's area of potential effect or when the project meets specific terms, the project may proceed under the terms of the *Programmatic Agreement among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (R6 PA), 2004.*

Cultural Resource Surveys and Sites

Past inventories and site reports are on file at the Rogue River-Siskiyou National Forest, Medford, Oregon and in the appropriate district offices. These reports potentially contain information on the nature and location of archaeological or historic sites which is confidential in nature and may not be available under the Freedom of Information Act (FSH 6209.13 11.22). The purpose of this exemption is to protect sites from harm, and to retain the confidentiality of sites culturally significant to American Indian tribes.

Past cultural work within the Eden Ridge area includes two project inventories which recorded some of the remains from the Eden Ridge Railroad logging activities. The sites recorded were described as highly degraded by ongoing use, fire, logging and natural deterioration, and were found not eligible to the National Register of Historic Places (NRHP). These surveys did not record the entire rail system within the Eden Ridge Tract, and with this additional work, as well as the fact that the entire system is now over 50 years old, the site is considered eligible under criterion A with some features also being considered under criterion C. While many of the features of the site have been heavily impacted and in some cases destroyed, some remain in a condition that still conveys the history of the Eden Ridge Tract. The Eden Ridge logging railroad site includes over eighteen miles of railroad grade, camps, donkey sleds, and skid trails.

The condition of the features across the miles of railroad grade and skid trails is quite variable. While many of the features still show distinct characteristics of the technology of the logging at Eden Ridge, many also have become very deteriorated through natural or cultural means and their value mostly lies in the information they give about the locations of operations within the system. Because of this, treatment may not be the same for similar feature types.

Of the over seventeen miles of railroad grade that ran through the Eden Ridge tract, about ten have already been converted to classified roads. These roads largely run in the old railroad grades following the original grades and curvature of the railroad, with some detours around trestles and draws. Many of the other railroad-specific features of these grades have been altered or destroyed by road maintenance activities, but taken as a whole, these roads still convey the original railroad system within the Eden Ridge Tract.

Other features of the site include camps, donkey sleds, trestle and skid trail remains. The remains of the Doe Swamp Camp are still evident in a cut over area on a private land in-holding within the Eden Ridge area, most of the buildings are collapsed and the few buildings remaining are failing. Many other buildings related to these logging activities are to be found in the town of Powers itself. The other camps have largely been salvaged at the end of the logging activities with many of the buildings and other materials removed.

The donkey sleds are in varying states of deterioration, with some very rotted and in one case partially burnt. While several are single features, two have the remains of three sleds, along with other features.

The remains of numerous trestles lie along the railroad grades, and in some case alongside the current classified road system. The conditions of the trestles range from failed with upright bents still in place, to nearly indiscernible with only a few timbers or spikes sticking out of the vegetation to indicate the past. Taken along with the grade, these remains still show the original location of the railroad on the landscape.

While many of the skid trails were visible on the 1943 aerial photographs, on the ground the condition of these trails varies with some having donkey mounds spaced along the trail, along with anchor trees, stumps, or down log features

b. Effects Mechanisms

The measurement indicators for cultural resources are the effects to historic properties. These effects may be beneficial or adverse. Beneficial effects could include stabilizing a historic property such as controlling erosion through an archaeological site, restoring and maintaining a historic building, or reducing fuel concentrations around a historic property to reduce the potential for a wildfire to impact it. As management actions beneficial effects are designed and agreed upon through consultation conducted under Section 106 of the National Historic Preservation Act (NHPA) with the State Historic Preservation Officer (SHPO).

Adverse effects are impacts to the integrity of the property, destroying a portion or all of the historic property and the information that it could yield, or destroying characteristic features or integrity of the historic property. A direct adverse impact occurs during the activity itself, such as when a road is built through a historic property and the construction process destroys the site.

An indirect adverse impact can occur as a side effect of the activity or after the activity is complete, such as runoff from a road that eventually erodes a historic property adjacent to it. In some cases where a beneficial action is possible, a no action determination that does not implement the beneficial action could be adverse if it allows greater degradation or deterioration of the historic property.

This planning process allows adverse impacts to be avoided altogether through project redesign, or mitigated through project modification or scientific investigation and/or removal of the site so that there are no adverse impacts to historic properties. These avoidance or mitigation measures are agreed to in consultation conducted under Section 106 of the National Historic Preservation Act (NHPA) with the State Historic Preservation Officer (SHPO) and allow the project to proceed with no adverse impact to historic properties. Under certain conditions this consultation has been streamlined by the *Programmatic Agreement among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (R6 PA), 2004.*

The effects on cultural resource sites may vary with the type of site, as well as the type of project. Subsurface cultural materials may be more protected than standing structures, or cultural materials lying on top of the surface. In addition, all sites may be impacted by activities which draw people into an area, increasing the likelihood of vandalism, looting or incidental damage done through use of an area.

Where avoidance of a significant cultural resource site is not possible, measures are developed to mitigate or limit the effects of the project. Where the loss of the site, or a portion of the site will occur, the loss can mitigated by data recovery or interpretation of the history of the site. Data recovery generally includes a synthesis of known information about the site, and a plan for further research to retrieve further information from the site. Further information may be retrieved through excavation and analysis of the results, or researching and documenting the relevant records and histories about the site. Interpretation of the site is generally intended to inform the public about the history of the area to provide greater enjoyment of their cultural environment. Limiting the extent of disturbance to a site could include modifying the operating season of a project so that soil disturbance is kept to a minimum, directional felling of trees, using certain techniques or technology, or limiting the area where operations can take place to only a portion of the site.

c. Direct and Indirect Effects of Alternatives

Alternative 1
Under this alternative, no actions are proposed and any previously recorded, or as yet undiscovered sites, would remain undisturbed. There are no identified on-going impacts to historic properties that would continue because of no action.

Action Alternatives
The three Action Alternatives all propose to convert some of the railroad grades to classified roads. Alternative 2 proposes to convert the most railroad grade to road with four miles reconstructed as road. Alternative 3 proposes three miles of railroad grade to be reconstructed as road. Alternative 4 proposes one mile of railroad grade to be reconstructed as road.

Where the railroad grades contain multiple tracks, the road building would be confined to one. Most of the features also lie along the old grades. Those features that retain some integrity would be avoided. In some cases timber may be removed from within the feature boundary by directional felling keeping equipment outside the feature. Skid trail features that still retain donkey mounds and other associated features will be avoided with perpendicular crossings where necessary.

The Eden Ridge logging railroad provides an opportunity to bring interpretive displays to the public. This has already been recognized by the USFS and the town of Powers in the creation of the video *When Everybody Was Working*. In order to mitigate the impacts proposed, information about the early logging at Eden Ridge will be made available on the Rogue River-Siskiyou National Forest webpage.

If additional sites are encountered in the course of additional inventory or during project implementation, Forest specialists would consult with the State Historic Preservation Office, as required by law, to determine the significance of the discovery and the effects of the project upon them. The Confederated Tribes of the Siletz would be included in these discussions where Native American sites are involved. Mitigation would be accomplished and may include avoidance of the sites, or scientific investigation.

Consultation with SHPO
Project area inventories and consultation with the State Historic Preservation Offices (SHPO) is in progress at this time (DEIS). Consultation will be completed for the Eden Ridge Timber Sales Project by the time of the Final EIS; a Record of Decision will not be rendered prior to completion of this consultation. All proposed units and connected actions including those in the preferred alternative will be inventoried. A cultural resource inventory report will be completed (during the Final EIS process) and will be submitted to the Oregon State Historic Preservation Office under the *Programmatic Agreement among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (R6 PA), 2004.*

d. Cumulative Effects

Before the National Historic Preservation Act (NHPA) of 1966 was implemented, project planning did not include consideration of impacts to historic properties. Any projects such as timber harvest, road building, fire suppression activities etc that occurred prior to this, had the potential to adversely impact historic properties, and many of these projects occurred in areas considered high probability for cultural resources.

Since the 1970s, cultural resource inventories have been conducted to locate cultural resources prior to project implementation. The knowledge of sites found during earlier inventories, and the refinement of the inventory process to locate properties, currently allows impacts from projects to be avoided or mitigated. While natural deterioration is ongoing, the current condition and trend of the historic record is that historic properties are being protected from project impacts. Information from the sites, their location and nature help to inform about the history of the area. Knowledge of the location and condition of historic properties also allows the potential for management action to abate or mitigate natural processes which affect the historical record.

Wild fire and suppression activities may impact cultural resources. Public actions on Forest Service lands have the potential to impact heritage resources. Generally these impacts are minimal because they are dispersed. However, when actions begin to concentrate impacts to known heritage resources, management actions can be taken to mitigate those impacts.

Cumulatively, when considering past, proposed, and ongoing and foreseeable actions, this project would not exacerbate effects to historic properties. The post-project condition and trend would continue the current condition and trend which protects historic properties through inventory and project design so no historic properties are impacted by project implementation.

16. RECREATION/HUMAN SAFETY

Effects of variable density management (thinning) treatments and other connected actions on recreation opportunities, and/or human safety conditions.

The Eden Ridge Planning Area has a limited past history of dispersed and developed recreational camping, hunting, hiking and site seeing. This issue also addresses public conflicts with operational activities associated with the Eden Ridge Timber Sales Project

a. Background and Analysis Framework

The analysis area for recreation resources consists of the Eden Ridge Planning Area (see Map I-1). The most common recreation opportunities in the Eden Ridge Planning Area include dispersed camping, hunting, off-highway vehicle riding and sightseeing. Public participation in hiking and horseback riding activities is generally nonexistent in this area due to limited access, no designated trails, and the presence of industrial timberlands and heavy log truck traffic that surrounds the Planning Area.

Public access to the Planning Area is limited to National Forest System Road 5000 at two entrance points. The western portion of this road is locked by Plum Creek Timberlands, Inc. during times of logging inactivity, while the portion along Wooden Rock Creek that accesses the southern end of the Planning Area is open year-round.

The Powers Ranger District has issued three outfitter/guide Special Use Permits to hunt for big game, but most of their activity has historically been outside of the Planning Area due to adjacent private property and locked gates. There are no designated dispersed campsites and no developed recreation sites within the Planning Area.

b. Effects Mechanisms

This issue summarizes current recreation resources in the affected area and those components with the potential to be affected by the proposed actions. Resources with no potential to be affected may be identified, but need not be analyzed. The potential effect to recreation resources caused by each alternative focuses on public access to recreation opportunities within the Eden Ridge Planning Area and effects to the visitors' recreational experience

Operational activities associated with the Eden Ridge Timber Sales Project may cause some short term disruption to recreation activities. Some recreations activities can be curtailed to accommodate i.e., temporarily closing roads or access until the operation activities are complete. The proposed activities would not directly affect developed recreation sites. Active dispersed sites are not associated with project activity areas. Commercial product haul may occur in proximity to dispersed recreation sites; this effect would be mitigated by public notification, partial closures, etc.

Historically, the Eden Ridge Planning Area has received occasional use by off road four-wheel drive vehicles and all terrain vehicles (ATVs); which are referred to Off-Highway Vehicles (OHVs). While this existing use is minor, a concern is that thinning the forest stands and constructing roads would create conditions where OHV use would expand into this and other areas and cause additional resource damage.

The primary effect to recreationists in the long-term after project activities would be a slight change in the visual character along many roads and trails. Currently, many of these areas are bordered by dense tree stands and downed woody material that tend to enclose or envelop the trail or road. Under the proposed actions, these stands would be opened up through cutting and removal of trees resulting in a more open forest. The Planning Area is primarily allocated to Matrix (General Forest) which is assigned a visual quality objective of Modification and Maximum Modification.

c. Direct and Indirect Effects of Alternatives

Under **Alternative 1 (No-Action)**, there would be no commercial logging operations in the Eden Ridge Timber Sales Planning Area. There would be no change to the limited current, publically accessible recreation opportunities in the area and no effects to visitors' experiences of the recreation resources. One consequence of this alternative is that there would not be any new road construction, which potentially restricts travel to and exploration of areas that are currently difficult to access. By not conducting development and operations this area, it is possible that land would not be opened to more productive big game hunting opportunities. Under No-Action, there would be no density management treatments, and therefore no mechanism to affect the amount of OHV use and any undesirable effects in the area: current conditions would continue.

Alternative 2 (Proposed Action) calls for the maximum extent of proposed treatments and connected actions. Public access to the Planning Area would be restricted at times during operations and in some areas where new road construction would be occurring. In addition, visitors would need to be aware that more log trucks and passenger vehicles than usual would be travelling down the roads before, during, and after operations. There would be new roads constructed and although they would be closed to motorized access, they could provide for more exploration and dispersed recreation opportunities. Treated areas may also provide access to big game hunting grounds in the future.

Alternative 3 proposes fewer new roads constructed and treated areas than the Proposed Action and includes helicopter logging. This alternative would have nearly the same effects to the recreation resources as Alternative 2 with a few differences. One exception is that fewer new roads would be constructed, which could decrease the number of dispersed recreation and exploration opportunities. There may also be fewer treated areas that could potentially benefit big game hunting. Visitors to the area could also lose their sense of solitude while recreating due to the presence of helicopter logging operations.

Alternative 4 proposes no new roads constructed, less treated areas and includes helicopter logging. This alternative would have the same effects as Alternative 3, with the exceptions that there would be even fewer areas opened up to exploration and dispersed recreation opportunities due to no new road construction. There could also be fewer treated areas that could benefit big game hunting productivity.

All Action Alternatives may indirectly affect dispersed recreation sites temporarily, due to personnel using these sites while working on contracts associated with fuel reduction treatments. This effect would be mitigated and managed, and would not result in any long-term adverse effects to the sites.

The primary effects to recreationists during the short-term implementation phase would involve temporary road closures (for safety reasons), noise (chain saws, heavy equipment, and helicopters), smoke, and increased vehicle traffic. This direct effect would degrade the recreation experience for some users who have come to expect a quiet experience. Since not all areas would be receiving treatments at the same time, most areas would remain open while implementation activities occur.

Some operation landing sites may be located in proximity to established roads. These landing sites would preclude public use during logging operations. It is expected that most users would accept short-term inconveniences to their accustomed habits. For some users, the recreation experience may be enhanced through viewing and observing project implementation associated with forest management.

The primary effect to recreationists in the long-term after project activities would be a slight change in the visual character along many roads. Currently, many of these areas are bordered by dense tree stands and downed woody material that tend to enclose or envelop the road. Under the Action Alternatives, these stands would be opened up through cutting and removal of generally small diameter trees resulting in a more open forest. Users reaction to this change in character is difficult to predict.

It is anticipated that many would welcome a more open forest with greater vistas and the opportunity to see more of what they are surrounded by. Others may prefer the more closed feeling of dense stands associated with the current condition. All treatments and connected actions would be in compliance with Forest Plan Visual Quality Objectives for the allocations affected.

OHV use has been limited to specific areas due to the nature of favorable conditions. Though treatment units are located along some existing and proposed new roads, the forested areas would only be thinned and a natural understory of vegetation would develop over time. A more open forest might increase the potential for a small portion of the public to encroach on these areas with off-road vehicle use.

This potential is anticipated to be very minor in areas associated with density management (thinning) treatments and other connected actions. New roads would be closed after their use. Residual forest conditions would not provide for a favorable OHV experience and OHV use would not be expected to expand into other forested areas. Motorized use on Maintenance Level 1 roads would not be authorized and would be an illegal use under forest-wide travel management rules. New roads would not have the potential to develop a ―dop system" as the roads would be constructed to access landing locations. These roads would be closed and rehabilitated after use (Maintenance Level 1 status). Such measures would not allow for OHV access onto these road locations.

Standard mitigation measures designed for placing roads into Maintenance Level 1 status to protect soil and water resource would be applied. These measures would minimize the risk of potential OHV use expansion and have been developed over time and are typically incorporated into timber sale contracts. These measures have been found to be implementable and effective to restrict OHV use within commercial thinning treatment areas similar to conditions associated with the Eden Ridge Planning Area. Mitigation measures would include: construction of water bars, scarification, scattering of slash and debris within disturbed areas, seeding and permanently barricading/closing the road entrance with native materials.

d. Cumulative Effects

There may be some minor cumulative effects from other timber or forest management activities occurring within the Planning Area and potentially utilizing the same roads, however these effects are expected to be minor and of short duration.

17. CLIMATE CHANGE

Effects of variable density management (thinning) treatments and other connected actions on climate change (greenhouse gas emissions and carbon cycling) and effects from global climate change on this proposal.

Former Forest Service Chief Abigail R. Kimbell characterized the Agency's response to the challenges presented by climate change as "one of the most urgent tasks facing the Forest Service" and stressed that "as a science-based organization, we need to be aware of this information and to consider it any time we make a decision regarding resource management, technical assistance, business operations, or any other aspect of our mission."[4]

a. Background

Regional and National Forest Service direction and guidance regarding climate change and analysis in NEPA at the Project Scale was released in April of 2008. More specific National direction for *Climate Change Considerations in Project Level NEPA Analysis* was released on January 13, 2009.

The agency direction released in January 2009 provides Forest Service guidance on how to consider climate change in project-level National Environmental Policy Act (NEPA) analysis and documentation. It introduces the agency position on climate change. Ongoing climate change research has been summarized in reports by the United Nations Intergovernmental Panel on Climate Change (www.ipcc.ch), US Climate Change Science Program's Science Synthesis and Assessment Products and the US Global Change Research Program.

Climate change studies specific to the Pacific Northwest have been conducted by the Climate Impacts Group at the University of Washington. These reports concluded that climate is already changing; that the change will accelerate in the future; and that human greenhouse gas (GHG) emissions, primarily carbon dioxide emissions (CO_2), are the main source of accelerated climate change.

Projected global climate change impacts include air temperature increases, sea level rise, changes in the timing, location and quantity of precipitation, and increased frequency of extreme weather events such as heat waves, droughts, and floods. These changes will vary regionally and affect renewable resources, aquatic and terrestrial ecosystems, and agriculture. While uncertainties will remain regarding the timing and magnitude of climate change impacts, the scientific evidence predicts that continued increases in greenhouse gas emissions leads to increased climate change.

The following are the basic concepts outlined in the January 13, 2009 direction:

1. Climate change effects include the effects of agency action on global climate change and the effects of climate change on a proposed project.
2. The Agency may propose projects to increase the adaptive capacity of ecosystems it manages, mitigate climate change effects on those ecosystems, or to sequester carbon.

[4] Abigail R. Kimbell, former Chief, USDA Forest Service, February 15, 2008, letter to Forest Service National Leadership Team

3. It is not currently feasible to quantify the indirect effects of individual or multiple projects on global climate change and therefore determining significant effects of those projects or project alternatives on global climate change cannot be made at any scale.
4. Some project proposals may present choices based on quantifiable differences in carbon storage and GHG emissions between alternatives.

While uncertainties will remain regarding the timing and magnitude of climate change impacts, the scientific evidence predicts that continued increases in greenhouse gas emissions leads to increased climate change.

b. Analysis Framework

As noted in Forest Service guidance, there are two types of climate change effects for proposed projects to consider, as appropriate:

- The effect of a proposed project on climate change (greenhouse gas emissions and carbon cycling). Examples include: short-term greenhouse gas emissions and alteration to the carbon cycle caused by hazardous fuels reduction projects, greenhouse gas emissions from oil and gas field development, and avoiding large greenhouse gas emissions pulses and effects to the carbon cycle by thinning overstocked stands to increase forest resilience and decrease the potential for large scale wildfire.

- The effect of climate change on a proposed project. Examples include: effects of expected shifts in rainfall and temperature patterns on the seed stock selection for reforestation after timber harvest and effects of decreased snow fall on a ski area expansion proposal at a marginal geographic location, such as a southern aspect or low elevation.

Determining whether there is a cause-effect relationship is the first step in identifying a potential issue. Consideration was given as to whether some element of the proposal would result in direct, indirect, or cumulative effects on greenhouse gas emissions or the carbon cycle and the direction of effects (e.g., increase, decrease, or combination of both).

Scoping was used to determine if climate change issues are specifically related to the Proposed Action. For Eden Ridge Timber Sales, it was determined that there may be a minor cause-effect relationship regarding the potential effect of the proposed project on climate change (i.e., short-term GHG emissions and alteration to the carbon cycle caused by density management thinning and fuels reduction treatments.

While the effect of climate change on this proposed project was not dismissed as —outside the scope" of the analysis, the Interdisciplinary Team identified only minor potential for a cause-effect relationships between climate change and its potential effect on this proposal.

As discussed in the FS guidance, an analysis of GHG emissions and carbon cycles is not always appropriate for every NEPA document. As with any environmental impact, GHG emissions and carbon cycling should be considered in proportion to the nature and scope of the Federal action in question and its potential to either affect emissions or be affected by climate change impacts. As with any environmental effects analysis, the scope of effects needs to be established in timing and geography relative to the scope of the actions being considered in the alternatives. There will be some situations where quantitative analysis will be useful and others where qualitative analysis will best serve decision making.

c. Effects Mechanisms

Thinning is an effective forest management technique used to produce larger stems more quickly, reduce fire risk, and increase tree resistance to insects and disease. Thinning increases the growth of the remaining individual trees, but generally decreases overall forest wood growth until the remaining trees grow enough to re-occupy the site. The carbon stock in a thinned stand is generally lower than that in an un-thinned stand.

Because of lower overall growth of a thinned stand, even 100% use of the harvested trees for products or biomass energy may not produce a total carbon benefit greater than that of the higher storage and storage rate in an un-thinned stand. The net carbon consequences of thinning would also depend on whether the harvested trees are used for long-lasting wood products or biomass energy, as well as the change in risk of a crown fire relative to the probability of fire occurring, the species, the site, the thinning regime, and the length of the harvest interval (Ryan et al. 2010).

Quantitative Effects of Projects on GHG Emissions & Carbon Cycle Climate Change
Many proposed projects and programs will emit greenhouse gases (direct effect) and, thus, contribute to the global concentration of greenhouse gases that affect climate (indirect effect).

Quantifying greenhouse gases emitted and/or sequestered may help choose between alternatives based on relative direct effects trade-offs. Forest Service decisions having the potential to emit or sequester more greenhouse gases; such as, energy facilities, transmission lines, oil & gas development or leases, and some Federal permitting decisions may be best informed by quantitative analyses. Also, quantitative analysis may be best when addressing applicable requirements for reducing, regulating, or monitoring GHG emissions.

Because greenhouse gases mix readily into the global pool of greenhouse gases, it is not currently possible to ascertain the indirect effects of emissions from single or multiple sources (projects). Also, because the large majority of Forest Service projects are extremely small in the global atmospheric CO2 context, it is not presently possible to conduct quantitative analysis of actual climate change effects based on individual or multiple projects.

Currently the Agency does not have an accepted tool for analyzing all GHG emissions. Models used by the Agency such as *FOFEM 5.5*[5] and *Consume 3.0*[6]can estimate the conversion of fuel loads into emissions (CO2, methane, nitrogen oxide (NO2)), though these tools are for projects which include prescribed burning of vegetation only. These two models are not used to estimate emissions for other project categories.

Other models that are being or have been developed include carbon life cycle calculators. For example, the Forest Vegetation Simulator (FVS) is a forest growth and yield model that can produce per acre estimates of total stand carbon and removed carbon over time and under various management scenarios and forest disturbances such as fire, insects, and disease. The FVS also tracks how much of the merchantable carbon is stored in products or is emitted with or without energy capture.

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[5] *FOFEM 5.5.* is First Order Fire Effects Model, a public domain computer program for predicting tree mortality, fuel consumption, smoke production, and soil heating caused by prescribed fire or http://www.fire.org/index.php?option=content&task=category&sectionid=2&id=12&Itemid=31.

[6] *Consume v. 3.0* is a software application used to predict fuel consumption, pollutant emissions, and heat release based on a number of factors including fuel loadings, fuel moisture, and other environmental factors http://www.fs.fed.us/pnw/fera/research/smoke/consume/index.shtml.

Efforts are under way to make FVS growth projections sensitive to changes in climate. Guidance and analysis methods will continue to be developed for estimating GHG emissions and carbon sequestration from activities by federal, state and local governments, and non-governmental organizations which the Agency will continue to evaluate for applicability to its environmental analysis.

It is not necessary to calculate GHG emissions for most projects; however, in situations where the responsible official finds the information useful for decision making, such data and conclusions developed through quantitative analysis would normally only be used for comparing alternatives related to direct effects or addressing any applicable regulatory requirements related to GHG emissions. Without enough scientific understanding to draw conclusions about the significance of the quantitative results, qualitative discussions about the potential for greenhouse gases sequestered and emitted are more appropriate for disclosing climate change implications.

Under NEPA, it is appropriate to consider the effects of no action frames, the effects tradeoffs of the proposed action and other action alternatives on GHGs emissions. The projected environmental baseline of the no action alternative can be used to compare quantitative impacts of the alternatives with respect to GHG emissions (when applicable); however, because it is not possible to predict the actual effects of a particular project on global climate change, a baseline comparison cannot be made using the no action alternative relative to climate change.

Qualitative Analysis Methods: GHG Emissions & Carbon Cycle
Qualitative effects disclosure for a project‘s impacts on GHG emissions and carbon sequestration should be couched in the ecosystem‘s role in the carbon cycle. In this context, descriptions of qualitative impacts should disclose the nature and direction (short-term and long-term) of the impact as opposed to the specific magnitude of the impact.

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Over longer time periods, indeed as long as forests exist, they will continue to absorb carbon. Qualitative discussions about these relationships can show the implications of agency decisions about climate change.

d. Direct and Indirect Effects of Alternatives

Effects of Project on Climate Change
Many proposed projects and programs would emit greenhouse gases (direct effect) and, thus, contribute to the global concentration of greenhouse gases that could affect climate (indirect effect). Since greenhouse gases mix readily into the global pool of greenhouse gases, it is not currently possible to ascertain the effects of emissions from single or multiple sources (project).

Also, because Forest Service projects are extremely small in the global atmospheric CO_2 context, it is not presently possible to conduct quantitative analysis of actual climate change effects based on individual or multiple projects.

The Proposed Action was identified to have minor cause-effect relationships to greenhouse gas emissions or the carbon cycle, and was determined to be of such a minor scale at the global or even regional scale, that the direct effects would be meaningless to a reasonable decision regarding this project.

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO_2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Over longer time periods, indeed as long as forests exist, they will continue to absorb carbon.

Thinning treatments under the Eden Ridge Timber Sales Project would likely not occur within a given watershed all in one year, treatments would likely be spread over 3-5 years or more. It is also highly likely that the total extent of acres within candidate stands would not be treated, because of the potential for areas to be excluded with application of the Project Design Criteria, as well as the fact that many stands or portions thereof may not be overly dense and in need of density management at this time. The direct and indirect effects regarding these relationships are insignificant because there would be minor amounts of vegetation treatments and disposal of brush and slash would be minimal at the scale of affected watersheds.

NEPA guidance from the Council on Environmental Quality

On February 18, 2010, The Council on Environmental Quality (CEQ) provided draft guidance memorandum for public consideration and comment on the ways in which Federal agencies can improve their consideration of the effects of greenhouse gas (GHG) emissions' and climate change in their evaluation of proposals for Federal actions under the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq. This draft guidance is intended to help explain how agencies of the federal government should analyze the environmental effects of GHG emissions and climate change when they describe the environmental effects of a proposed agency action in accordance with Section 102 of NEPA and the CEQ Regulations for Implementing the Procedural Provisions of NEPA, 40 C.F.R. parts 1500-1508.

This guidance was found to be similar to and in accord with existing Forest Service direction on assessment of climate change in project level NEPA. It reiterates the same context as Forest Service direction. Of note on page 3 is the threshold for evaluation for specifically calculating emissions for proposed actions that would directly emit 25,000 metric tons or more of CO_2 equivalent greenhouse gas emission on an annual basis. It is estimated that it would take over 600 acres of burning in the Douglas-fir/Hemlock fuel type to approach 25,000 metric tons of emissions (per year). It would be highly unlikely that Eden Ridge Timber Sales would generate this quantity of greenhouse gas emissions annually in regard to this threshold.

Effects of Climate Change on Project

While there is ongoing research on the potential impacts of global climate change in the region and while no specific forest management recommendations have been published regarding global climate change, a brief review of climate change research in the region was conducted to assess predicted changes in climate and relate the changes to impacts climate change may have on the desired outcomes of, and the potential impacts from, this project.

Although El Niño/Southern Oscillation and the Pacific Decadal Oscillation comprise the primary factors for climate variability in the Pacific Northwest (Climate Impacts Group 2006), the influence from global climate change is a growing concern. According to the Climate Impacts Group, based out of the University of Washington, climate modeling for the Pacific Northwest predict a future rate of warming of approximately 0.5 degrees Fahrenheit per decade for the Pacific Northwest through at least 2050, relative to the 1970-1999 average temperature (2006). Temperatures are projected to increase across all seasons, although most models project the largest temperature increases in summer (June-August), and the average temperatures could increase beyond the year-to-year variability observed in the Pacific Northwest during the 20th century as early as the 2020s.

Nakawatase and Peterson (2006) studied the effects of climate variability on forest growth across the western and northeastern Olympic Mountains. Their results suggest that warmer temperatures predicted for the Olympic Mountains would result in decreased productivity at high elevations (i.e., subalpine forest types) in the northeastern region of the Olympic Mountains as a result of decreased summer soil moisture. Growth in low- to mid-elevation Douglas-fir and western hemlock forests, however, would depend on the combined effect of potential decreases in precipitation and increased temperature in the summer.

Whether and how increasing temperatures resulting from global climate change would alter predicted forest response to the proposed commercial thinning under any of the Action Alternatives would depend on specific site conditions in relation to temperature and soil moisture availability on tree growth. If temperature were to increase while precipitation changes minimally, as predicted by the Climate Impacts Group, tree evapotransportation would increase nonlinearly, leading to more frequent drought stress (Littell 2007, *pers comm*). Douglas-fir, in particular, is sensitive to low soil moisture (Climate Impacts Group 2004). A moderate density commercial thinning could decrease competition for water during the summer while limiting additional evaporation from the soil and transpiration from the understory in the summer (Littell 2007, *pers comm*). Such thinning could also maximize the duration of snowpack in spring by having an open enough canopy that more snow accumulates in the ground rather than on the forest canopy, yet, is still shaded from melting by the sun in the spring. The resulting increased available moisture, in turn, could reduce the risk of dead or drought-stressed trees created by increasing temperatures and changes in precipitation caused by climate change and that would be susceptible to fire and disease in the near-term.

Comments provided during public scoping raised the concern that climate change may increase the risk of roads causing landslides and downstream flooding. According to the Climate Impacts Group (2006, 2007), however, while changes in precipitation are less certain than changes in temperature, most models predict modest changes in regional precipitation through the mid-century. Models suggest that there will be slight decreases in summer precipitation and slight increases in winter changes, but little change in the annual mean by mid-century. Winter precipitation changes are predicted to be largest in December – February, but still within the range of year-to-year variability observed during the 20th century. A larger percent of the precipitation, however, will fall as rain rather than snow with the warmer temperatures, but natural year-to-year and decade-to-decade fluctuations in precipitation are likely to be more noticeable than longer term trends associated with climate change. While an increased likelihood of extreme precipitation events may also be a result of climate change, there is little information to confirm the increased risk for the Pacific Northwest region. Global climate change is not expected to discernibly increase the risk of the roads used in this project causing landslides and downstream flooding.

e. Cumulative Effects

As greenhouse gas emissions are integrated across the global atmosphere, it is not possible to determine the incremental cumulative impact on global climate from emissions associated with any number of particular projects. Nor is it expected that such disclosure would provide a practical or meaningful effects analysis for local project decisions. Uncertainty in climate change effects is expected since it is not possible to meaningfully link individual project actions to quantitative effects on climatic patterns.

It is recognized that global climate change may affect human health, that there is scientific controversy surrounding the effects of human activity on climate change, and that there is uncertainty and unknown risks associated with global climate change. The ultimate effects on climate change are indeed the results of incremental cumulative effects of many actions, most of which are outside of the Agency‘s control.

D. OTHER EFFECTS, LAWS, REGULATIONS, AND EXECUTIVE ORDERS

This section deals with those effects for which disclosure is required by National Environmental Policy Act (NEPA) regulations, Forest Service policy or regulation, various Executive Orders, or other laws and direction covering environmental analysis and documentation. In many cases, the information found here is also located elsewhere in this document. In other cases, the effects are not necessarily connected to any particular resource area. All effects were determined to be consistent within the Standards and Guidelines identified in the Siskiyou National Forest Land and Resource Management Plan.

Adverse Environmental Effects Which Cannot be Avoided
Implementation of any Action Alternative would result in some adverse environmental effects that cannot be avoided. For example: timber harvest and road construction activities would have some adverse effects on water quality, soil productivity and vegetation. The magnitude of these effects relative to the extent of the proposed project, however, is minor and within prescribed Standards and Guidelines. The degree of adverse effects is substantially reduced by following Forest Plan Standards and Guidelines and by including the Project Design Criteria and Mitigation Measures outlined in Chapter II. See the Significant and Other Issues discussed earlier in this chapter, by resource area, for more information.

Short-term Uses and Long-term Productivity
Maintaining long-term site productivity is the basis for the ecosystem being able to meet the needs of the land and people through time. The maintenance of productivity is required through legislation: the Organic Act of 1897, the Multiple Use Sustained Yield Act of 1960, the National Environmental Policy Act of 1969, and the National Forest Management Act of 1976.

Long-term productivity and sustainability is the inherent potential of the land (ecosystem) to produce a certain level of vegetation and associated processes, such as wildlife, water, and clean air, indefinitely into the future.

Fixed components influencing productivity include local climate, topographic features, and soil type. Components affecting productivity that can be changed include: soil volume, porosity, water availability, chemistry, and biology. Factors that can affect these components include: compaction and soil displacement from timber harvest and fuels treatment activities; loss of soil organic matter; modification of the water table or moisture-holding capacity; and reductions in the functioning of soil organisms from compaction or displacement.

As detailed in this Chapter, Alternative 2 (Proposed Action) would treat the most acres and thus have the highest level of short-term uses of natural and depletable Forest resources of the alternatives, and it would also result in the greatest potential impact to long-term productivity. All of the alternatives would authorize various amounts of silvicultural and fuels treatments, and they would have varying impacts to short-term uses and long-term productivity within the Planning Area.

Analysis indicates that short-term density management and commodity extraction would not adversely affect long-term productivity. Long-term productivity and health of young forested stands would be expected to increase because of vegetation management actions.

Irreversible and Irretrievable Effects
—Irreversible" commitment of resources refers to a loss of future options with nonrenewable resources. An —irretrievable" commitment of resources refers to loss of opportunity due to a particular choice of resource uses.

The soil and water protection measures identified in the Forest Plan Standards and Guidelines, Project Design Criteria and Mitigation Measures in Chapter II of this document and Best Management Practices are designed to avoid or minimize the potential for irreversible losses from the proposed management actions.

With all alternatives: tree removal would result in an irretrievable loss of the value of removed trees for wildlife habitat, soil productivity, and other values. Minimal irreversible loss of soil should occur due to Project Design Criteria and Mitigation Measures associated with timber harvest (see Chapter II).

Energy Requirements and Conservation Potential
Some form of energy would be necessary for projects using mechanized equipment. Silvicultural treatments would involve both heavy and small machines for yarding logs. Fuels treatments and road construction, reconstruction and maintenance would also require use of machinery. Both possibilities would result in various amounts of fossil fuels, and human labor would be expended (more fuel consumption for helicopter logging systems). Fossil fuel energy would not be retrievable. However, fossil fuel energy is not in short supply and their use for this project would not have an adverse effect upon continued availability of these resources.

Clean Air Act Amendments, 1977
The alternatives are designed to meet the National Ambient Air quality standards through avoidance of practices that degrade air quality below health and visibility standards. The project is consistent with the 1990 Clean Air Act and the 1977 Clean Air Act and its amendments (see Air Quality section).

The Clean Water Act, 1987
This act establishes a non-degradation policy for all federally proposed projects. Compliance with the Clean Water Act would be accomplished through planning, application, and monitoring Best Management Practices (BMPs). Based on the analysis presented in this EIS, TMDL requirements would be met in each alternative (see Hydrology and water Quality sections).

Environmental Justice
Executive Order 12898, —Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," directs federal agencies to integrate environmental justice considerations into federal programs and activities. Environmental justice means that, to the greatest extent practical and permitted by law, all populations are provided the opportunity to comment before decisions are rendered or are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment.

One goal of Executive Order 12898 is to provide, to the greatest extent practicable, the opportunity for minority and low-income populations to participate in planning, analysis, and decision-making that affects their health or environment, including identification of program needs and designs. This public involvement process for the Proposed Action has been conducted under Departmental regulation 5600-2, December 15, 1997, including the Environmental Justice Flowchart (Appendix E of the regulation). The Proposed Action, its Purpose and Need, and area of potential effect have been clearly defined.

There would be no adverse effects to human health and no alternative has been determined to disproportionately affect minority or low income populations. The alternatives do not appear to have a disproportionately high or adverse effect on minority or low-income populations. Scoping did not reveal any issues or concerns associated with the principles of Environmental Justice. No mitigation measures to offset or ameliorate adverse affects to these populations have been identified. All interested and affected parties will continue to be involved with the public involvement and decision process.

USDA Civil Rights Policy
The Civil Rights Policy for the USDA, Departmental Regulation 4300-4 dated May 30, 2003, states that the following are among the civil rights strategic goals: (1) managers, supervisors, and other employees are held accountable for ensuring that USDA customers are treated fairly and equitably, with dignity and respect; and (2) equal access is assured and equal treatment is provided in the delivery of USDA programs and services for all customers. This is the standard for service to all customers regardless of race, sex, national origin, age, or disabilities.

Disparate impact, a theory of discrimination, has been applied to the Eden Ridge Project's planning process in order to reveal any such adverse effects that may unfairly and inequitably impact beneficiaries regarding program development, administration, and delivery. The objectives of this review and analysis are to prevent disparate treatment and minimize discrimination against minorities, women and persons with disabilities and to ensure compliance with all civil rights statutes, Federal regulations, and USDA policies and procedures.

Persons with Disabilities
Under section 504 of the Rehabilitation Act of 1973, no person with a disability can be denied participation in a Federal program that is available to all other people solely because of his or her disability. No groups or classes or persons were found to be disproportionately adversely affected by this proposal. This project would apply equally to all members of the public, and therefore is not discriminatory to any person or group.

Determination that a Civil Rights Impact Analysis (CRIA) is not needed
It is the policy of the Forest Service that the Responsible Forest Service Official (FSM 1704) review proposed actions for civil rights impacts and take either of the following actions in compliance with DR 4300-4 and 1010-1 (FSM 1730.1): prepare a Civil Rights Impact Analysis and statement of its findings for any proposed policy or organizational action which may have a major civil rights impact, or document the determination that a civil rights impact analysis and a statement of findings are not needed.

In April of 2010, the formal process under NEPA was initiated. Scoping letters were mailed on 4/13/10 to all known interested publics having been involved in the initial sensing process, describing the Proposed Action and Purpose and Need for the Project. A Legal Notice for Scoping was published in the Coos Bay World, Newspaper of Record, on 4/16/10. In addition, Scoping Letters were sent to other agencies such as Oregon Department of Fish and Wildlife, Oregon Department of Forestry, NOAA Fisheries, Bureau of Land Management, and various city and county government entities in coastal southwest Oregon. Government-to-Government consultation letters were mailed to the Coquille Tribal Council; no response was received.

The Scoping process for this project officially began with the issuance of a Notice of Intent (NOI) to prepare an Environmental Impact Statement published in the Federal Register on April 26, 2010 (FR page 21577-21579). Written and electronic responses to the Scoping Letter were received through June 10, 2010. Eight sources of substantial input were received from interested individuals, environmental interest groups, industry representatives, the Environmental Protection Agency (EPA), and the Oregon Department of Fish and Wildlife.

Due to the length of time that had passed since the original NOI was published, refinement of the Proposed Action, and a change in the Responsible Official, a second (corrected) Notice of Intent was sent to the Federal Register and was published on January 18, 2012 (FR Vol. 77, No. 11, page 2508-2510). Notification was provided to the initial scoping respondents to notify them of the corrected NOI.

People self-select to participate and are not required to provide any information concerning individual demographic information. Based on public comment, there were no issues raised that would suggest, or from which one may infer, that planning or implementation of the Eden Ridge Timber Sales Project would affect groups or classes of persons, adversely, because of one or more prohibited bases.

Local Social/Economic Effects
The availability of natural resources contributes to the quality of life for many Coos County residents. Many communities are closely tied to the forest in work and recreation. These communities are directly influenced by changes in the supply of resources produced from the forest, and by the forest production of firewood, game, scenic resources, and recreational opportunities.

Executive Order 13186 – Migratory Birds
A Memorandum of Understanding was signed between the USFS and USFWS to complement the January 2001, Executive Order. There are several bird species recognized as neo-tropical migrants on the Rogue River-Siskiyou National Forest. The Eden Ridge Timber Sales may contain populations of migratory landbirds typical of coniferous forest and oak woodlands. See the ~~"~~Neo-Tropical Migratory Birds" section above for further discussion of effects.

Executive Order 13443 - Facilitation of Hunting Heritage and Wildlife Conservation
This August 17, 2007 Executive Order requires Federal agencies ~~"~~to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat." The proposed creation and enhancement of early seral habitat in the alternatives would improve forage for game species and proposed harvest actions and access development would provide better hunting opportunities for the public.

IV. CONSULTATION AND COORDINATION

A. PREPARERS AND CONTRIBUTORS

This Draft EIS (DEIS) document was prepared by the USDA Forest Service, Rogue River-Siskiyou National Forest, Powers Ranger District. A Forest Service Interdisciplinary Team (IDT) developed the Proposed Action and alternatives, conducted analysis, prepared the DEIS document, and conducted technical review of analysis and documentation. This section identifies the coordinators and resource specialists who participated in the overall preparation of the DEIS for Eden Ridge Timber Sales.

1. Forest Service Project Leadership and Interdisciplinary Team

The following Rogue River–Siskiyou National Forest personnel (including contractors and former employees) provided leadership and input for this DEIS. Responsibilities included development of the Proposed Action and alternatives, conducting the environmental analysis process, public involvement, organization of specialist input, and preparation of documentation for the DEIS under the provisions of the National Environmental Policy Act (NEPA). MIO refers to the Medford Interagency Office, i.e., the Forest Supervisor's Office. GPIO refers to the Grants Pass Interagency Office. RD refers to Ranger District. GIS is Geographic Information Systems.

CONTRIBUTOR	CONTRIBUTION
Jennifer Eberlien Acting Forest Supervisor	Responsible Official.
Jessie Berner Powers District Ranger (September 2011)	Management of NEPA process, ID Team and public involvement.
Carl Linderman Former Powers District Ranger	Responsible Official; project development, management of NEPA process, initial scoping. Approval of purpose and need, issues and alternatives.
Robert Davies Acting Powers District Ranger	Management of NEPA process; facilitator for public participation; timeframe and checkpoints.
Steve Boyer Zone Silviculturist; Gold Beach & Powers RD	IDT Leader, Scoping process, stand exams, identification of candidate stands and silvicultural treatment prescriptions and modeling; Port-Orford-Cedar disease analysis; Preliminary Silvicultural Diagnosis and Port-Orford–Cedar Report; overall writing/editing and review.
Wesley Crum Forester, Powers RD	IDT Leader, public involvement, finalization of Proposed Action; field verification of candidate stands and proposed roads, logging systems; economic analysis, and overall writing/editing and review.
Ken Grigsby NEPA Contractor (former Forest Planner; retired 2009)	NEPA process specialist; co-IDT leadership, document managing editor. Initial development of Proposed Action. NEPA process and alternative documentation; logging system planning and Roads Analysis, other undeveloped areas, climate change and overall EIS document compilation.
Karen Gamble GIS Specialist: DRM/CSA 2	Geographic documentation of Proposed Action and alternatives, quantification of proposed units, proposed and existing roads, and development of EIS maps (all chapters)
Maureen Joplin Hydrologist , MIO	Assistance with initial development of Proposed Action candidate stands (GIS). Hydrologic and water quality analysis and cumulative watershed effects; Hydrology Report.
Joni Brazier Soil Scientist, GPIO	Geology, soils and site productivity analysis; Geology and Soils Report
Richard MacDonald Fire Management Officer, Powers RD	Fire, fuels treatments and air quality analysis; Fire/Fuels and Air Quality Report

CONTRIBUTOR	CONTRIBUTION
Clint Emerson Botanist, Gold Beach & Powers RD	Botanical and invasive species analysis; Botanical Resources Report and Biological Evaluation
John Lowe Wildlife Biologist, Powers RD	Threatened terrestrial wildlife species and critical habitat, FS Service Sensitive terrestrial wildlife species & habitats, wildlife management indicator species, rare and uncommon terrestrial wildlife species, and neo-tropical migratory birds; Wildlife Report and Biological Evaluation.
Karla Cottom Fisheries Biologist, Powers RD	Analysis of aquatic species and habitats: Aquatic Biota Report and Biological Evaluation. Consultation with National Marine Fisheries Service.
Kristin Hauge Archaeologist, Gold Beach & Powers RD	Heritage (Cultural Resources) analysis; Heritage Resources Report
Wade Christy Natural Resource Specialist, Gold Beach & Powers RD	Recreation and human safety; visual resources analysis.

2. Other Resource Specialists and Contributors

The following Rogue River–Siskiyou National Forest personnel (including contractors and former employees) provided input, analysis, consultation and/or documentation review for this DEIS.

CONTRIBUTOR	CONTRIBUTION
Frank Betlejewski Interregional Port-Orford-Cedar Program Manager, Southwest Oregon Forest Insect & Disease Service Center	Consultation and review of Port-Orford-Cedar Report and analysis.
Amy Lowe Sale Administrator, Powers RD	Logging feasibility, contract mitigations and implementation review
Robin McAlpin Operations Manager, Powers RD	Existing and proposed roads analysis, cost share roads analysis, road construction costs, and economic analysis and review.
Dave Zimmerman Timber Management Assistant, Gold Beach & Powers RD	Timber sale implementation and oversight.
Troy Jorgenson Engineering Technician	Roads/engineering analysis and input.
Holly Witt Environmental Coordinator, Gold Beach & Powers RD	Project coordination, consultation on Forest Service policies.
Mike Dearborn Former Environmental Coord., Gold Beach & Powers RD	Initial project coordination; project initiation and development, logging systems paper planning.
Eric Martz Former Silviculturist, Gold Beach & Powers RD	Silvicultural consultation and historical background.
Dave Clayton Forest Wildlife Biologist, MIO	Forest-level review of Wildlife Report and Biological Evaluation.
Susan Maiyo Forest Fisheries Biologist, MIO	Forest-level review of Biological Assessment and Aquatic Biota Report.
Steve Brazier Fisheries Biologist, GPIO	Consultation and review of Aquatic Biota Report.
Chris Park Forest Hydrologist, GPIO	Forest-level review of hydrology, ACS Objectives and Riparian Reserve Project Design Criteria and compliance with standards and guidelines.
Steve Rheinburger Forester, Logging Engineer; TEAMS Enterprise	Logging systems and transportation paper panning and report.
Patrick Murphy Forester (former Gold Beach RD)	Initial logging and transportation paper planning.
Cole Belongie GIS Specialist-DRM/CSA 2	Compilation and analysis of road data for cumulative effects analysis.

B. DISTRIBUTION OF THE ENVIRONMENTAL IMPACT STATEMENT

Copies of the Draft Environmental Impact Statement (DEIS) have been distributed to the following organizations and government agencies in the form of a hard copy, compact disc, or a notification that the document is available on the Internet. Individuals specifically requesting a copy of the DEIS have also been mailed a hard copy or compact disc.

Copies of the DEIS are available for review at the following locations:

Rogue River–Siskiyou National Forest
Powers Ranger District
Powers Ranger Station
42861 Highway 242
Powers, OR 97466

Rogue River-Siskiyou National Forest
Gold Beach Ranger District
Gold Beach Ranger Station
29279 Ellensburg Avenue
Gold Beach, OR 97444

Rogue River-Siskiyou National Forest
Supervisor's Office
Medford Interagency Office
3040 Biddle Road
Medford, OR 97501

FEDERAL AGENCIES

Advisory Council on Historic Preservation

Agriculture, U.S. Department of
- APHIS PPD/EAD
- Forest Service, Pacific Northwest Research Station
- Forest Service, Pacific Northwest Regional Office
- Forest Service, Washington Office
- National Agricultural Library
- Natural Resource Conservation Service

Commerce, U.S. Department of
- National Marine Fisheries Service

Defense, U.S. Army Engineer
- Northwest Division

Environmental Protection Agency
- Office of Federal Activities, EIS Filing Section
- Region 10, EIS Review Coordinator

Homeland Security, U. S. Coast Guard
- Environmental Management

Interior, U.S. Department of the
- Bureau of Land Management
  - Medford District Office
  - Coos Bay District office
- Fish and Wildlife Service
- Office of Environmental Policy and Compliance

STATE AGENCIES

State of Oregon
- Department of Environmental Quality
- Department of Fish and Wildlife
- Department of Forestry
- Governor's Natural Resources Office
- Water Resources Department

NATIVE AMERICANS

Coquille Tribal Council

ELECTED OFFICIALS

Oregon Governor John Kitzhaber
U.S. Senator Jeff Merkley (Oregon)
U.S. Senator Ron Wyden (Oregon)
U.S. Representative Peter DeFazio (Oregon)
U.S. Representative Greg Walden (Oregon)

COUNTY

Curry County Board of Commissioners
Coos County Board of Commissioners

LIBRARIES

Southern Oregon University

ORGANIZATIONS

Columbia Helicopters, Inc.
Klamath Siskiyou Wildlands Center
Cascadia Wildlands
American Forest Resource Council
Oregon Wild

CHAPTER V - REFERENCES

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United States
Department of
Agriculture

Forest
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Pacific Northwest
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March 2012

Draft Environmental Impact Statement

APPENDICES

Eden Ridge Timber Sales

Powers Ranger District

Rogue River-Siskiyou National Forest

Coos County, Oregon

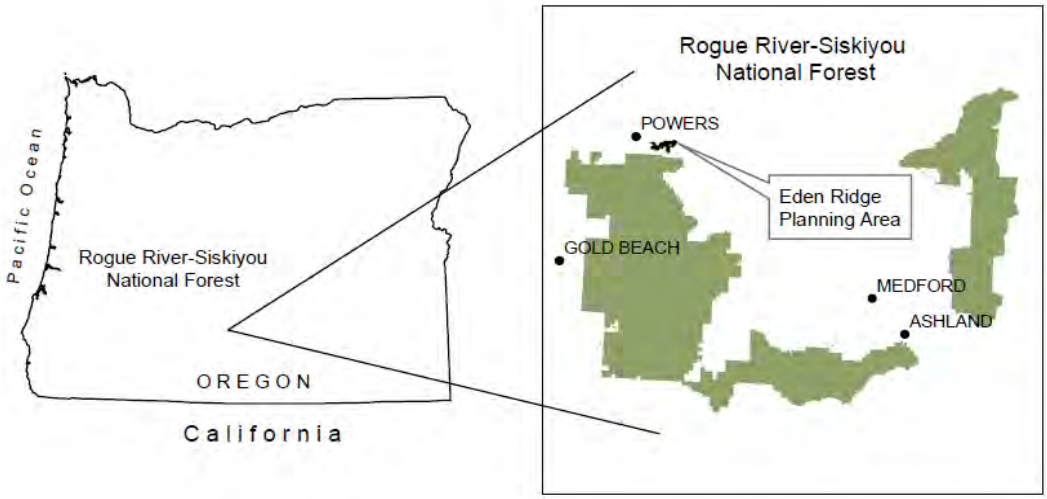


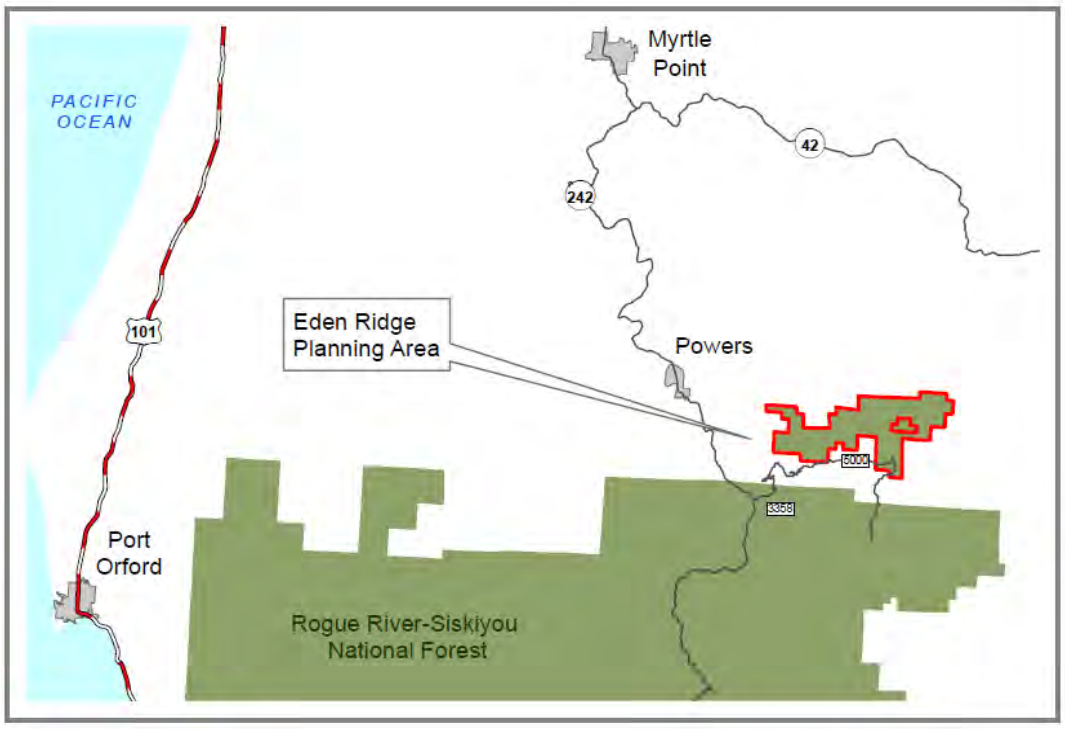




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VICINITY MAPS





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EDEN RIDGE TIMBER SALES
DRAFT ENVIRONMENTAL IMPACT STATEMENT

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PROCESS RECORD; CORRECTED NOTICE OF INTENT

APPENDIX A

FEDERAL REGISTER - CORRECTED NOTICE OF INTENT

Notices

Federal Register
Vol. 77, No. 11
Wednesday, January 18, 2012

This section of the FEDERAL REGISTER contains documents other than rules or proposed rules that are applicable to the public. Notices of hearings and investigations, committee meetings, agency decisions and rulings, delegations of authority, filing of petitions and applications and agency statements of organization and functions are examples of documents appearing in this section.

DEPARTMENT OF AGRICULTURE

Submission for OMB Review; Comment Request

January 12, 2012.

The Department of Agriculture has submitted the following information collection requirement(s) to OMB for review and clearance under the Paperwork Reduction Act of 1995, Public Law 104–13. Comments regarding (a) whether the collection of information is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility; (b) the accuracy of the agency's estimate of burden including the validity of the methodology and assumptions used; (c) ways to enhance the quality, utility and clarity of the information to be collected; (d) ways to minimize the burden of the collection of information on those who are to respond, including through the use of appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology should be addressed to: Desk Officer for Agriculture, Office of Information and Regulatory Affairs, Office of Management and Budget (OMB), *OIRA_Submission@OMB.EOP.GOV* or fax (202) 395–5806 and to Departmental Clearance Office, USDA, OCIO, Mail Stop 7602, Washington, DC 20250–7602. Comments regarding these information collections are best assured of having their full effect if received within 30 days of this notification. Copies of the submission(s) may be obtained by calling (202) 720–8958.

An agency may not conduct or sponsor a collection of information unless the collection of information displays a currently valid OMB control number and the agency informs potential persons who are to respond to the collection of information that such persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

Natural Resource Conservation Service

Title: Emergency Watershed Protection Program Recovery.

OMB Control Number: 0578–0030.

Summary of Collection: The Emergency Watershed Protection (EWP) Program regulations at 7 CFR 624 set forth the basic policies, program provisions, and eligibility requirements for sponsors to participate in the EWP program. The Natural Resource Conservation Service (NRCS) is responsible for administration of the EWP Program. EWP assistance is provided to sponsors to undertake emergency measures for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood, or any other natural disaster occurrence is causing or has cause a sudden impairment of that watershed. The sponsor's request is submitted formally as a letter (NRCS–PDM–20A) to the NRCS State Conservationist for consideration. Form NRCS–PDM–20, Damage Survey Report (DSR) is the agency decisionmaking document that includes the economic, social, and environmental evaluation, as well as the engineer's cost estimate.

Need and Use of the Information: The collected information allows the responsible federal official to make EWP eligibility determinations and provide federal cost-share payments to the sponsors. Without the information NRCS would not be able to perform its responsibilities in administrating the EWP program.

Description of Respondents: State, Local, or Tribal Government.

Number of Respondents: 210.

Frequency of Responses: Reporting: Other (Disaster Occurrence).

Total Burden Hours: 5,565.

Ruth Brown,

Departmental Information Collection Clearance Officer.

[FR Doc. 2012–814 Filed 1–17–12; 8:45 am]

BILLING CODE 3410–16–P

DEPARTMENT OF AGRICULTURE

Forest Service

Rogue River-Siskiyou National Forest, Powers Ranger District, Coos County, OR; Eden Ridge Timber Sales

AGENCY: Forest Service, USDA.

ACTION: Corrected Notice of Intent to prepare an environmental impact statement for the Eden Ridge Timber Sales. The original notice was published on April 26, 2010.

SUMMARY: The USDA, Forest Service, is preparing an Environmental Impact Statement (EIS) on proposed variable density thinning treatments designed to control stocking and maintain or improve overall forest vigor and resiliency within a 6,516-acre planning area known as Eden Ridge. Timber harvested from stand treatments would contribute commercial timber to the Forest's Probable Sale Quantity. The planning area is located approximately four (4) air miles southeast of the city of Powers, Oregon, on the Powers Ranger District. A Notice of Intent (NOI) was first published for this proposal on April 26, 2010, Volume 75, No. 79, pages 21577–21579. Due to the length of time that has passed since the first NOI was published, refinement of the proposed action, and a change in the responsible official, the district is publishing this Corrected NOI. The district now proposes within the planning area, timber harvest and other connected activities on approximately 3,314 acres in stands regenerated from timber harvested around the 1930s and 1940s via historical railroad logging. Candidate stands located on suitable forest land within the planning area are proposed for treatment that are designated as Matrix, with some amount of Riparian Reserve under the Land and Resource Management Plan as amended by the Northwest Forest Plan. Approximately seventy-five (75) treatment units would be designed for timber harvest with associated harvest systems that would use a combination of ground-based and skyline operations depending on soil, slope and hydrological concerns. To facilitate treatments within the potential units being considered, approximately:

- 10.5 miles new road construction
- 0.03 miles of temporary roads

- 3.7 miles reconstruction of existing template non system roads
- 7.7 miles maintenance of proposed existing cost share roads
- 31 miles maintenance of existing system roads is proposed. It is estimated the project could produce approximately 50 million board feet from the 3,314 acres being considered, from multiple timber sales over a 5-year period. The alternatives include the proposed action, no action, and additional alternatives that responded to issues generated through the scoping process. The agency will give notice of the full environmental analysis and decisionmaking process so interested and affected people may participate and contribute to the final decision.

DATES: The draft environmental impact statement is expected March 2012 and the final environmental impact statement is expected July 2012.

ADDRESSES: Powers Ranger District, 42861 Highway 242, Powers, OR 97466–9700.

FOR FURTHER INFORMATION CONTACT: For information about the proposal, contact Wesley H. Crum, Project Leader, at the above address, phone (541) 439–6241 or email *whcrum@fs.fed.us*.

SUPPLEMENTARY INFORMATION:

Purpose and Need for Action

The overall *Purpose* of this project is to implement direction from the 1989 Land and Resource Management Plan for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan. The majority of the Eden Ridge Timber Sales proposal is located on lands allocated to Matrix which emphasizes obtaining a full yield of timber within the capability of the land. Most scheduled timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands (NW Forest Plan, page C–39). Specifically for the Eden Ridge Timber Sales project, *Needs* include: *Improvement of Overall Forest Vigor and Resiliency*—There is a need for tree stocking level control to reduce stand densities through intermediate harvest thinning treatments to sustain or increase tree growth and improve forest vigor and resiliency. Density management would release remaining trees from inter-tree competition for sunlight, and would also reduce competition for water and soil nutrients when compared to untreated areas. Minor portions of the Planning Area infected with root diseases would be managed to harvest trees predisposed to pathogen infection and retain or plant resistant tree species to improve forest health. Older legacy (remnant) trees, minor conifer tree species (in portions of stands uninfected with root disease), hardwoods, existing snags and coarse woody debris would be retained where feasible to maintain or improve forest diversity. Post-treatment objectives are to develop a sustainable forest resilient to drought, wind, insects, disease, fire and other natural disturbances. *Contribution of Commercial Timber to the Probable Sale Quantity*—Proposed candidate stands are primarily allocated to Matrix and contribute to the Rogue River-Siskiyou National Forest Probable Sale Quantity (PSQ). PSQ is the estimated output of commercial timber and other commodities assigned to the Forest under the 1994 Northwest Forest Plan. The Purpose of this action is to respond to the stated Needs. Specific stand management objectives associated with the Purpose and Need for this proposal include:

- Maintenance or improvement of forest health and diversity within Matrix and Riparian Reserve land allocations through density management treatments. This typically means individual tree and overall stand diameter growth, crown development, vigor and overall stand health, and improved root strength on residual trees;
- Improve habitat conditions for wildlife and fish. This means increasing vegetative and structural species diversity; maintain or improve shading capability of streams; improve large wood retention and large wood recruitment, and provide suitable amounts of snags and/or replacement habitat for dependent species;
- Reduce the risk of effects from insect and disease infestations;
- Minimize or reduce the potential for high severity, stand replacement wildfires;
- Increase riparian vegetation quality, health and vigor; and
- Contribute to a predictable and sustainable level of timber commodities with human and economic dimensions.

Proposed Action

The action proposed by the Forest Service to meet the Purpose and Need is variable density thinning and other silvicultural treatments designed to control stocking and maintain or improve overall forest vigor and resiliency from within the 6,516-acre Eden Ridge Planning Area. Commercial timber harvested from stand treatments would contribute to the Forest's Probable Sale Quantity. The 6,516 acre Eden Ridge planning area is located approximately four (4) air miles southeast of the city of Powers, Oregon at the closest point, with a legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon. The planning area falls within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds. The proposed action would occur from multiple timber sales over a 5-year period.

Possible Alternatives

The Proposed Action and two action alternatives are proposed for achieving the stated Purpose and Need, as well as a No-Action Alternative. These alternatives were developed based on issues raised by the public and other agencies.

Responsible Official

The Forest Supervisor, Rogue River-Siskiyou National Forest, is the responsible official for this project.

Nature of Decision To Be Made

The Forest Supervisor will decide whether to implement the action as proposed, whether to take no action at this time, whether to implement any alternatives that are proposed, or develop a preferred alternative from all of the alternatives.

Preliminary Issues

The following are significant issues: Hydrologic Conditions, Water Quality, Cumulative Watershed Effects, Soils, Geology, and Site Productivity and Economics.

Other issues include: Aquatic Conservation Strategy, Fire/Fuels, Air Quality, Botanical Resources, Invasive Plants, Port-Orford-cedar Root Disease, Threatened Terrestrial Wildlife Species and Critical Habitat, Forest Service Sensitive Terrestrial Wildlife Species and Habitats, Rare and Uncommon Terrestrial Wildlife Species, Neotropical Migratory Birds, Aquatic Species and Habitats, Thinning Shock and Wind throw Potential, Other Undeveloped Areas, Heritage Resources, Recreation/Human Safety and Climate Change.

Scoping Process

The scoping process for this project occurred when the original NOI was published in 2010. Issues identified during the scoping period were used to determine the alternatives considered and breadth of analysis. Public field

trips were held on August 1st and 2nd, 2011. Additional public meetings may be planned in the future. This proposal has been listed on the Rogue River-Siskiyou NF Schedule of Proposed Actions since October, 2010.

Dated: January 4, 2012.

Jennifer Eberlien,

Acting Forest Supervisor, Rogue River-Siskiyou National Forest.

[FR Doc. 2012–860 Filed 1–17–12; 8:45 am]

BILLING CODE 3410–11–P

DEPARTMENT OF COMMERCE

U.S. Census Bureau

Proposed Information Collection; Comment Request; Quarterly Financial Report

AGENCY: U.S. Census Bureau, Commerce.

ACTION: Notice.

SUMMARY: The Department of Commerce, as part of its continuing effort to reduce paperwork and respondent burden, invites the general public and other Federal agencies to take this opportunity to comment on proposed and/or continuing information collections, as required by the Paperwork Reduction Act of 1995, Public Law 104–13 (44 U.S.C. 3506(c)(2)(A)).

DATES: To ensure consideration, written comments must be submitted on or before March 19, 2012.

ADDRESSES: Direct all written comments to Jennifer Jessup, Departmental Paperwork Clearance Officer, Department of Commerce, Room 6616, 14th and Constitution Avenue NW., Washington, DC 20230 (or via the Internet at *jjessup@doc.gov*).

FOR FURTHER INFORMATION CONTACT: Requests for additional information or copies of the information collection instrument(s) and instructions should be directed to Demetria V. Hanna, U.S. Census Bureau, HQ–6K181, Washington, DC 20233, Telephone (301) 763–6600.

SUPPLEMENTARY INFORMATION:

I. Abstract

The Census Bureau's Quarterly Financial Report program (QFR) is planning to expand to include, along with corporations currently surveyed, additional Services sectors in the scope of collection. The current collection includes the Manufacturing, Mining, Wholesale Trade, Retail Trade, Information, and Professional, Scientific, and Technical Services (excluding legal) sectors. The expanded collection will include the Real Estate and Rental and Leasing, Administrative and Support and Waste Management and Remediation Services, Health Care and Social Assistance, and Accommodation and Food Services sectors.

The QFR forms to be submitted for approval are: The QFR 200 (MT) long form; QFR 201 (MG) short form; and the QFR 300 (S) long form.

The QFR Program has published up-to-date aggregate statistics on the financial results and position of U.S. corporations since 1947. The QFR is a principal economic indicator that also provides financial data essential to the estimation of key Government measures of national economic performance. The importance of this data collection is reflected by the granting of specific authority to conduct the program in Title 13 of the United States Code, Section 91, which requires that financial statistics of business operations be collected and published quarterly. Public Law 109–79 extended the authority of the Secretary of Commerce to conduct the QFR Program under Section 91 through September 30, 2015.

The main purpose of the QFR is to provide timely, accurate data on business financial conditions for use by Government and private-sector organizations and individuals. The primary public users are U.S. Governmental organizations with economic measurement and policymaking responsibilities. In turn, these organizations play a major role in providing guidance, advice, and support to the QFR Program. The primary private-sector data users are a diverse group including universities, financial analysts, unions, trade associations, public libraries, banking institutions, and U.S. and foreign corporations.

II. Method of Collection

The Census Bureau uses two forms of data collection: mail out/mail back paper survey forms, and a secure encrypted Internet data collection system called Centurion. Centurion provides improved quality with automatic data checks and is context-sensitive to assist the data provider in identifying potential reporting problems before submission, thus reducing the need for follow-up. Centurion is completed via the Internet eliminating the need for downloading software and increasing the integrity and confidentiality of the data.

Companies are asked to respond to the survey within 25 days of the end of the quarter for which the data are being requested. Letters and/or telephone calls encouraging participation are directed to companies in the survey sample that have not responded by the designated time.

III. Data

OMB Control Number: 0607–0432.

Form Number: QFR 200 (MT), QFR 201 (MG) and QFR 300 (S).

Type of Review: Regular submission.

Affected Public: Manufacturing corporations with assets of $250 thousand or more Mining, Wholesale Trade, Retail Trade, Information, Professional, Scientific, and Technical Services (excluding legal), Real Estate and Rental and Leasing, Administrative and Support and Waste Management and Remediation Services, Health Care and Social Assistance, and Accommodation and Food Services corporations with assets of $50 million or more.

Estimated Number of Respondents:

Form QFR 200 (MT)—5,000 per quarter = 20,000 annually.

Form QFR 201 (MG)—5,000 per quarter = 20,000 annually.

Form QFR 300 (S)—2,700 per quarter = 10,800 annually.

Total 50,800 annually.

Estimated Time Per Response:

Form QFR 200 (MT)—Average hours: 3.0.

Form QFR 201 (MG)—Average hours: 1.2.

Form QFR 300 (S)—Average hours: 3.0.

Estimated Total Annual Burden Hours: 116,000 hours.

Estimated Total Annual Cost: $3.8 million.

Respondent's Obligation: Mandatory.

Legal Authority: Title 13 U.S.C. 91 and 224.

IV. Request for Comments

Comments are invited on: (a) Whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; (b) the accuracy of the agency's estimate of the burden (including hours and cost) of the proposed collection of information; (c) ways to enhance the quality, utility, and clarity of the information to be collected; and (d) ways to minimize the burden of the collection of information on respondents, including through the use of automated collection techniques or other forms of information technology.

Comments submitted in response to this notice will be summarized and/or included in the request for OMB approval of this information collection; they also will become a matter of public record.

APPENDIX B

PRELIMINARY SILVICULTURAL DIAGNOSIS
PORT-ORFORD-CEDAR REPORT

APPENDIX B

Port-Orford-Cedar Report and Risk Key Assessment

Eden Ridge Timber Sales

Prepared by
Stephen F. Boyer
Pacific Zone Silviculturist

September 15, 2011

BACKGROUND

On most of the Rogue River-Siskiyou National Forest, Port-Orford-cedar (POC) is concentrated in Riparian Reserves except on the Powers Ranger District where POC is well distributed across the landscape.

The Powers Ranger District has the greatest concentration of POC occurring in the world, from the South Fork of the Coquille River to Iron Mountain. This district is also unique in having stands with POC stand components of up to 70 to 80 percent. Included within the district are the Port-Orford-cedar Research Natural Area, Big Tree Viewing Area, which includes the largest POC in the world at nearly 12 feet in diameter, and the Coquille River Falls Research Natural Area.

The 2008 inventory showed 47,902 acres of POC present on the district, of which 2,349 acres (4.9%) are infested with PL. The research natural areas are infested with POC root disease, *Phytophthora lateralis* (PL).

Phytophthora lateralis
PL is a virulent, non-native pathogen that was introduced into the native range of POC in the early 1950s and its place of origin is unknown. PL readily kills POC of all ages that are growing on sites favorable for infection. Once an area becomes infested, it is difficult to eradicate PL.

PL can cause mortality within weeks of infection in the case of small trees and in one to four years when large trees are infected (Roth et al. 1987). Trees usually lose all foliage two to three years after death. In areas where the disease has been active for several years, dead and dying trees with all degrees of foliage symptoms are visible (Hadfield et al. 1986).

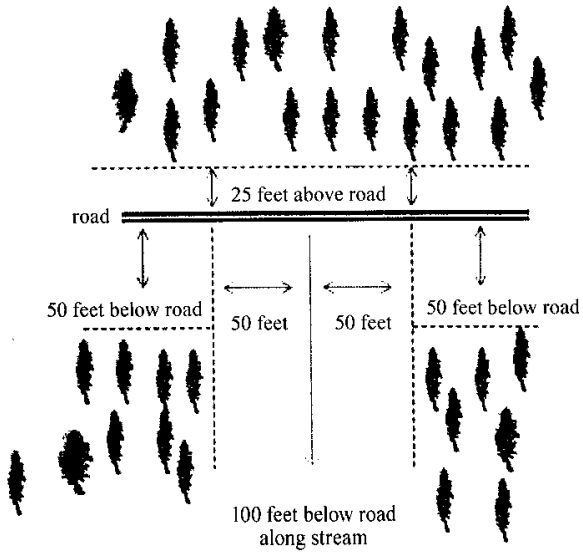
PL is spread in the following ways (Hansen et al. 2000; Zobel et al. 1985):

-Human vectors over long distances via resting spore transported in infested plant material or soil.
-Locally via waterborne spores moving in ditches, streams, or overland flow.
-Via mycelia growing across root contacts and grafts between infected and uninfected POC.

PL is favored in areas of slow-moving or standing water and on poorly drained microsites, especially when such sites occur below roads. Susceptible areas are segregated by the following risk categories (USDA Forest Service, 2004: *Record of Decision and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon*, Siskiyou National Forest).

High-risk Sites
Low-lying wet areas (infested or not) that are located downslope from already infested areas or below likely sites for future introductions, especially roads. They include streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low lying areas where water collects during rainy weather (USDA-FS 2004). High risk sites are defined as streamside POC within 100 feet below a road and non-streamside POC within 50 feet below a road or 25 feet above a road (Figure 1).

Figure 1. High-risk Sites



For the purposes of this analysis, probability (USDA-FS 2004, section 3&4, page 37) below 6.1% for spread and establishment of PL in previously uninfested areas is considered low risk. This probability corresponds to Low-risk sites defined as follows:

Low-risk Sites
These are sites with characteristics unfavorable for spread and infection by PL. Low risk sites are defined as streamside POC greater than 100 feet from a road and non-streamside POC greater than 50 feet from a road.

Probabilities of spread are based on literature and professional judgment of forest pathologists with substantial amounts of experience evaluating PL in the laboratory and in the field.

EDEN RIDGE TIMBER SALES - CURRENT CONDITION

Field observations noted variable amounts of standing small to medium diameter snags in PL pockets associated with profuse natural regeneration of POC seedlings and saplings in the Eden Ridge Timber Sales (ER) Planning Area. Infected and healthy POC seedlings usually occur intermingled.

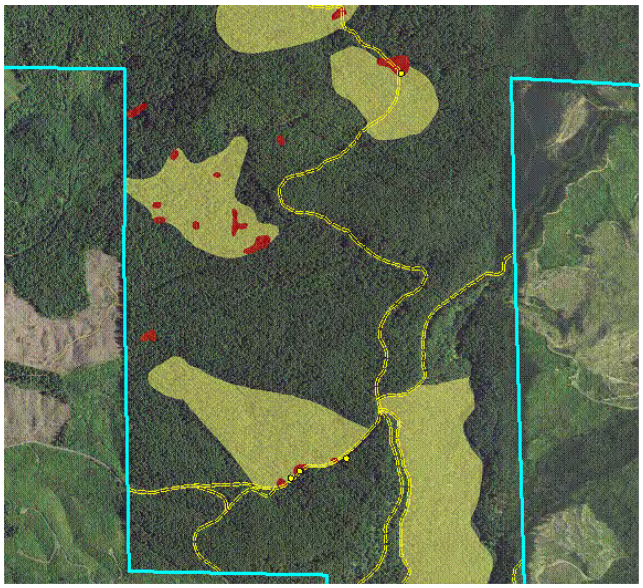
Figure 2. Examples of PL Pockets – Eden Ridge Planning Area



Unit 326 **Unit 332** **Unit 326**

Field reconnaissance in combination with GPS waypoints during summer 2011 noted clumps of five (5) to twelve (12) 4" to 30" diameter standing snags occurring in Port-Orford-cedar root disease pockets (*Phytophthora lateralis)* in the southern portion of the Planning Area adjacent to the 5000 Road. Most of the snags are < 12" diameter. Larger 24" to 32+" diameter snags were observed interspersed in the overstory north of this road and below the southernmost waypoint. This area is not proposed for treatment in ER.

Figure 3. GPS Waypoints in *Phytophthora lateralis* pockets



Yellow dots = GPS way points

Port-Orford-Cedar Inventory

An updated POC inventory based on field verification was finalized in 2008 on the Powers Ranger District of the Rogue River-Siskiyou National Forest. POC presence and PL root disease is mapped in small portions of the Planning Area.

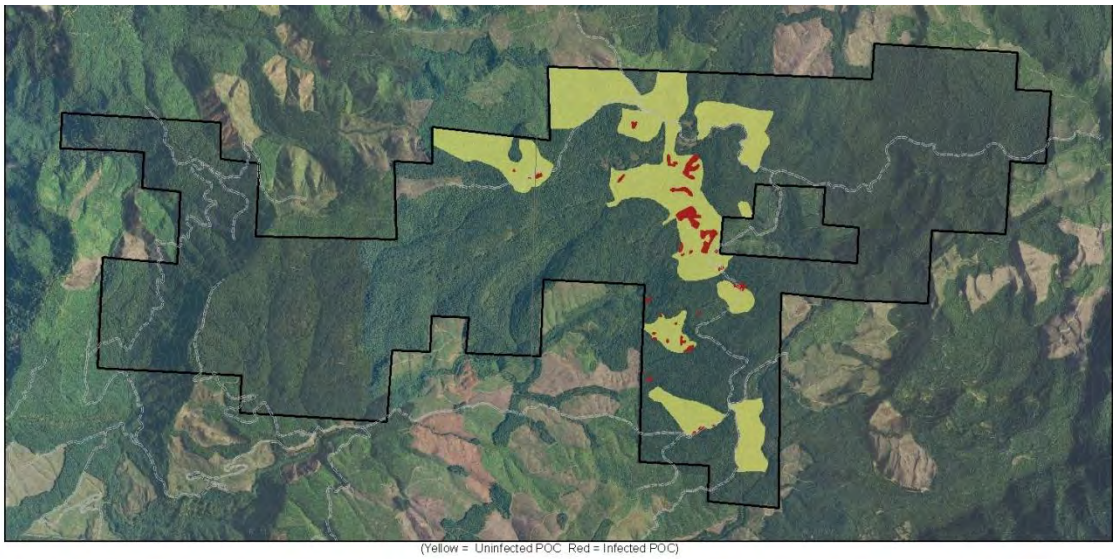
Most of ER Planning Area is mapped as canopy cover 1 in the updated inventory. This attribute is defined as 2-5% canopy cover of POC foliage present in mapped polygons. Canopy cover is estimated during air photo interpretation and field verification in some cases (see Attachment A: Polygon Attribute Table-Data Dictionary).

Canopy cover 1 can be considered to not measurably contribute to land management objectives[1]. Where POC is a small percentage of the stand or does not provide unique stand attributes, its loss is probably not meaningful when measured against management objectives (USDA 2004, p. 34). In these circumstances, the decision to manage for POC is determined by the ER Interdisciplinary Team.

Landscape-scale POC distribution should be considered for ER as surrounding private timber company land is being managed for planted Douglas-fir regeneration on a 40-50 year rotation. Dead and dying POC seedlings and saplings, likely infected with PL are present in road ditches and drainages in the surrounding land ownership. PL has been diagnosed in dying POC regeneration alongside the 5000 Road west of the eight mile gate before entering into FS ownership (June 14, 2011, field trip with Frank Betlejewski, Interregional POC Manager).

[1] Pers. conv. Frank Betlejewski, Interregional Port-Orford-cedar Program Manager, Southwest Forest Insect and Disease Service Center.

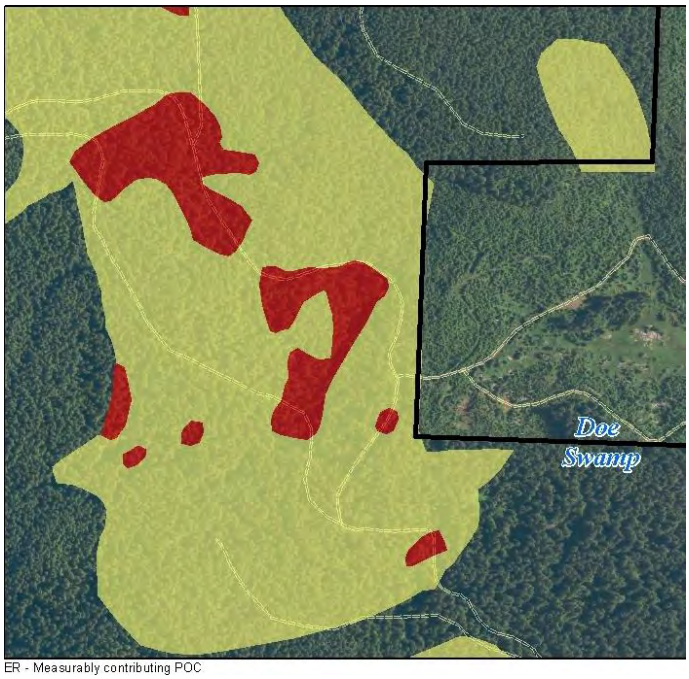
Figure 4. Port-Orford-cedar Distribution in Eden Ridge Planning Area



(Yellow = Uninfected POC Red = Infected POC)

Measurably contributing POC and PL infection is present west of the private inholding around Doe Swamp. This area is mapped as canopy cover 2, defined as 6-20% POC present in mapped polygons, **which triggers the POC Risk Key.**

Figure 5. POC and PL Infection near Doe Swamp



ER - Measurably contributing POC

Previous tree planting of 98,100 POC seedlings occurred in 1937 across 144 acres in a portion of the area inventoried as canopy cover 2 (see stand history of main silvicultural diagnosis report). This plantation is adjacent to the land ownership boundary around Doe Swamp with private timber company which has recently been clearcut harvested in 2010. Many planted POC appear to be deformed with busted tops that are being out competed and overtopped by larger Douglas-fir.

Figure 6. POC Plantation near Doe Swamp



Proposed treatment activities and road building through PL pockets in ER Units 326 and 327 can have potentially adverse effects to POC in this area. A project-specific POC Risk Key assessment is required in areas with measurably contributing POC to help determine where risk reduction management practices would be applied and to comply with the LRMP amendment (USDA 2004).

Figure 7. PL Pocket in Unit 326 Adjacent to Railroad Grade Proposed for Road Reconstruction



PORT-ORFORD-CEDAR RISK KEY

The POC Risk Key is used to clarify the environmental conditions that require implementation of one or more of the disease controlling management practices listed in the *2004 Record of Decision (ROD) and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon Siskiyou National Forest*. The objectives of the amended POC management Standard and Guidelines are to:

- Maintain POC on sites where the risk for infection is low.
- Reduce the spread and severity of root disease in high-risk areas to retain its ecological function to the extent practicable.
- Reestablish POC in plant communities where its numbers or ecosystem function have been significantly reduced.
- Reduce the likelihood of root disease becoming established in disease-free 7th field watersheds.

Program objectives are to maintain POC as an ecologically and economically significant species on National Forest (NF) lands. POC management will provide cost-effective mitigation for management activities that create appreciable additional risk to important uninfected POC though not to reduce all risk to all trees at all cost (USDA-FS 2004). In areas proposed for timber harvest and road building, mitigation would be required as described in the POC Risk Key assessment (USDA 2004, Appendix A).

Project-specific NEPA analysis will appropriately document the application of the Risk Key and the consideration of the available management practices. Application of the Risk Key and application of resultant management practices will make the project consistent with the mid- and large-geographic and temporal-scale effects described by the SEIS analysis, and will permit the project analysis to tier to the discussion of those effects (USDA FS 2004).

Application of the Risk Key

1a. *Are there uninfected Port-Orford-cedar (POC) within, near, or downstream of the activity area that's ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?* **Yes.**

Measurably contributing POC and PL infection is present west of the private inholding around Doe Swamp. This area is proposed for commercial thinning treatments, road reconstruction of an existing railroad grade and construction of a new system road to access ER Units# 326 and 327.

Harvest units and road building are within a wet western hemlock plant association (Atzet et al. 1996).

1b. *Are there uninfected Port-Orford-cedar within, near, or downstream of the activity area that, were they to become infected, would likely spread infections to trees whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?* **No.**

Surrounding treatment areas near or downstream of the Doe Swamp area are inventoried as canopy cover 1, which indicates POC as not measurably contributing to LRMP objectives at the stand-level scale.

Whether or not areas with POC are considered measurably contributing in the ER Planning Area, landscape-scale POC distribution should be considered as surrounding private timber company land downstream from the Doe Swamp area is being managed for Douglas-fir regeneration on a 40-50 year rotation. The ecological value of maintaining healthy POC during treatment activities on Forest Service land should be considered important for vegetation diversity.

1c. *Is the activity area within an un-infested 7th field watershed as defined in Attachment 1?* **No.**

2. *Will the proposed project introduce appreciable additional risk of infection to these un-infested Port-Orford-cedars?* **Yes.**

Recommended Management Practices (Mitigation Measures)

Project Scheduling- schedule commercial treatments/road building west of Doe Swamp to occur during the dry season (or wash project equipment).

Utilize Uninfested Water- Use uninfested water sources for equipment washing, road watering and other water-distribution needs or treat water with bleach to prevent/reduce the spread of PL.

Unit Scheduling- Conduct work in all timber sale units where PL is not present before working in units infested with PL.

Road Management Measures- Implement proactive disease-prevention measures including not building roads (e.g., Road W through PL pockets in Units 326 and 327) or relocating the proposed road to avoid these infested areas.

Resistant POC Planting- Silvicultural prescriptions for sites having potential for growing POC will provide for the establishment of the species through natural or artificial regeneration and maintenance as a viable stand component through the current and future rotations.

Washing Project Equipment- Wash project equipment prior to beginning work in uninfested project areas, when leaving infested areas to work in uninfested areas, and when leaving the project area to minimize the transportation of infested soil to uninfested areas.

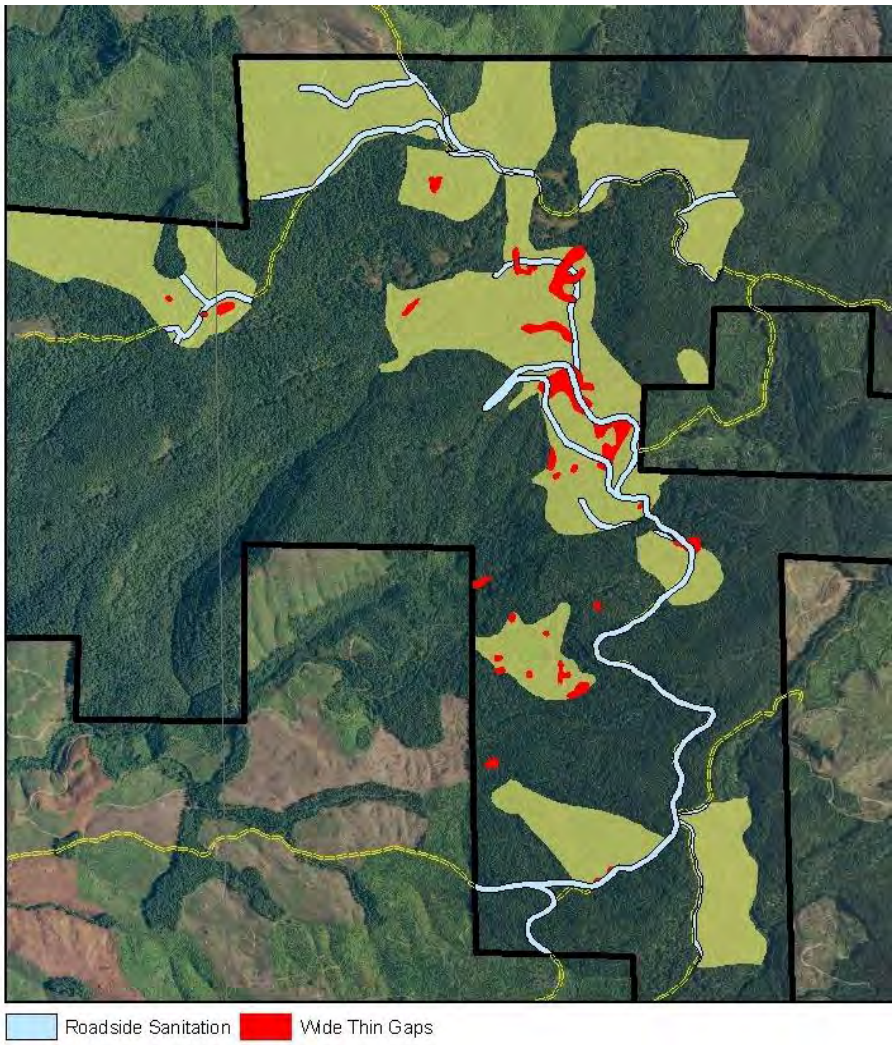
Roadside Sanitation- Remove POC along both sides of the road. Recommended width is 25 feet above the road or the top of the cut bank and 50 feet below the road. Remove POC 100 feet below the road where crossing streams.

Site-Specific POC Management- Manage to favor POC uphill from creeks, on ridgetops and on well-drained sites to emphasize management of POC on sites where conditions make it likely that trees will escape infection. Emphasis may include priority retention during thinning or other silvicultural treatments and planting to increase the presence of POC in areas unfavorable to PL.

Recommended Treatments

The following active treatments (Figure 8) are recommended:

Figure 8. Port-Orford-Cedar Root Disease Treatments



Roadside Sanitation **Wide Thin Gaps**

Wide-Thin Gap Treatments

Remove all live POC within PL infection sites. Leave non-susceptible tree species on site. Thin out all live POC within 2 to 3 crown radii from last infected POC along the perimeter of infection sites to separate healthy POC from potential root contact with infected POC. Pile and burn all POC slash and follow-up underburn to potentially mitigate disease presence. Sites can be planted with non-susceptible tree seedlings.

Roadside Sanitation

Manage for non-susceptible tree species by removing all POC along road sides and high risk sites as follows:

100-feet below roads at stream crossings, width of high water table.
25 feet above roads and 50-feet below roads in non-streamside areas.

Planting

Restore POC within its natural range by planting non-PL infested areas and low risk areas with resistant POC. Gaps and root rot pockets may be site prepared and planted with Port-Orford-cedar seedlings for stand health and enhance structural and species diversity within a stand.

Recommended planting spacing is twenty-five (25) feet apart or in approximately ten (10) tree clusters at 100-150 foot spacing to lessen the potential for root grafting (USDA 2004, ROD, pg. 36). These spacing guidelines can be flexible to meet site-specific conditions. Avoid stagnant water and plant POC in areas that maximize chances of maintaining moist surface soil year-round.

POC's distribution in Coos County appears primarily to reflect edaphic conditions (Zobel, 2011). During introduction of disease-resistant POC, the General Soil Type *Digger-Preacher-Remote* is an appropriate soil type to plant POC (based on POC's native distribution in historical cruise data in pre-harvest forests).

ER is within the 'Oregon Transitional' Block/Zone 340 (2,501-4,000 ft. elevation) for disease-resistant seed (Hamlin, 2005). Seed is collected from seed orchards established since 2001 at the Dorena Genetic Resource Center, USDA Forest Service, in Cottage Grove, Oregon. Seedlings should be grown primarily from this seedlot.

Plant openings created by WTG treatments in PL pockets with Douglas-fir where openings > ¼ acre. Western hemlock is anticipated to naturally regenerate in openings and does not need be planted. Do not plant POC as these PL pockets are considered high risk and should be managed for non-host species to reduce the potential for long-term PL disease persistence on site. Post-planting tree netting of seedling terminal buds may be needed to reduce big game browse damage on Douglas-fir.

Climate Change Consideration
In anticipation of potential climate change and species migration, combine seedlots for sowing POC seed for planting as follows:

Original Zone	Lower Elevation Zone	Southern Latitude Zone
340 (50%)	325 (25%)	440 (25%)

If a lower elevation or southern latitude source is not available, then increase the original zone percentage accordingly (Hamlin, 2009).

The Tyee Formation is the dominant geologic type in the coastal mountains in Douglas, Lane, and Lincoln counties and extends as far north as Tillamook County. Tyee supports moderate performance of POC in terms of both its incidence and volume. Knowing the relative performance of POC on these edaphic units should help to decide where POC could be introduced during efforts to move its range north as climatic warming continues (Zobel 2011).

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ATTACHMENT A

Port-Orford-Cedar Field Inventory
Polygon Attribute Table - Data Dictionary

Polygon #: A number corresponding to a black number on the aerial photo as an identifier of individual polygons. This numbering system is sequential for each aerial photo. The Rogue/Siskiyou N.F. overall unique number for that polygon is shown in the margin directly to the left of this number.

POC Root Disease Presence/Absence: If coded 66 then POC Root Disease (*Phytophthora lateralis*) has been detected and delineated within the polygon. If coded 00 then no POC root disease has been detected or delineated within the polygon. Note: in some situations POC root disease may be present or shown on the Interregional Data Base for that area but the root disease killed trees were not detected on the 1997 aerial photo.

Live POC Canopy Cover: This is the percent of the land within a polygon which is estimated to be covered by POC foliage. It represents the density or concentration of POC within a polygon and is done during photo interpretation with field verification in some cases. The codes used are:

1*- Canopy cover of POC within this polygon is 2 to 5%.
2 - Canopy cover of POC within this polygon is 6 to 20%
3 - Canopy cover of POC within this polygon is 21 to 40%
4 - Canopy cover of POC within this polygon is 40%+

* 2% is the lowest canopy cover of POC that can be reliably mapped using aerial photos or field verification . POC may be present outside of such classified polygons but its concentration is, on average, low.

Survey Date: This is either the date when a polygon was field verified or the date of photo interpretation.

Estimated # of Live POC By Size Classes: This data is normally estimated during photo interpretation but for some smaller polygons the trees were counted during field verification. The size classes employed are: S = Small (less than 22" dbh); M = Medium (22" to 32" dbh); L = Large (32" +).

Estimated # of Dead POC By Size Class: The size classes are the same as for Live POC.

Field Verification Level: This is the reliability of field verification to validate the work of photo interpretation and data integration on a given polygon. Due to the size of the analysis area and the limited amount of time available for this work it is not feasible to do more than briefly sample polygons. Learning the ecology of where POC is present and absent and applying this knowledge to areas away from roads is one of the important values of field verification.

The codes used are: 1 - Field verification where the field person is reasonably confident that the polygon classifications are correct. 2- Field verification where the polygon is large and only a very small sample was examined or where distances observation (with and without binoculars) was done. 3 - Field verification was not done.

Source: The 1992 Interregional Data Base Codes were used along with year of data.

Remarks: Any useful information that the photo interpreter felt should be passed on to the data user. No more than 60 characters

Eden Ridge Timber Sales
Preliminary Silvicultural Diagnosis

Prepared by
Stephen F. Boyer
Pacific Zone Silviculturist

January 12, 2012

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ATTACHMENT A

2009 Stand Exam Locations
Stand #199 (within ER 2/201)
Stand #604 (within ER 320/324)
Stand #802 (within ER 307)
Stand #747 (within ER 906/905)

I. INTRODUCTION

The Eden Ridge Timber Sales project (ER) is located on the Powers Ranger District of the Rogue River-Siskiyou National Forest. The Planning Area is approximately 6,516 acres of Forest Service land within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Headwaters of South Fork Coquille River, Coal Creek, Mill Creek, Lower Rock Creek and Myrtle Creek 6th-Field watersheds. The South Fork Coquille 5th-Field watershed was designated as a Tier 1 Key Watershed by FEMAT in 1983 and selected for directly contributing to anadomous salmonid and bull trout conservation in the Northwest Forest Plan (USDA 1994). Adjacent private timber company lands owned by Plum Creek surround the Planning Area.

Alternative 2 proposes to treat seventy-five (75) units totaling 3,314 acres for harvest treatments, principally commercial thinning for stocking-level control (Map B-1) with some small group selection (gap treatments) to treat laminated root rot (*Phellinus weirii*) pockets and eradication treatments mostly in the understory, in areas infested with Port-Orford-cedar root disease (*Phythophthora lateralis*) and sanitation treatments along roadsides in areas with uninfested Port-Orford-cedar. Follow-up planting of resistant conifer seedlings is proposed for forest health and species diversity objectives in root disease pockets. Nine (9) units totaling 363 acres are proposed for noncommercial treatments that include thinning small diameter trees, planting Port-Orford-cedar and removing disease-infected or damaged understory trees.

Map B-1. Proposed Units for Eden Ridge Timber Sales (Alternative 2)

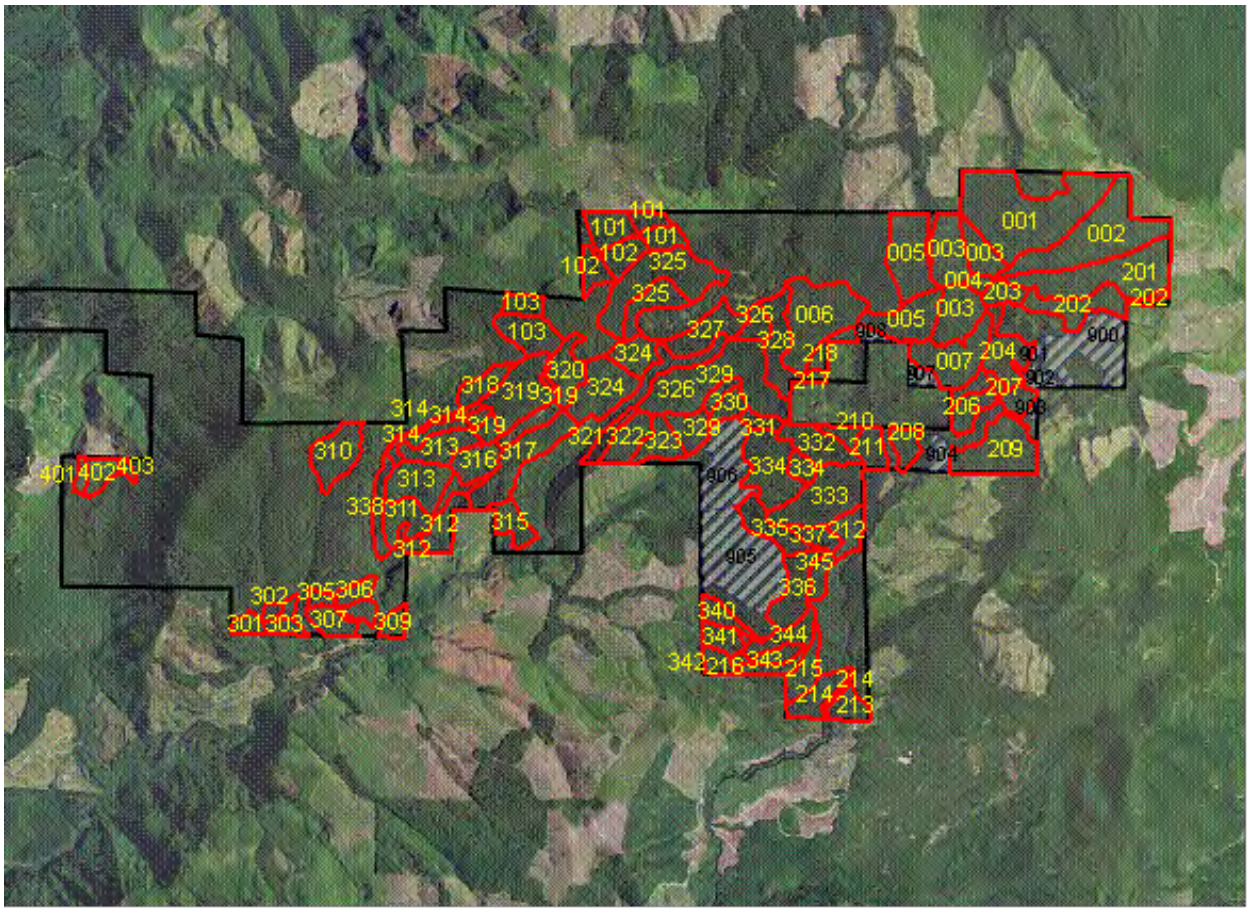


Table B-1. Alternative 2: Units, Acres and Proposed Logging Systems

Unit Number	Logging Systems	Rounded Acres	Unit Number	Logging Systems	Rounded Acres	Unit Number	Logging Systems	Rounded Acres
001	Ground Based	187	302	Skyline	7	331	Skyline	13
002	Ground Based	137	303	Ground Based	12	332	Ground Based	44
003	Skyline	135	304	Skyline	6	333	Ground Based	86
004	Ground Based	8	305	Skyline	8	334	Ground Based	88
005	Ground Based	126	306	Skyline	15	335	Skyline	38
006	Ground Based	102	307	Ground Based	24	336	Skyline	49
007	Ground Based	70	308	Ground Based	13	337	Skyline	19
101	Ground Based	65	309	Ground Based	14	338	Skyline	24
102	Skyline	46	310	Ground Based	49	340	Skyline	19
103	Skyline	61	311	Ground Based	36	341	Ground Based	25
201	Ground Based	117	312	Skyline	38	342	Skyline	16
202	Skyline	57	313	Ground Based	93	343	Ground Based	18
203	Ground Based	19	314	Skyline	40	344	Skyline	30
204	Skyline	48	315	Skyline	26	345	Ground Based	17
205	Skyline	14	316	Skyline	33	401	Ground Based	8
206	Ground Based	25	317	Ground Based	74	402	Skyline	20
207	Ground Based	17	318	Ground Based	25	403	Skyline	5
208	Skyline	21	319	Ground Based	86		**Total:**	**3314**
209	Skyline	79	320	Skyline	37		**Noncommercial**	
210	Ground Based	13	321	Skyline	16	900	900	85
211	Skyline	23	322	Ground Based	35	901	901	7
212	Skyline	26	323	Skyline	31	902	902	7
213	Skyline	22	324	Ground Based	95	903	903	5
214	Skyline	36	325	Ground Based	135	904	904	14
215	Skyline	29	326	Ground Based	155	905	905	140
216	Ground Based	17	327	Ground Based	47	906	906	82
217	Skyline	6	328	Skyline	52	907	907	12
218	Ground Based	17	329	Skyline	41	908	908	9
301	Skyline	13	330	Ground Based	18		**Total:**	**363**

Proposed logging systems are ground-based on 2,089 acres within thirty-nine (39) units and skyline on 1,225 acres within thirty-six (36) units. To access treatment units, proposed new classified road construction is 10.8 miles, classified road reconstruction is 6.1 miles and 0.3 miles of temporary road construction. No logging system or road construction/reconstruction is proposed for treating non-commercial units.

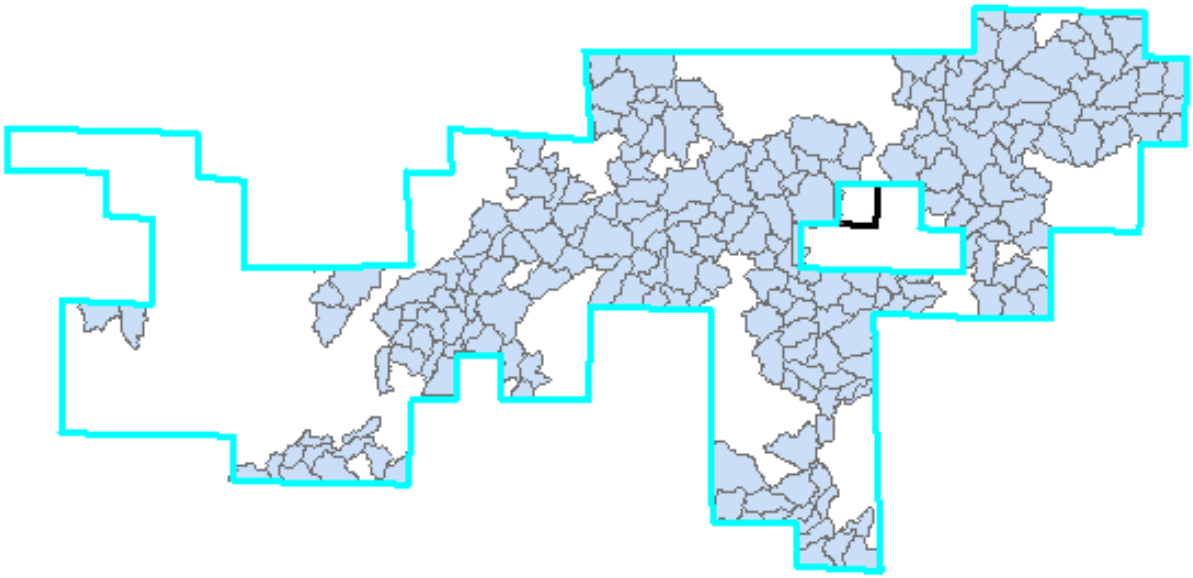
The Planning Area is primarily accessed by Forest Roads 3300, 3358 and cost share Road 5000 with secondary access provided by cost share roads 5000200, 5000210, 5000290, 5000297, 5000420, 5000440, 5000441, 5000448 and 5000449.

This report is prepared as a preliminary silvicultural diagnosis, as required by FSH 2409.17 (Silvicultural Practices Handbook), section 8.22. Upon a final decision for Eden Ridge timber Sales under NEPA, a site-specific silvicultural prescription would be developed for each individual stand identified for treatment and address each land allocation classification (Matrix, Riparian Reserve) during implementation. Silvicultural prescriptions would describe desired future conditions, specify tree spacing, target relative density (RD), preferred species, canopy retention, post-harvest treatments and other key stand components. Final silvicultural prescriptions would be approved by a Region 6 certified silviculturist.

II. STAND IDENTITY AND LOCATION

Map B-2 displays proposed units for Alternative 2 overlayed onto the Rogue River-Siskiyou National Forest (RRSNF) existing vegetation layer stored in the Forest's GIS reference library. The attribute table for the existing vegetation layer contains stand and location numbers for each polygon linked to FSVEG, the Forest Service's corporate spatial layer for inventorying forest stands on National Forest lands. Additionally, a FACTS (Forest Activity Tracking System database) identification number is assigned to each existing vegetation polygon for tracking commercial and noncommercial vegetation treatments planned and implemented on forest stands.

Map B-2. Existing Vegetation Layer and Alternative 2 Units



A. RRSNF Existing Vegetation Layer

The existing vegetation layer was created through computer-automated delineation using eCognition software and populated with data derived from Gradient Nearest Neighbor (GNN) models produced by the Interagency Mapping and Assessment Project (IMAP). Forests stands with homogeneous forest types and structures were delineated across the entire Rogue River-Siskiyou National Forest based on aerial imagery using eCognition software with a minimum stand size of 5 acres.

The plot data used in the GNN models comes from a variety of sources: Forest Inventory and Analysis (FIA) Periodic and Annual plots, USFS Region 6 Current Vegetation Survey (R6-CVS), USFS Region 5 Inventory (R5), Bureau of Land Management Current Vegetation Survey (BLM-CVS), and Bureau of Land Management Fire Effects Monitoring and Inventory Protocol (FIREMON) plots. This plot data was imputed to assign attribute conditions across the landscape based on Landsat Thematic Mapper data using direct gradient analysis and nearest neighbor models.

The Forest's existing vegetation data is appropriate for mid-scale, broad watershed-level, planning efforts and is typically insufficiently accurate for *site-specific* uses on its own. The data is summarized here at the stand-level because it is currently the best-available data, and this is the level at which management actions are implemented. Though the data should provide appropriate information at the watershed level and appropriately guide planning efforts, it is recognized that specific site locations (stands) may not be sufficiently accurate at this scale. The proportion of a watershed or broad Planning Area in the given forest condition should typically be appropriately represented, even though specific stands may be insufficiently accurate.

The data presented in this existing vegetation layer needs to be *ground-verified* at the stand-level *before stand silvicultural prescriptions are written*. As stand-level information is gathered, the data provided here will be verified and the existing vegetation layer updated to reflect the most current and best-available data [1].

III. AFFECTED ENVIRONMENT

Location
ER Planning Area is located on Eden Ridge approximately four (4) air miles southeast of Powers, Oregon. The legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27, Willamette Meridian; Coos County, Oregon.

Topography
Elevations range 2,080 to 3,540 feet. Slopes range from 0-10% on flat ridgetops to 80+% along steep inner gorges bordering Wooden Rock Creek and Coal Creek. Generally, aspect is south to southwesterly with easterly to westerly aspects along drainages and some northerly aspects in the Middle Fork Coquille River 5th-Field watershed in the northern half of the Planning Area.

Precipitation
Average annual rainfall is 80 to 100 inches (Meyer, Amaranthus, 1979). A strong maritime influence results in high winter precipitation and moderate year-round temperatures (USDA, 1995).

A. Physiography

Eden Ridge is situated within the Coast Range Physiographic province to the northeast of South Fork Coquille River. This river forms the boundary between two major physiographic provinces, the Coast Range province to the north and the much older Klamath Mountain province to the south (USDI, 1994).

The Coast Range consists of rhythmically bedded sandstone and siltstone that have only minor deformation, except along major faults. Mountains of the Coast Range are characterized by highly dissected ridges with very steep side slopes and narrow, sharply defined ridgetops. Bedrock commonly is exposed on the steeper slopes. The sedimentary rock is weakly consolidated and consequently easily weathered (USDA Soil Conservation Service, 1989). With the close maritime influence, the Coast Range has the highest average winter temperatures, the coolest summers and the greatest rainfall in Oregon (Orr et. al., 1992).

[1] Pers. conv. and document 'RRS Existing Veg metadata summary' received from Guenther Castillon, Assistant Forest Silviculturist, Rogue River-Siskiyou National Forest.

Geology
The Tyee Formation is present in large blocks on the Powers District spreading from Sand Rock Mountain to Eden Ridge, all along the south fork of the Coquille River, south from Hanging Rock, along Panther Ridge to Bald Knob. The Tyee Formation was deposited in the middle Eocene, apprx 49 million years ago (Orr et al., 1992). Tyee Formation is composed of thick rhythmically bedded, buff to greenish-gray sandstone with thin interbedded dark colored mudstone. Local coal beds are found in this unit (Meyer, Amaranthus, 1979).

Soils
Soils are derived from sedimentary bedrock, Tyee sandstone. Map B-3 displays Planning Area soil mapping. Table B-2 displays map unit composition and some soil characteristics (USDA SCS 1989).

Map B-3. Soil Mapping for Eden Ridge Planning Area

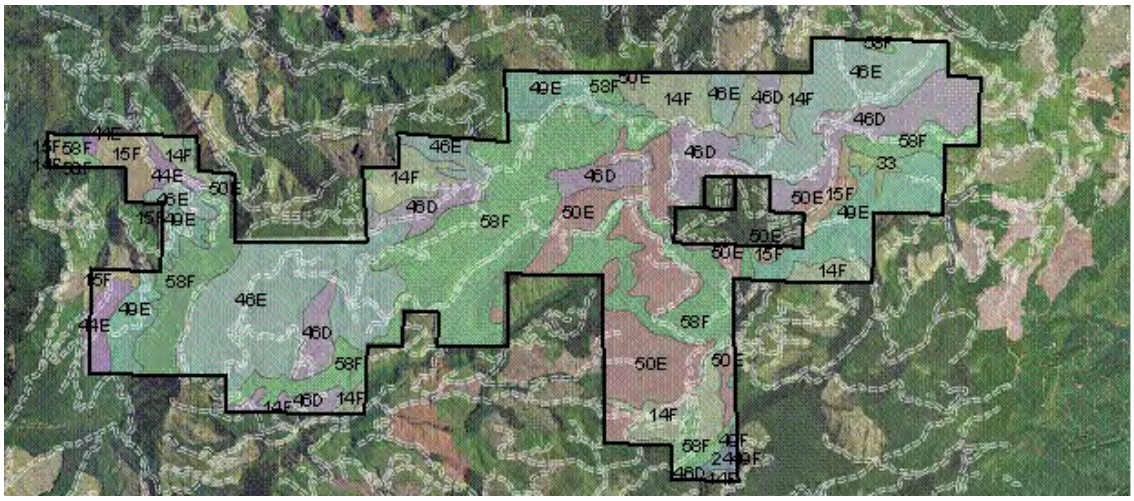


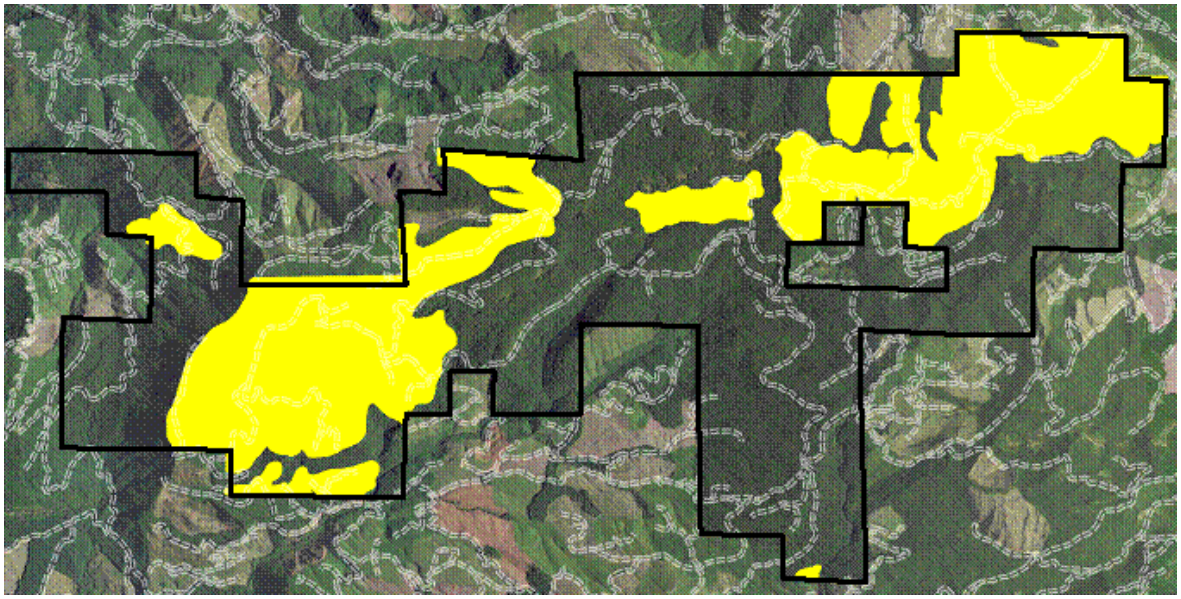
Table B-2. Soil Map Units for Eden Ridge Planning Area

MU#	Map Unit*	%Component Surface texture/thickness Depth/AWC	%Component Surface texture/thickness Depth/AWC	%Component Surface texture/thickness Depth/AWC
14F	Digger-Preacher-Umpcoos, 50-80% slopes	30% Digger, gravelly loam/6", mod deep, AWC 2-5"	30% Preacher, loam/14", deep, AWC 6.5-12.5"	25% Umpcoos, very gravelly sandy loam/3", shallow, AWC 0.5-1.5"
15F	Digger-Umpcoos-Rock outcrop, 50-90% slopes	30% Digger, gravelly loam, mod deep, AWC 2-5"	25% Umpcoos, very gravelly sandy loam/3", shallow, AWC 0.5-1.5"	25% Rock outcrop Hard fractured sandstone
24	Gardiner sandy loam	85% Gardiner sandy loam/9" deep, AWC 6-6.5"		
46D	Preacher-Bohannon loams, 3-30% slopes	50% Preacher, loam/14", deep, AWC 6.5-12.5"	30% Bohannon gravelly loam/11"mod deep/AWC 2.5-6.5"	
46E	Preacher-Bohannon loams, 30-60% slopes	40% Preacher, loam/14", deep, AWC 6.5-12.5"	30% Bohannon gravelly loam/11" mod deep/AWC 2.5-6.5"	
49E	Remote loam, 30-50% slopes	75% Remote loam/5", deep/AWC 6-8"		
50E	Remote-Digger-Preacher complex, 30-50% slopes	35% Remote loam/5", deep/AWC 6-8"	30% Digger, gravelly loam/6", mod deep, AWC 2-5"	25% Preacher, loam/14", deep, AWC 6.5-12.5"
58F	Umpcoos-Rock outcrop, 70-99% slopes	40% Umpcoos, very gravelly sandy loam/3", shallow, AWC 0.5-1.5"	25% Rock outcrop Hard fractured sandstone	

Deep = 40-60" Mod Deep = 20-40" Shallow = 0-20" AWC = Available Water Capacity
*** see 1989 Soil Survey of Coos County for inclusions in map units.**

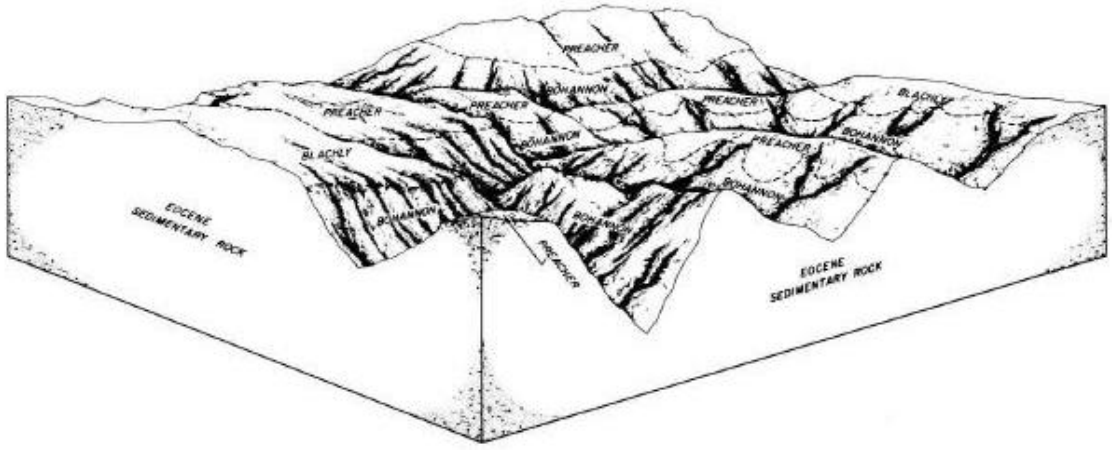
Table B-2 displays soil depth ranging from deep and moderately deep (Preacher-Bohannon) to shallow (Umpcoos-Rock Outcrop). Mapped soils are in General Soil Map Units **10 - Preacher-Bohannon**; **11 - Digger-Preacher-Remote**; and **13 - Umpcoos-Rock Outcrop-Digger**. Broad land use considerations describe productivity for Douglas-fir as high for general map unit 10, moderate for unit 11 due to soil fertility and low in unit 13 due to droughtiness and hazard of windthrow (USDA SCS 1989). Map B-4 displays areas mapped as Preacher-Bohannon, the highest productivity soils in the Planning Area.

Map B-4. Preacher-Bohannon Loams (Soil Map Units 46D and 46E)



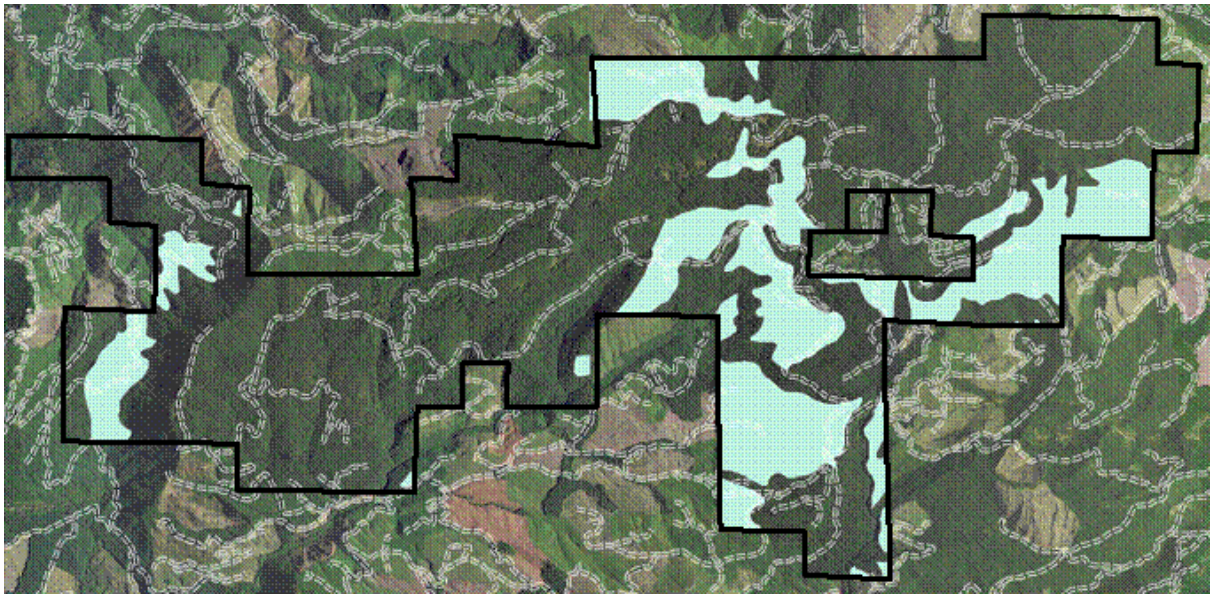
Preacher-Bohannon loams: There are approximately 2,198 acres of this general soil map unit, formed in colluviums and residuum of the Tyee sandstone, siltstone and conglomerate. Soil thickness over sandstone ranges 10-60 inches. Soil erosion is high only when the duff and litter are disturbed. Water infiltration is rapid with high available water capacity for plant growth. Site productivity is high (Gross, 1992a). Figure B-1 displays relative landform positions of Preacher and Bohannon soils.

Figure B-1. Preacher-Bohannon, Landform Positions



Map B-5 displays Remote-Digger-Preacher soil associations mapped in the Planning Area.

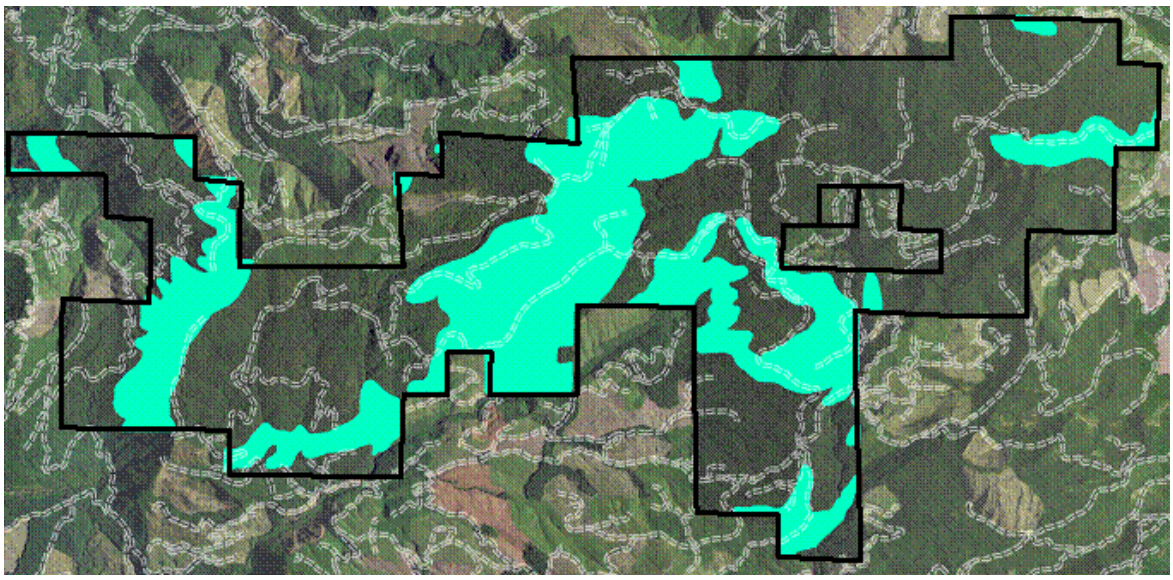
Map B-5. Remote-Digger-Preacher (Soil Map Units 49E and 50E)



Digger-Preacher-Umpcoos association and Remote loam. There are approximately 1,428 acres of this general soil map unit. Rock outcrops occasionally present. Soil thickness ranges 20-60+ inches. Erosion hazard is low when the duff and litter are undisturbed. Site productivity is high (Gross, 1992b).

Map B-6 displays Umpcoos-Rock outcrop mapped in the Planning Area.

Map B-6. Umpcoos- Rock Outcrop (Soil Map Unit 58F)



Umpcoos-Rock Outcrop-Digger. These are the shallowest soils with relatively lower site productivity and hazard of windthrow as described above for General Soil Map Unit 13. There are approximately 1,867 acres of this general soil map unit in the Planning Area.

B. Vegetation - Stand Conditions

Overstory is dominantly composed of Douglas-fir (*Pseudotsuga menziesii*) with subordinate amounts of western hemlock (*Tsuga heterophylla)* and minor amounts of Port-Orford-cedar (*Chamaecyparis lawsoniana)*. Hardwoods occur in the mid-story and understory and consist of chinquapin (*Chrysolepis chrysophylla)*, tanoak (*Lithocarpus densiflorus)* and some red alder (*Alnus rubra)* occurring in riparian areas adjacent to streams. Conifer regeneration is mostly western hemlock with more localized profuse Port-Orford-cedar seedlings/saplings associated with drainages and areas with high water tables.

Understory vegetation dominantly consists of salal (*Gaultheria shallon)*, Pacific rhododendron (*Rhododendron macrophyllum)*, tall in places (> 10 feet), and lower covers of dwarf Oregongrape (*Mahonia nervosa)*, prince's pine (*Chimaphila* Pursh), sword fern (*Polystichum munitum)*, western twinflower (*Linnaea borealis)*, woods rose (*Rosa gymnocarpa)*, evergreen huckleberry (*Vaccinium ovatum)* and some grasses.

Plant Associations
The Eden Ridge Planning Area is in the western hemlock series with understory conifer regeneration dominantly composed of western hemlock seedlings and saplings. Western hemlock is considered to be the climax forest species throughout the Coast Range Province and is most efficient in soils of the Tyee sandstone parent material (USDI 1994).

The following southwest Oregon plant associations (Atzet et al., 1996) were keyed during field reconnaissance (listed in descending order of prevalence):

Western Hemlock/Pacific Rhododendron-Dwarf Oregongrape (TSHE/RHMA3-BENE2-SWO). This plant association is the wettest of the western hemlock series and coolest of the coastal western hemlock plant associations. This association has a dense shrub layer consisting of Pacific rhododendron and salal.

Western Hemlock/Evergreen Huckleberry/Western Sword-Fern **(**TSHE/VAOV2/POMU). This plant association is found in warm and wet environments. This association generally has multiple species of ferns with Oregon oxalis ground cover and rarely occurs on ridgetops or valleys.

Western Hemlock/Salal-Pacific Rhododendron-SWO **(**TSHE/GASH/RHMA3). This plant association was keyed along the northeastern perimeter and is found in warm sites, drier than the above two plant associations and occurs commonly on upper slopes.

Current Stand Condition
Candidate stands are mostly single-storied in stem exclusion (Oliver, 1996) with scattered openings from root disease infection in the northern portion of the Planning Area that have more multi-layered structure from natural regeneration of conifers and hardwoods. Live crowns are receding from dense stand conditions with crown ratio ranging 15-20% on suppressed and intermediate crown class trees to 30-40% for dominant and codominant trees. Hardwood thickets of chinquapin are present and interspersed within stands and are associated with rocky, shallow soils (Atzet, Wheeler, 1989) and rock outcrops. Candidate stands are generally 60-70 years old. An older stand, located in the eastern corner of the Planning Area, is proposed for noncommercial treatments within Unit 900.

Relative Density

Relative Density (RD) index is used on ER for determining thinning treatment thresholds for candidate stands. RD is calculated using quadratic mean diameter and stand basal area (Curtis 1982) or by dividing a stand's existing Stand Density Index (SDI) (Reineke 1933) by a maximum SDI characteristic of the stand's species composition (Woodall 2009). The SDI maximum for Douglas-fir in Oregon of 595 was used for ER (Larsen, 2001, Daniel et al., 1979). Calculated RD numbers from the Curtis method describe stand competition as follows (Ellen 1984).

Table B-3. Stand Competition; Curtin 1982

70%+	Grossly overstocked (unmanaged mature stands)
60%	Approximate "normal" stocking
50-70%	Stand density sufficient to cause competition-related mortality
35-50%	Stand vigor and growth are maximized
<35%	Individual tree growth maximized

Previous environmental analysis of similar stands on Powers and Gold Beach Ranger Districts identified a RD of 50% as a threshold of undesirable competition-related tree mortality (USDA 2007). This RD threshold will be used for ER.

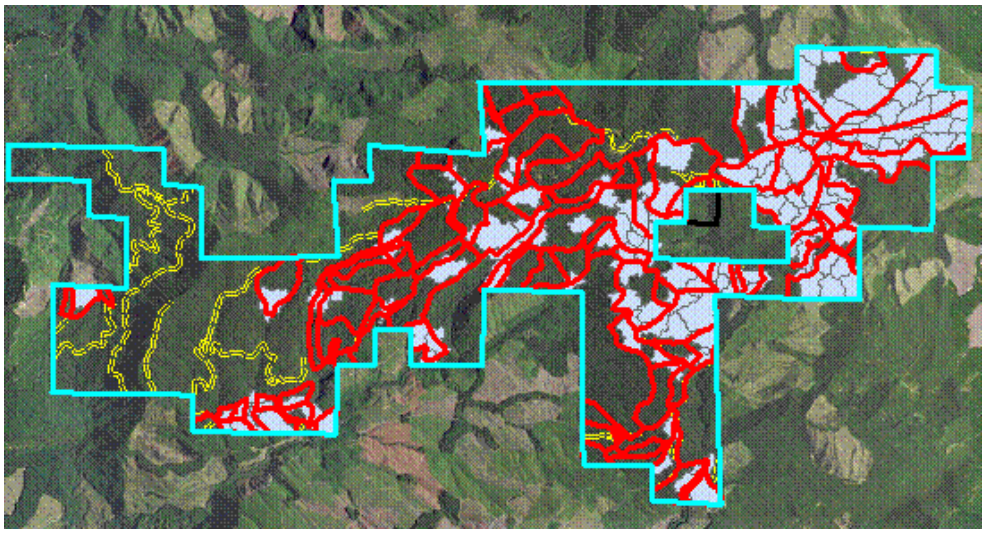
Previous timber stand exams were conducted in portions of proposed units in 1986 and 1999. Table B-4 displays previous stand summary information in 1986 and 1999 indicating dense stocking conditions exceeding treatment thresholds in most stands at the time of stand exam data collection.

Table B-4. Stand Exam Summaries, Eden Ridge Timber Sales

1986 Stand Exams - Eden Ridge					
ER Unit# (est)	**Stand Age**	**2011 Stand Age**	**Ba/ Ac**	**SDI**	**RD**
3	40	65	207	472	0.79
332, 333	43	68	253	463	0.78
333	38	63	171	309	0.52
340, 341	40	65	176	389	0.65
1999 Stand Exams - Eden Ridge					
5,7,9	53	65	283	505	0.85
5,7,9	54	66	203	377	0.63
210, 332	51	63	240	469	0.79
332, 333	54	66	253	463	0.78
332, 333	51	63	280	498	0.84
340, 341, 342	57	69	250	428	0.72
340, 341, 342	58	70	262	504	0.85
216, 343, 344	53	65	222	412	0.69
Not in proposed unit	49	61	242	425	0.71
401, 402	50	62	230	476	0.80

A data query of the Forest's existing vegetation GIS layer displays 1,996 acres exceeding 50% RD in candidate stands for Eden Ridge Timber Sales (Map B-7). Queried polygons are concentrated in the eastern portion of the Planning Area and are associated with the more productive Preacher-Bohannon soils. These areas are higher priority for treatment though computer-generated existing vegetation data will need ground verification at the stand-level for determining data accuracy and developing site-specific silvicultural prescriptions (see RRS Existing Vegetation section description).

Map B-7. Existing Vegetation Polygons Exceeding 50% RD within Candidate Stands

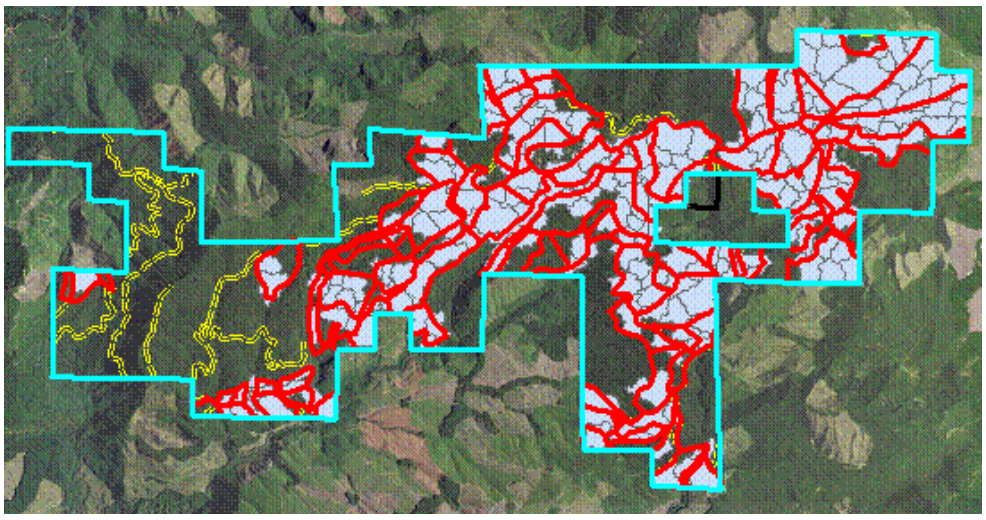


RD >= 50% in blue shaded areas

Canopy Cover

A data query of the Forest's existing vegetation GIS layer displays most candidate stands exceeding 70% canopy cover for Eden Ridge Timber Sales (Map B-8).

Map B-8. Existing Vegetation Polygons >= 70% Canopy Cover within Candidate Stands



Canopy Cover >= 70% in blue shaded areas

2009 Timber Stand Exams
Recent timber stand exams were conducted in 2009 to ground verify existing vegetation polygon information located within candidate stands (see Attachment A for polygon locations). Table B-5 displays stand exam summaries. Attributes in parenthesis are for trees greater than or equal to 6" dbh for candidate stands proposed for commercial treatments.

Table B-5. 2009 Stand Exam Summaries, Eden Ridge Timber Sales

# TSE plots	location#	stand#	acres	ER unit (apprx)	Trees / ac	Canopy Cover+	Basal Area / ac	Tree Species (based on plot data)	QMD	SDI	RD (Curtis)	Merch BF/ac*	10 yr Radial growth (20th/ inch)
3	6032030	199	17	2/201	544/ (244)	77%	333/ (333)	82%PSME 14%TSHE 4%CACH	10.6/ (15.8)	597/ (560)	0.84	68,751	9-11, avg=10
3	6048010	604	5	320/324	96/ (96)	58%	253/ (253)	100%PSME	22.0/ (22.0)	340/ (340)	0.54	58,599	15-31, avg=24
4	6048030	802	21	307	1670/ (220)	81%	376/ (372)	86%PSME 8%TSHE 6%CACH	6.4/ (17.6)	821/ (683)	0.89	106,689**	5-20, avg=11
8	6048010	747	38	906/905 (noncommercial)	152	50%	165	69%PSME, 16%CHLA, 10%TSHE, 5%CACH	14.1	264	0.44	34,493	7-28, avg=17

+ Canopy cover projected by Stand Visualization System (SVS) from inventory conditions from FVS, version 6.21, ICASCA variant.
*** Board foot volumes projected by FSVEG, Report 17.**
**** Estimated volume is unrealistic due to small sample size and 61" DF, 226' tall present on one of the plots.**
( ) Attributes for trees >= 6" dbh

High RDs, closed canopy conditions, receding live crowns and low average ten year radial growth indicate suppressed growth is occurring in densely-stocked candidate stands. This is evidenced by the presence of standing 7-16" diameter snags from self thinning in stand #802 (see snag section).

Additionally, root disease is present adjacent to stand #199 (within ER units #2 and 201, see laminated root rot section). These candidate units have a high percentage of susceptible tree species in the overstory predisposed to further infection and spread from root contact with infected trees.

C. Forest Health

Port-Orford-Cedar Root Disease
Port-Orford-cedar (POC) root disease, *Phytophthora lateralis* **(**PL) is present in small portions of the ER Planning Area within drainages and roadsides adjacent to the 5000 road and associated spur roads. Field observations noted variable amounts of standing small to medium diameter snags in PL pockets with scattered natural regeneration of POC seedlings and saplings. Infected and healthy POC seedlings occur intermingled with scattered overstory POC in proximity.

Figure B-2. Port-Orford-Cedar Disease, Adjacent to 5000 Road and Associated Spurs



Unit 326 **Unit 332** **Unit 326**

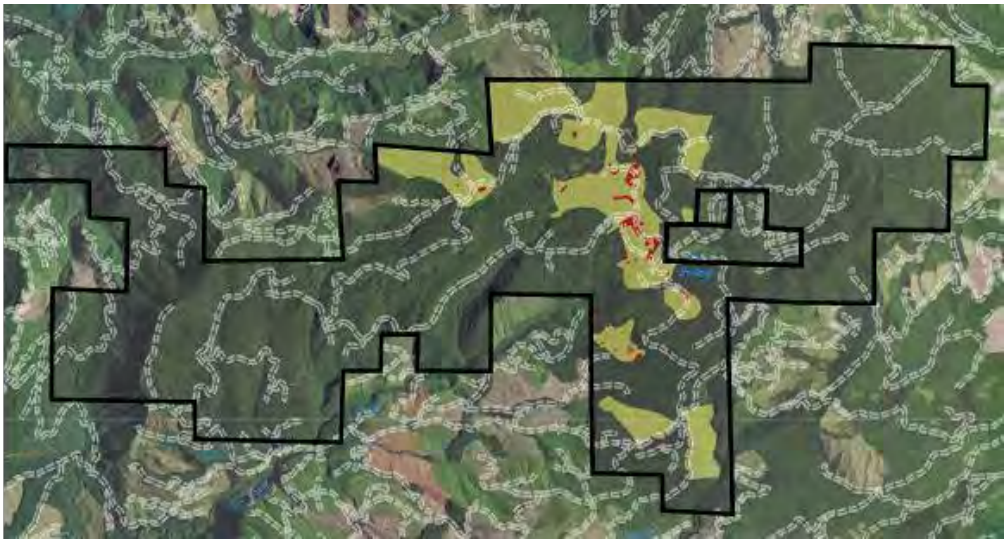
POC and occasionally Pacific yew are susceptible to PL. This disease can cause mortality within weeks of infection in the case of small trees and in one (1) to four (4) years when large trees are infected (Roth et al., 1987). Trees usually lose all foliage two (2) to three (3) years after death. In areas where the disease has been active for several years, dead and dying trees with all degrees of foliage symptoms are visible (Hadfield et al., 1986).

POC decays more slowly than other tree species making it more valuable for nutrient supply, sediment storage and dissipating flow in the channel. PL infected areas may contribute some trees to streams through mortality. Dead trees may stand for a long period of time before being delivered to streams (USDA Forest Service, 1995).

Port-Orford-Cedar Inventory

An updated POC inventory, based on field verification, was finalized in 2008 on the Powers Ranger District. Map B-9displays areas where POC exists in the Planning Area and associated PL infestation locations. POC is mostly a minor component (2-5% of the tree species composition in the overstory and midstory) except where POC was planted in the 1940s west of Doe Swamp (see EIS Appendix B, POC Report).

Map B-9. POC and PL Distribution in Eden Ridge Planning Area



(Yellow = Uninfected POC Red = Infected POC)

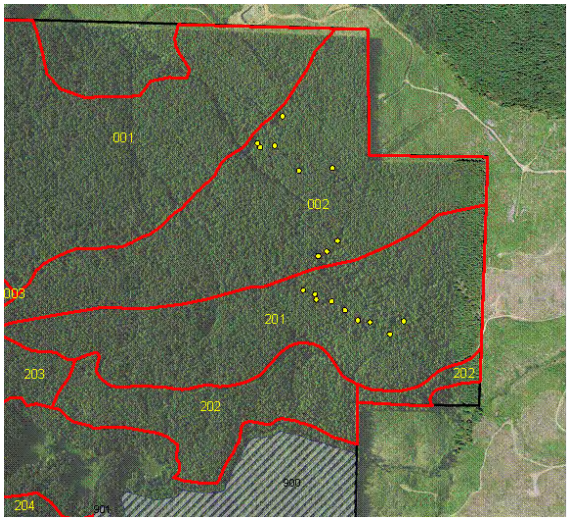
Outside of the Planning Area, dead and dying POC seedlings and saplings are present in roadside ditches and drainages in the surrounding private timber company ownership. PL has been diagnosed in dying POC regeneration alongside the 5000 Road west of the eight mile gate before entering into FS ownership (June 14, 2011, field trip with Frank Betlejewski, interregional POC manager).

Landscape-scale POC distribution should be considered to sustain healthy populations of POC on Forest Service land ownership during implementation of silvicultural treatments in Eden Ridge Timber Sales (see Management Direction). Surrounding private timber company land appears to be managed for Douglas-fir regeneration only, with little healthy POC present in planted stands. These private lands are managing their timber crop on a 40-50-year rotation (USDA 1995). The POC report for ER is contained in EIS Appendix B.

Sudden Oak Death (SOD)
Currently the Eden Ridge Timber Sales Planning Area is outside the quarantine area for SOD. If new SOD infestations result in an expansion of the quarantine area boundary to include the Planning Area, compliance with state and federal quarantine regulations will be required.

Laminated Root Rot
Laminated root rot is affecting forest health on portions of ER, particularly in the northern half of the Planning Area, in forest stands adjacent to FS Roads 5000440, 5000440003 and 5000448. Root rot pockets are approximately 1/8th to ¼ acre with larger infection centers occurring within proximity to each other in the northeastern section (Map B-10).

Map B-10. GPS Points of Laminated Root Rot Infection



Overstory tree species is dominantly composed of Douglas-fir in candidate units and across all of Eden Ridge. Stand-level infection is expected to increase as root rot pockets continue to expand in size from infected root contact with healthy susceptible trees. Disease infection extensively decays roots of susceptible host trees and either causes windthrow or mortality by destroying the tree's ability to take up water and nutrients (Hadfield et al., 1986). Windthrow is more common with laminated root rot than other root pathogens and is present in candidate stands.

Although timber volume losses caused by laminated root rot are most conspicuous as tree mortality or windthrow, tree growth may also be reduced for several years before tree death (Bloomberg and Reynolds 1985, Thies 1983). For commercial forest land in Oregon, reduction in wood volume is estimated to be 40-70% on areas affected (Goheen and Hansen, 1993).

Figure B-3. Laminated Root Rot in Eden Ridge Planning Area



Unit 2



Unit 201

Laminated root rot spreads by root contact between uninfected trees when living roots penetrate infected roots. In pole-sized and larger trees, the root disease can spread outwards an average rate of one (1) foot per year. This pathogen can live saprophytically in infected dead roots for fifty (50) years or more. Tree species present in candidate stands are listed in decreasing order of susceptibility:

Douglas-fir and white fir > western hemlock > Port-Orford-cedar

All hardwoods are immune

Mistletoe

Hemlock dwarf mistletoe (*Arceuthobium tsugense*) infection is present in a very few scattered overstory western hemlock trees in candidate stands. Effects are usually minor until hosts reach ages in excess of 120 years (USDA Forest Service, 2008). Heavier mistletoe infection was observed in an older western hemlock stand located on a ridgetop within noncommercial Unit# 900. Noncommercial treatments to sanitize mistletoe from this stand should be carefully considered as this stand may be a unique feature of vegetative diversity at the landscape-scale in the context of surrounding younger forests dominantly composed of Douglas-fir, which is a non-host to this species of dwarf mistletoe. Chances of lateral spread are minimal.

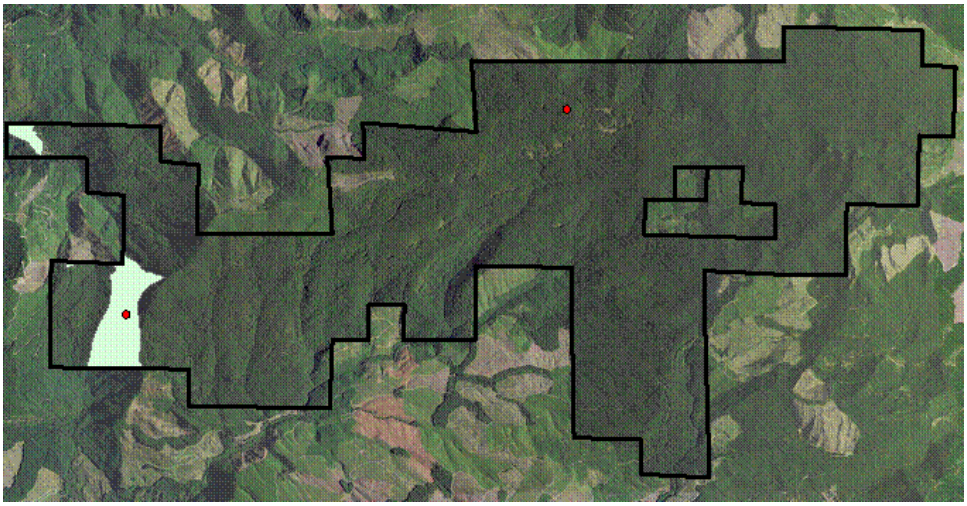
Windthrow

In addition to windthrow trees being present in laminated root rot pockets, windthrown trees are evident along the perimeter adjacent to large openings created by timber harvest on private timber company lands. Windthrow creates pockets of variable-sized down wood, particulary where susceptible forest stands have a high percentage of western hemlock in the overstory tree species composition (e.g. Unit 213). Windthrow is also present on landforms with shallow soils (i.e., Umpcoos-Rock Outcrop-Digger).

Fire

The fire occurrence rate in the South Fork Coquille drainage is relatively low for lightening and human-caused fires. The fire occurrence interval for western hemlock series in the Klamath region is about 65 years (USDA 1995). Previous reported fires mostly occur in the west half of the ER Planning Area (Map B-11).

Map B-11. Previous Fires on Eden Ridge Planning Area



1964	**Debris Burning**	**129 acres**	**1965**	**Campfire**	**20 acres**
1970	**Lightening**	**0.1 acres**	**2001**	**Lightening**	**0.5 acres**

D. Stand History

Forest stands in the Eden Ridge Planning Area were extensively railroad logged in the 1930s and 1940s with steam donkeys as railroad lines were constructed through the area. Harvested areas were likely covered in slash or burned with abundant quantities of residual down wood still present today in many proposed units. Some areas in the northern section of the Planning Area appear to have incurred a forest fire during the logging operation[2]. Large contiguous areas of post-harvest early seral vegetation are visible on 1943 air photos taken of Eden Ridge (see compilation EIS Chapter III, subsection 14).

Approximately 10% of the Planning Area has documentation of post-harvest reforestation treatments (Table B-6). Historical records for ten (10) plantations documented 648 acres of tree planting between 1939 and 1943. Conifer species planted were Douglas-fir and Port Orford cedar. Approximately 232 acres of understocked areas from poor seedling survival within plantations were naturally regenerated and later determined stocked between 1954 and 1963.

Table B-6. Plantation Data in Eden Ridge Planning Area

Unit	Year Logged	Year Planted/ Acres	Tree Species Planted	Year Site Prep. or Release	Year Natural Regen/ Acres
P-1	Early 1900's	1939/44 ac	30,000 POC	1947	1954/11 ac
P-2	Early 1900's	1940/36 ac	13,500 POC	Unknown	1954/14 ac
P-3	Early 1900's	1940/37 ac	25,300 POC	Unknown	1954/15 ac
P-4	Early 1900's	1941/144 ac	98,100 POC	1937	1954/68 ac
P-5	Early 1900's	1942/57 ac	28,000 POC	1937	1954/27 ac
P-6	Early 1900's	1942/100 ac	74,000 DF	Unknown	1954/23 ac
P-7	Early 1900's	1942/40 ac	28,000 DF	Unknown	1954/18 ac
P-8	Early 1900's	1946/48 ac	33,000 POC	1937	1963/24 ac
P-9	Early 1900's	1946/127 ac	70M DF	1937	1954/26 ac
P-10	Early 1900's	1946/15 ac	10M DF	1937	1954/5 ac; 1963/1 ac
	Total Acres:	**648 ac**			**232 ac**

[2] Silver Doe Timber Sale, Silvicultural prescription, Stand Area Description.

There are no records that stocking level control occurred on these plantations or naturally regenerated stands during the early stages of stand development. Field reconnaissance noted many areas that appear planted or precommercially thinned due to the spatial arrangement of overstory trees, particularly in the northeast portion of the Planning Area.

Figure B-4. Planted Stands in Northeast Portion of Planning Area



Unit 002

Long-time residents of Powers stated that aerial seeding was a post-harvest treatment implemented on Eden Ridge[3] though no records currently exist to validate these statements.

Past Management

Table B-7 lists previous commercial timber sale activity within the Planning Area (since historical railroad logging in the 1930s and 1940s). None of the candidate stands for Eden Ridge Timber Sales are located within these previous contemporary timber sale units.

Table B-7. District Records of Commercial Timber Sale Activity within Planning Area

Timber Sale	Year	Remarks
Silver Doe Thin	2010-current	Skinny Doe units 5, 6, 7
Backwoods Thin	2000-2006	
Silver Doe ATV #1	2006	Skinny Doe unit 19
Doe Swamp Thin	1997-2000	
Sweeney Butte HCC	1969	southeast of Backwoods Thin # 6
Oversite Salvage	1961	along south boundary, east of 5000420
Unnamed HCC	1957	east of Backwoods Thin # 1

[3] Pers. conv. with Eric Martz, Powers Ranger District silviculturist (retired).

E. Large Woody Material and Snags

Observations based on an informal walk through candidate stands prior to 2009 by the previous district silviculturist noted Large Woody Material (LWM), 20 inch plus diameter at breast height (dbh), limited on the forest floor. Where observed, LWM was in the class 4 and 5 range. Standing snags over 16 inch diameter are also limited with most snags being within the 8 to 11 inch diameter range.

Current Condition – Down Wood

Stand self-thinning is evident in many stands proposed for treatment. High RDs exceeding stated density thresholds has caused tree mortality to occur in the suppressed and intermediate crown class trees. Correlations between living tree biomass and deadwood biomass emerge when stands exceed 75% RD (Woodall 2009). Down wood boles from self-thinning are smaller in diameter than historical logging slash, present around old railroad grades and in riparian areas.

Figure B-5. Down Wood Conditions from Historical Railroad Logging



ER Unit 326



ER Unit 1

Root rot infection caused by laminated root (*Phellinus weirii*) contributes more localized pockets of down wood, particularly in the northern half of the ER Planning Area. Infected areas resemble between 1-DF-3 and 2-DF-3 in the Pacific Northwest photo series (Maxwell 1980) which estimates 59 to 111 tons per acre of forest residue respectively. Laminated root rot centers are more susceptible to windthrow (Hadfield et al. 1986) and may supply important concentrations of down woody material as infected dead trees do not remain standing for very long.

In addition to laminated root rot centers, windthrown trees are evident along the perimeter of the Planning Area adjacent to large openings created by timber harvest on private timber company lands. Down wood from windthrow is also present on landforms with shallow soils (e.g. Umpcoos/Rock outcrop).

Down woody material information using Brown's transect protocol was recorded during 2009 stand exam data collection (see attachment A, for vegetation polygon locations). Table B-8 displays quantitative downed woody data for stands sampled. Down woody material present on stand exam plots is mostly associated with laminated root rot pockets and old railroad logging slash.

Table B-8. Eden Ridge 2009 Stand Exams - Down Woody Data (FSVEG Report 19)

Location#	stand#	ER Unit # (apprx)	Tons/ac (0-0.24")	Tons/ac (0.25-0.99")	Tons/ac (1-2.99")	Sound Tons/ac (3+")	Rotten Tons/ac (3+")	Tons / ac (ALL)	Ave. Diam. 3+ Rotten	Pieces/ acre (ALL)	Photo Series (1980)
6032030	199	2/201	0.64	1.98	3.87	0.00	43.87	50.36	19.60	168	1DF3 4DF4
6048010	604	320/324	0.37	0.46	1.94	0.00	4.98	7.74	7.60	45	2DF4 3DF4
6048030	802	307	0.59	1.80	2.90	1.41	8.05	14.75	6.00	533	2DF4 3DF4 4DF4
6048010	747	906/905	0.30	1.91	5.58	0.41	60.49	68.70	16.70	312	4DF4 3MC3 1MC4 1DFHD4 4DFHD4

In riparian areas of the South Fork of the Coquille watershed, large wood is delivered to stream channels by debris flows, streamside landslides, recruitment from adjacent riparian forests, and transport from upstream sites. Federal and private activities removed massive amounts of wood for salvage following the 1964 flood. Standing large wood has been lost from riparian areas primarily by harvest, scouring debris flows and salvage following windthrow (USDA Forest Service 1995).

Current Condition – Snags

Currently there are scattered snags in ER due to stand density, past fires and forest disease conditions causing tree mortality. Table B-9 lists standing dead (snags) present on the 2009 stand exam plots.

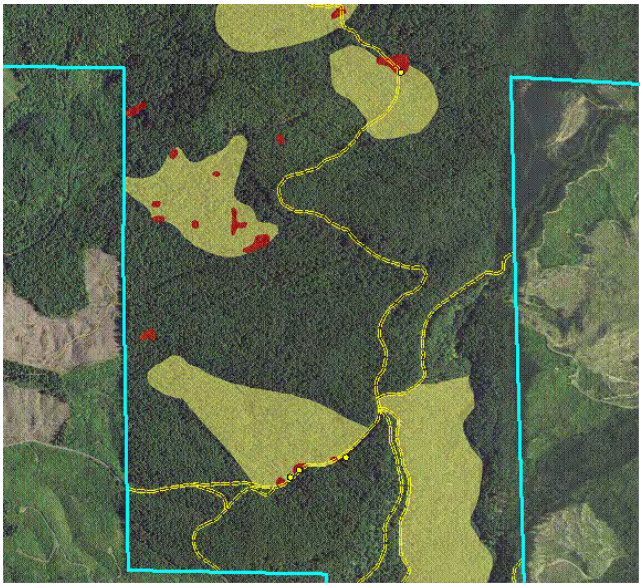
Table B-9. 2009 Stand Exams Standing Dead (Snags) from Plot Data (FSVEG Report 19)

location#	stand#	ER Unit # (apprx)	Total Stand Dead	Species	DBH	Hgt	TPA
6032030	199	2/201	0				
6048010	604	320/324	0				
6048030	802	307	5	PSME	7"	15'	37.4
				PSME	11"	64'	15.2
				PSME	13"	97'	10.8
				PSME	16"	78'	7.2
				PSME	15"	89'	8.1
6048010	747	906/905	2	PSME	28"	86'	0.8
				PSME	42"	38'	0.4

Snags are deficient in two of the vegetation polygons inventoried in the eastern portion of the Planning Area, small 7 to 16 inch snags are present in an older stand in the western portion near Coal Creek and scattered larger 20+inch snags are present in the noncommercial units west of the 5000 Road.

Field reconnaissance in combination with GPS waypoints during summer 2011 noted clumps of five (5) to twelve (12), four (4) inch to thirty (30) inch diameter standing snags occurring in Port-Orford-cedar root disease pockets (*Phytophthora lateralis)* in the southern portion of the Planning Area adjacent to the 5000 road (Map B-12).

Map B-12. Standing Snags Occurring in *Phytophthora lateralis* Pockets



Most of the snags are < 12 inch diameter. Larger 24 inch to 32+inch diameter snags were observed interspersed in the overstory north of this road and below the southernmost waypoint. This area is currently outside candidate units proposed for commercial treatments and will be assessed for POC treatment needs and possible funding in the Sale Area Improvement (KV) plan. POC is not considered a desirable tree species for wildlife use as snag habitat[4].

Land And Resource Management Plan (LRMP)

The Siskiyou National Forest LRMP (1989) is the existing policy direction for snags and coarse down wood objectives. However, scientific studies on wildlife habitat (Johnson, O'Neil, 2001) have determined that snag retention based on biological potential is a flawed technique[4]. This technique was used for determining snag requirement standards and guidelines in the LRMP.

The Southwestern Oregon Provincial Interagency Executive Committee requested a province-wide process be developed for determining levels of snags and down woody material in forests in the late 1990's. As a result, landscape stratification based on Plant Association Groups (PAGs), was developed across the Forest.

A key element of desired conditions for PAGs is down dead woody material. Existing large woody material varies depending on past logging operations and PAG in southwest Oregon. Desired levels of dead wood were modeled by PAG, based on Ecology Plot data, adjusted by past conditions with consideration of the DecAID[5] advisory system. These models were intended to be used as a baseline for managers to develop prescriptions for landscape management. Treatment units proposed for ER are within the maritime western hemlock PAG model derived from this process (Siskiyou NF, 2000).

[4] Personal conversation: Dave Clayton, Rogue River-Siskiyou NF Wildlife Biologist, January 18, 2012

[5] DecAID is a wood advisory tool for Washington and Oregon forests and is based on *Habitat Model for Wildlife Tree Retention*. USDA Forest Service, Region 6, Portland Oregon: Kim Mellen (editor) 2003. The title can be read as decayed wood advisor and management aid "decay-aid" or "decision-aid".

Ecological processes within PAGs vary due to changes in climate, topography and soil. Each PAG has a mean and range for snags and down wood derived from ecological plot data. These recommended means and ranges (standard deviations) are broken into diameter classes: 6 to 9 inches, 10 to 19 inches and 20 inches and greater and into decay classes: 1 through 5 (White, unpubl.).

Because the Forest's PAG data is at a finer scale, the Forest is currently using plant series data from new PAG classifications, delineated by geographical regions (Cascades, Siskiyous, Coast), for determining snag and down wood objectives on the Rogue River-Siskiyou National Forest[6].

Snag Recommendations

The LRMP specifies a desired snag quantity of 185 to 235 snags per 100 acres delineated into hard and soft 11+, 15+, 17+ and 25+ snag diameter classes to maintain habitat capability of woodpeckers (indicators of cavity nesting species) at not less than 60% of potential population levels (LRMP, IV-33 to 36). Snag quantities are dependent on woodpecker species present in the treatment area.

As previously discussed, the Forest is choosing to use plant series data derived from new PAG classifications to determine snag and down wood objectives. Table B-10 displays snag data for the western hemlock plant series in the coast geographic region.[7] This data reflects snag quantities present in older stands derived from PAG inventory plots and represents desired snag quantities to develop in candidate units post-treatment.

Table B-10. Snag Data for Western Hemlock Plant Series

COAST - Snags					
SERIES	Diameter	Minimum TPA	Maximum TPA	Mean TPA	Standard Deviation TPA
Western Hemlock	0-10"	0	211.73	28.64	49.45
Western Hemlock	11-19"	0	42.74	7.93	12.51
Western Hemlock	20"+	0.38	16.83	6.27	4.37

Large snags over 20 inch diameter are particularly essential for forest function. In addition, at least 96 wildlife species in Oregon and Washington are associated with snags in forests, using snags for shelter, roosting and hunting. Most species use snags greater than 14 inch diameter (Rose et al. 2001). Ridges, upper thirds of slopes, and riparian areas or lower third of slopes are very important for late-successional dependent species. Snags in various size classes also are important to the recruitment pathways of the down, coarse materials important to soils.

In areas where past management has resulted in a lack of large snags needed for cavity nesting species, snags would be created from live trees left in stands. Whenever possible, creation of a minimum of 2 or more snags per acre over 20 inch dbh within all commercially treated units should be part of each silvicultural prescription. Creation can be through girdling, topping the trees with chain saws, blasting, inoculation with heart rot fungi, or deliberate injury. These methods would open the trunk to development of a hollow core used by woodpeckers and a variety of other birds, mammals, and other wildlife.

[6] Pers conv. David Clayton, Rogue River-Siskiyou National Forest Wildlife Biologist, January 18,2012

[7] Hochhalter (et al.) Ecology Group, Southwest Oregon Province, plant series data from PAG plots.

Large Wood Recommendations
As with snags, down logs are important for wildlife and aquatic ecosystem function. In addition, large coarse woody material is particularly important to maintaining and holding soils in place. The following table displays down wood data (pieces per acre, tons and size) for the western hemlock plant series in the coast geographic region[8] and represents desired down wood quantity and size objectives.

Table B-11. Down Wood Data for Western Hemlock Plant Series

COAST – Down Wood													
SERIES	Diameter	Min PPA	Max PPA	Mean PPA	Std Dev. PPA	Min TONS	Max TONS	Mean TONS	Std Dev TONS	Min LENGTH	Max LENGTH	Mean LENGTH	Std Dev LENGTH
Western Hemlock	0-10"	0	428	110	131	0	12	3	3	0	275	63	59
Western Hemlock	11-19"	0	184	52	46	0	35	11	8	5	120	64	37
Western Hemlock	20"+	0	204	35	46	0	116	38	37	6	367	111	94

Under the Action Alternatives, snags and down wood would be retained to support ecosystem function (see Wildlife Report). Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem (SIS LRMP 1989). LWM already on the ground would be protected from disturbance to the greatest extent possible during logging and other land management activities that might destroy the integrity of the substrate.

Evaluations would occur after density management treatments to assess potential needs for snag/down wood creation. In areas lacking adequate amounts of down woody material (include snags in calculations), green trees may be felled. Any leave trees damaged during harvest operations would be left standing or felled for safety, but left on site. The intent is to provide future snags or trees with cavities or deformities utilized by wildlife.

IV. MANAGEMENT DIRECTION

Candidate stands proposed for treatment are located on suitable forest land designated as Management Areas 14 (*General Forest*) and 11 (*Riparian*) in the Siskiyou National Forest Land and Resource Management Plan (USDA, 1989) and as *Matrix* or *Riparian Reserve* land allocations as amended by the 1994 Northwest Forest Plan. No *Late-Successional Reserves* or other land allocations are proposed for treatment in this Planning Area**.**

The primary management goal for *General Forest* is to obtain full yield timber within the capability of the land and the management requirements of other resources (LRMP, IV-139). Most timber harvest and other silvicultural activities would be conducted in that portion of *Matrix* with suitable forest lands, according to standards and guidelines (NWFP, C-39). Applicable Standards and Guidelines for *Matrix*:

> Provide specified amounts of coarse woody debris in matrix management. Manage to provide a renewable supply of large down logs well distributed across the matrix landscape in a manner that meets the needs of species and provides for ecological functions. Develop models for groups of plant associations and stand types that can be used as a baseline for developing prescriptions.
>
> Coarse woody debris already on the ground should be retained and protected to the greatest extent possible from disturbance during treatment which might otherwise destroy the integrity of the substrate.

[8] Hochhalter (et al.) Ecology Group, Southwest Oregon Province, plant series data from PAG plots.

The management goal for *Riparian* is to manage these areas under the principles of multiple-use while maintaining the integrity of these riparian ecosystems which includes streambank stability, vegetation, terrestrial and aquatic habitats (LRMP, IV-126). The primary treatment objective in *Riparian Reserves* is to benefit riparian area and wetland functions, including future recruitment of large woody debris into streams (see hydrology report for more information on Management Direction in riparian areas). Applicable standards and guidelines for timber management in Eden Ridge Timber Sales:

> Apply silvicultural practices for *Riparian Reserves* to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

For the portion of *Riparian Reserves* located within Key Watersheds, standards and guidelines for Key Watersheds as well as standards and guidelines for Riparian Reserves apply (NWFP, C-30). Applicable Standards and Guidelines for Key Watersheds (NWFP, C-7):

> Outside of Roadless Areas – Reduce existing system and non-system road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds.

Additionally the programmatic Record of Decision and LRMP amendment for *Management of Port-Orford-Cedar in Southwest Oregon, Siskiyou National Forest* (USDA 2004) amended Standards and Guidelines to have the following objectives for management of Port-Orford-cedar:

- Maintain POC on sites where the risk for infection is low.
- Reduce the spread and severity of root disease in high-risk areas to retain its ecological function to the extent practicable.
- Reestablish POC in plant communities where its numbers or ecosystem function have been significantly reduced.
- Reduce the likelihood of root disease becoming established in disease-free 7th field watersheds.

Project-specific NEPA analysis will appropriately document the application of the Port-Orford-Cedar risk key and the consideration of the available management practices (see POC Report, EIS Appendix B). Application of the risk key and application of resultant management practices will make the project consistent with the mid- and large-geographic and temporal-scale effects described by the SEIS analysis, and will permit the project analysis to tier to the discussion of those effects (ROD, p 33).

A. Desired Conditions

The desired conditions for candidate stands in Eden Ridge Timber Sales is sustainable, cost-efficient timber production, within LRMP standards and guidelines, to support current and future economies while treating to improve forest health and resiliency.

The desired condition for *Riparian Reserves* within candidate stands is for these riparian areas to continue to serve their existing aquatic ecosystem protection functions (effective stream shade, bank stabilization, provision of wood and leaf litter to the stream channel, etc.) at lower tree densities that are on a trajectory to develop high quality, sustainable riparian habitat.

B. Silvicultural Objectives

The primary silvicultural objective for ER is to control existing dense tree stocking conditions within commercial stands to develop more sustainable, full yield timber production on suitable lands while harvesting projected density and disease-related tree mortality in support of the Forest's Probable Sale Quantity.

A secondary objective is to treat subordinate amounts of root disease infection to improve forest health and sustain or increase tree growth and vigor by retaining or planting non-host tree species. Riparian Reserve treatments will be designed to protect or improve riparian stand conditions to meet Aquatic Conservation Strategy objectives stated in the NW Forest Plan.

V. SILVICULTURAL TREATMENTS

In order to produce sustained full yield timber from these stands, intermediate harvest treatments using variable density thinning (VDT) techniques are proposed.

A. Variable Density Thinning (VDT)

VDT uses a combination of low and crown thinning to release larger dominant and co-dominant trees. Spacing between trees is variable depending on tree diameter distribution on the ground and thinning intensity. Individual stand characteristics will be heterogeneous and post-harvest tree spacing will not have a rigid, grid-like appearance.

Intensity of density management treatments ranges light (150-225 trees per acre [tpa]), medium (90-150 tpa) or heavy (50-90 tpa) thinning with a target RD of approximately 35-50%. Tree species composition is maintained or enhanced by favoring a diverse mixture of conifers and hardwoods.

Stocking level control to reduce stand density to a RD of 35-50% will allow stand vigor and growth to be maximized (Ellen 1984) by creating more growing space for retained trees and controlling inter-tree competition for site resources. Retained trees will ideally have 40% live crown ratios following treatment to respond to increased availability of site resources. A live crown ratio of 40% represents a generally acceptable level of individual tree vigor (Daniel et al. 1979).

Although maximum gross production in coastal Douglas-fir is obtained when RD exceed 40%, thinning to relative densities below this optimum may produce less growth per unit area but this will be offset by greater growth per tree (Drew and Flewelling,1979). Reducing treated stands to this target 35-50% RD range will achieve the desired future condition of sustainable, cost-efficient timber production while treating candidate stands to improve forest health and resiliency.

Future thinning treatments would occur when stand density grows back to 50% RD or when dominant and codominant trees have about 40% live crown ratios. For Douglas-fir, a live crown ratio of 40% appears to correspond with a SDI of about 50% of the maximum SDI (i.e., 50% RD) (Long, 1985).

Untreated candidate stands would continue on a track of suppressed stand growth and lost economic opportunities to capture density and disease-related tree mortality.

B. Forest Vegetation Simulator

Stand growth attributes were projected with Forest Vegetation Simulator (USDA FS: Dixon 2002; Keyser 2008 (revised October 4, 2011) on existing vegetation polygons within candidate stands proposed for commercial thinning treatments (see Table B-5 -2009 Stand Exam Summaries). Stand #199 is presented as an example and the following figures and tables are stand data for trees >= 6" dbh from simulations for no treatment and thinning from below treatments to 35% and 45% RD respectively. Stand Visualization System (McGaughey, 1997*)* was used to visually display no harvest and harvest treatments (i.e., no treatment and 35% RD treatment).

Figure B-6. Stand #199 (within ER Units 2/201)

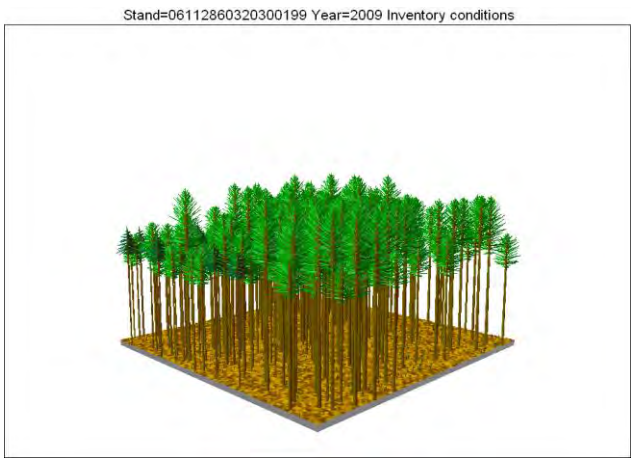
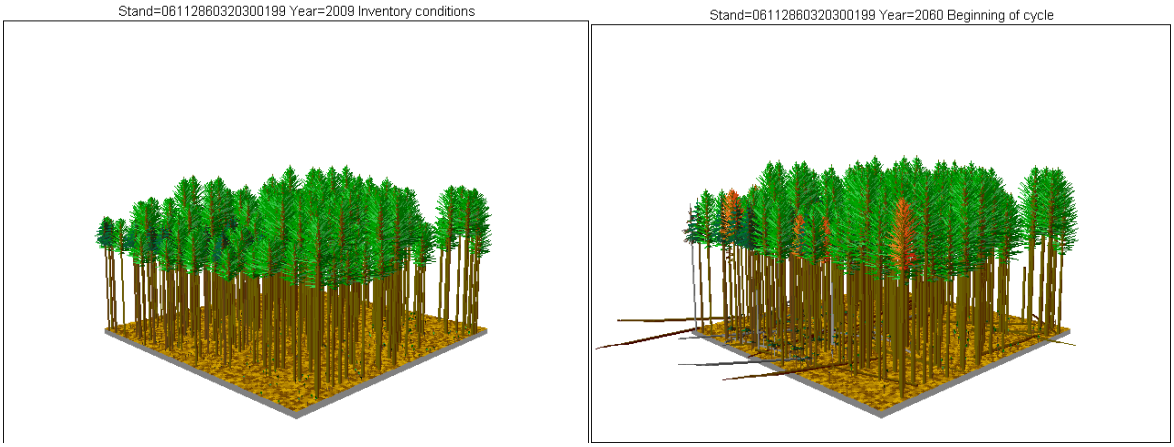




Table B-12. Stand #199

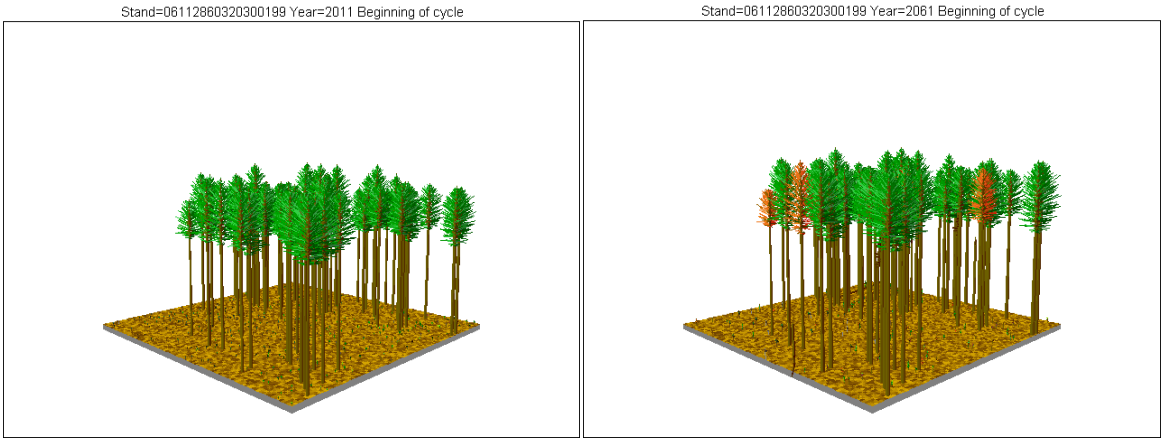
Existing Condition: Location-Stand 6032030-0199					
Age	Trees/ acre	Basal Area/ acre	Quadratic Mean Diameter	Relative Density (Curtis)	Canopy Cover
52	243	335	15.9	84	77
No Treatment - projected growth					
62	238	363	16.7	89	79
72	220	374	17.7	89	79
82	195	374	18.8	86	78
92	176	374	19.8	84	77
102	158	373	20.8	82	76
Thin to 35% Relative Density - post harvest					
52	68	150	20.1	33	43
Thin to 35% Relative Density - projected growth					
62	68	168	21.3	36	46
72	68	186	22.5	39	48
82	67	206	23.7	42	51
92	67	225	24.8	45	53
102	66	243	25.9	48	54
Thin to 45% Relative Density - post harvest					
52	93	189	19.3	43	51
Thin to 45% Relative Density - projected growth					
62	92	210	20.4	46	54
72	92	231	21.5	50	57
82	92	253	22.5	53	59
92	89	270	23.5	56	60
102	87	286	24.5	58	62

Figure B-7. No Treatment 6032030-0199



Current Conditions **Projected 50 years**

Figure B-8. Thin to 35% Relative Density 6032030-0199

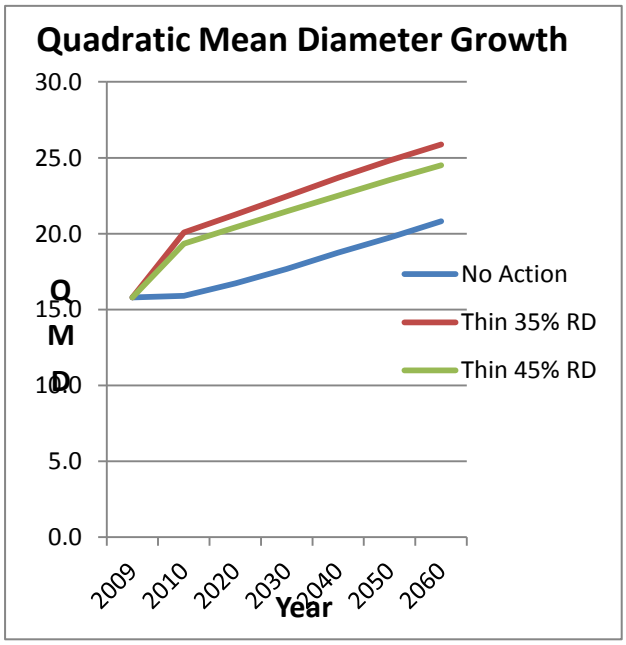


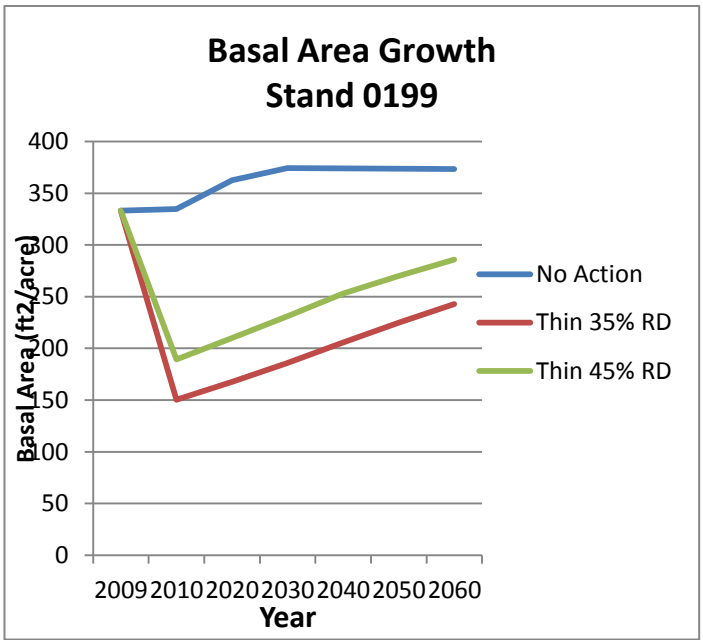
Post Harvest **Projected 50 years**

Table B-13. Stand 6032030-0199; 50 Year Stand Summary

No Treatment			35% RD Thin			45% RD Thin		
Stand Attribute	**Current Condition**	**50 years post-harvest**	**Stand Attribute**	**After Harvest**	**50 years post-harvest**	**Stand Attribute**	**After Harvest**	**50 years post-harvest**
Relative Density	84	82	Relative Density	33	48	Relative Density	43	58
Trees per acre	243	158 (-85)	Trees per acre	68	66 (-2)	Trees per acre	93	87 (-6)
Canopy Closure	77	76	Canopy Closure	43	54	Canopy Closure	51	62
QMD Growth	15.9	20.8 (+4.9)	QMD Growth	20.1 (+4.2)	25.9 (+5.8)	QMD Growth	19.3 (+3.4)	24.5 (+5.2)
Basal Area per acre	335	373 (+38)	Basal Area per acre	150	243 (+93)	Basal Area per acre	189	286 (+97)
			Retain 45% of BA, Remove 34,937 mbf/ac			Retain 56% of BA, Remove 27,187 mbf/ac, HTH again in 20 yrs (RD>=50)		

Figure B-9. Growth Data Stand #199





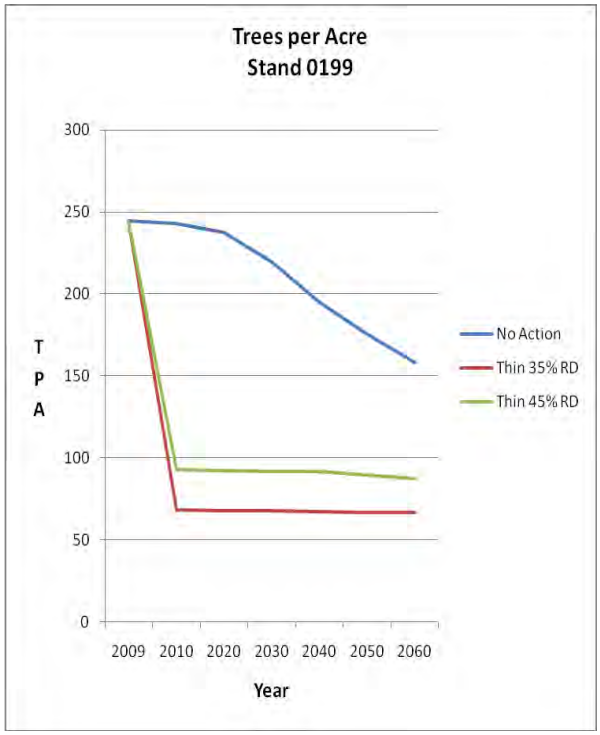


Figure B-10. Stand #604 (within ER Unit 320/324)

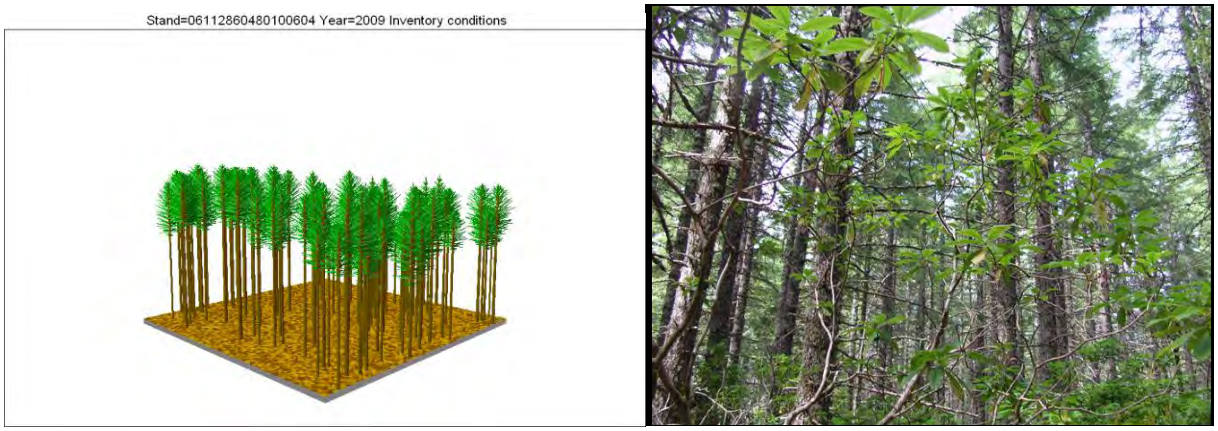
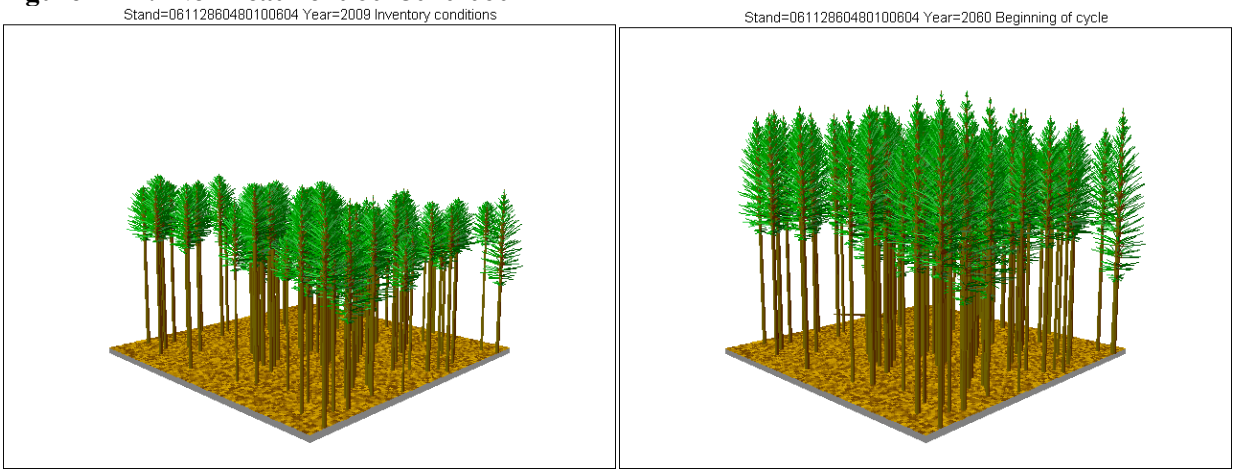


Table B-14. Stand #604

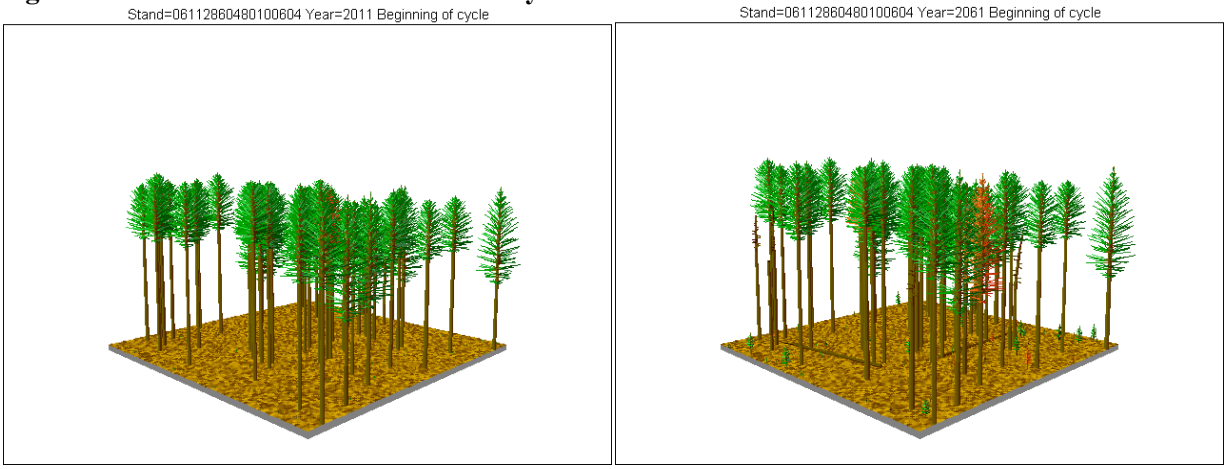
Existing Condition: Location-Stand 6048010-0604					
Age	Trees/ acre	Basal Area/ acre	Quadratic Mean Diameter	Relative Density (Curtis)	Canopy Cover
56	96	256	22.2	54	57
No Treatment					
66	95	283	23.3	59	61
76	95	310	24.5	63	63
86	94	337	25.6	67	66
96	94	365	26.7	71	68
106	92	388	27.8	74	69
Thin to 35% Relative Density - post harvest					
56	51	177	25.3	35	43
Thin to 35% Relative Density - projected growth					
66	51	197	26.7	38	46
76	50	217	28.1	41	49
86	50	238	29.5	44	51
96	50	260	30.9	47	53
106	50	281	32.2	49	55
Thin to 45% Relative Density - post harvest					
56	72	220	23.7	45	50
Thin to 45% Relative Density - projected growth					
66	72	243	24.9	49	53
76	72	267	26.2	52	56
86	71	291	27.4	56	59
96	71	315	28.5	59	61
106	71	339	29.7	62	63

Figure B-11. No Treatment 6048010-0604



Current Conditions **Projected 50 years**

Figure B-12. Thin to 35% Relative Density 6048010-0604

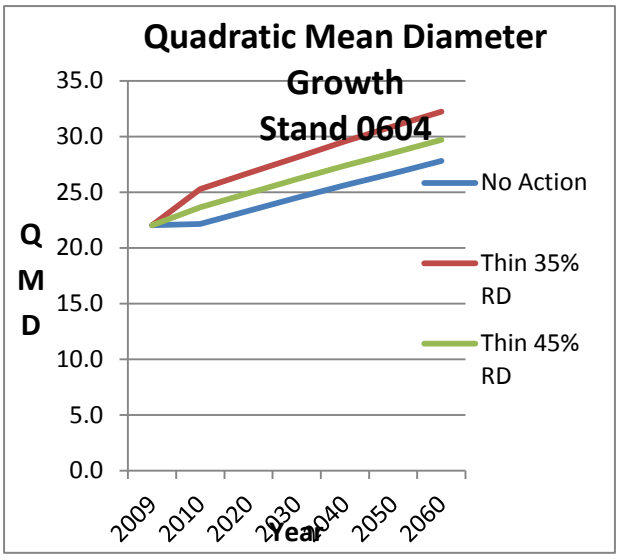


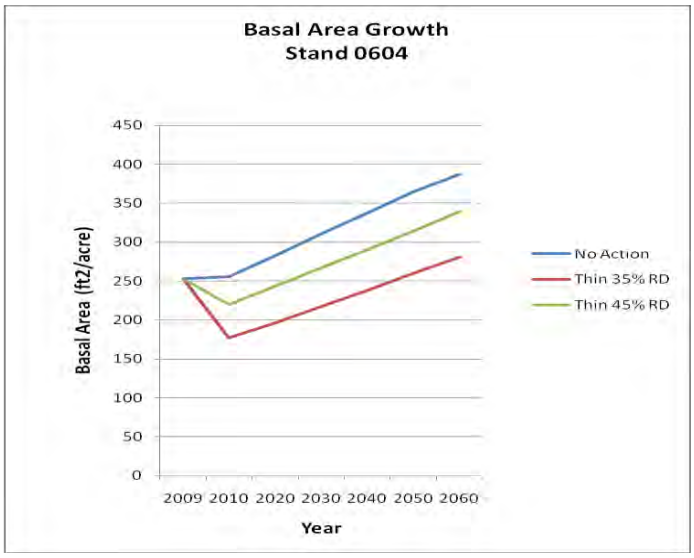
Post Harvest **Projected 50 years**

Table B-15. Stand 6048010-0604; 50 Year Stand Summary

No Treatment			35% RD Thin			45% RD Thin		
Stand Attribute	**Current Condition**	**50 years post-harvest**	**Stand Attribute**	**After Harvest**	**50 years post-harvest**	**Stand Attribute**	**fter Harvest**	**50 years post-harvest**
Relative Density	54	74	Relative Density	35	49	Relative Density	45	62
Trees per acre	96	92(-4)	Trees per acre	51	50 (-1)	Trees per acre	72	71 (-1)
Canopy Closure	57	69	Canopy Closure	43	55	Canopy Closure	50	63
QMD Growth	22.2	27.8 (+5.6)	QMD Growth	25.3 (+3.1)	32.2 (+6.9)	QMD Growth	23.7 (+1.5)	29.7 (+6.0)
Basal Area per acre	256	388 (+132)	Basal Area per acre	177	281 (+104)	Basal Area per acre	220	339 (+119)
			Retain 69% of BA, Remove 15,425 mbf/ac			Retain 80% of BA, Remove 6,729 mbf/ac, HTH again in 20 yrs (RD>=50)		

Figure B-13. Growth Data Stand #604





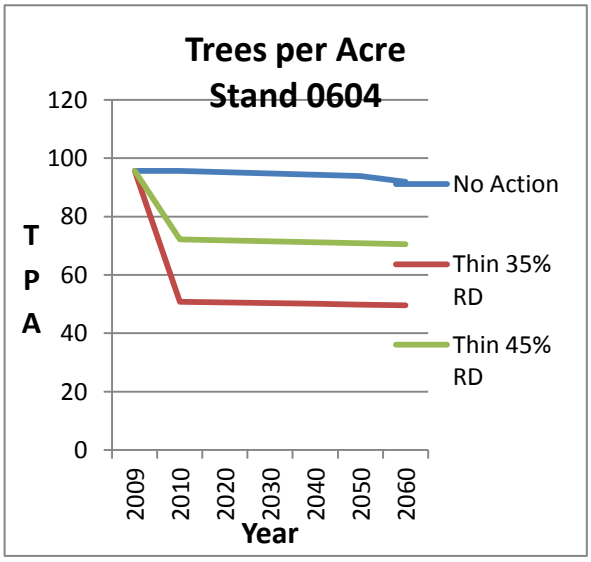


Figure B-14. Stand #802 (within ER Unit 307)

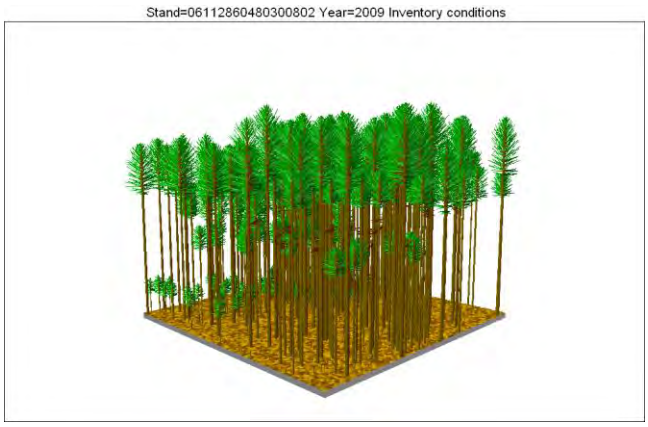




Table B-16. Stand #802

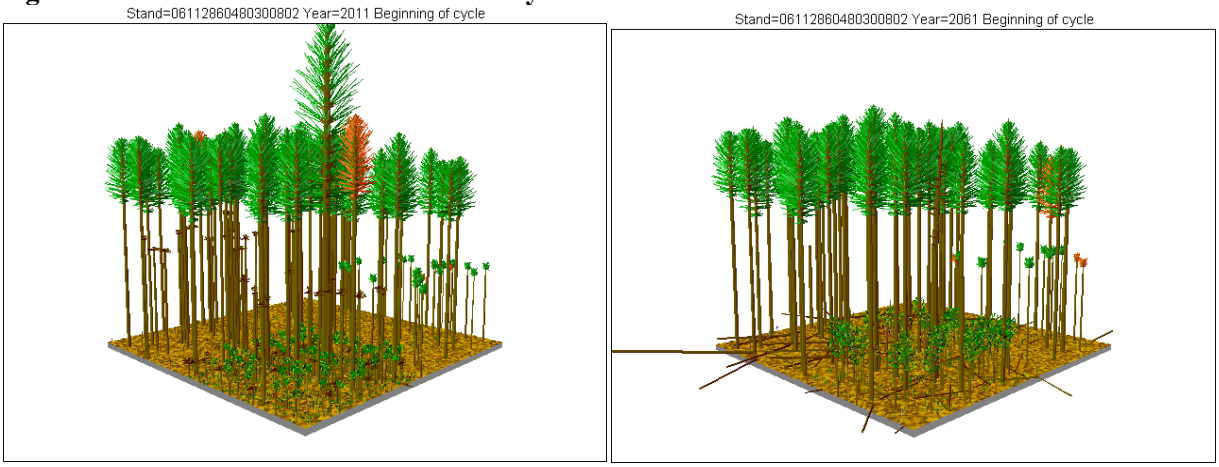
Existing Condition: Location-Stand 6048030-0802					
Age	Trees/ acre	Basal Area/ acre	Quadratic Mean Diameter	Relative Density (Curtis)	Canopy Cover
70	220	372	17.6	89	75
No Treatment					
80	211	387	18.3	90	75
90	199	396	19.1	91	75
100	189	405	19.8	91	75
110	179	414	20.6	91	75
120	180	424	20.8	93	75
Thin to 35% Relative Density - post harvest					
70	49	173	25.4	34	41
Thin to 35% Relative Density - projected growth					
80	55	186	24.9	37	43
90	72	201	22.6	42	47
100	71	213	23.4	44	48
110	71	227	24.2	46	50
120	70	240	25.0	48	51
Thin to 45% Relative Density - post harvest					
70	67	219	24.5	44	50
Thin to 45% Relative Density - projected growth					
80	67	233	25.3	46	51
90	89	251	22.7	53	55
100	89	265	23.4	55	56
110	88	280	24.2	57	57
120	87	294	24.9	59	58

Figure B-15. No Treatment 6048030-0802



Current Conditions **Projected 50 years**

Figure B-16. Thin to 35% Relative Density 6048030-0802

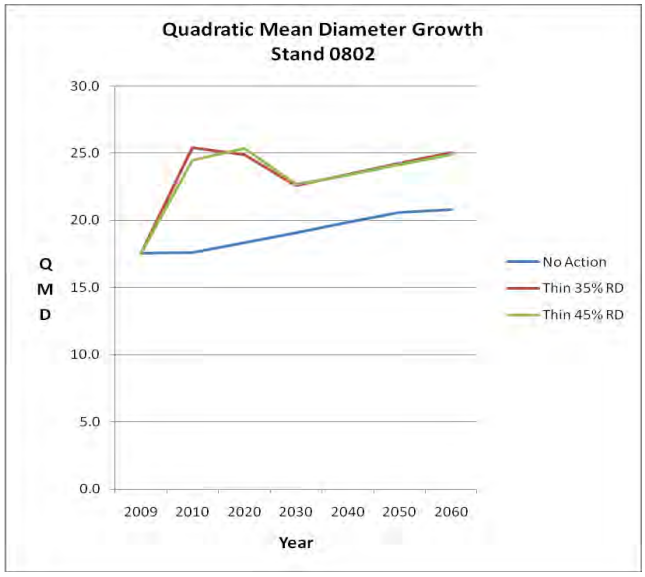


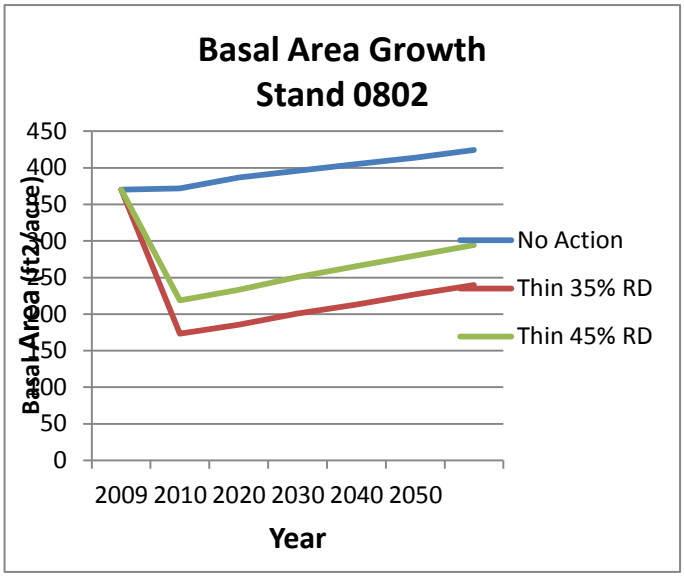
Post Harvest **Projected 50 years**

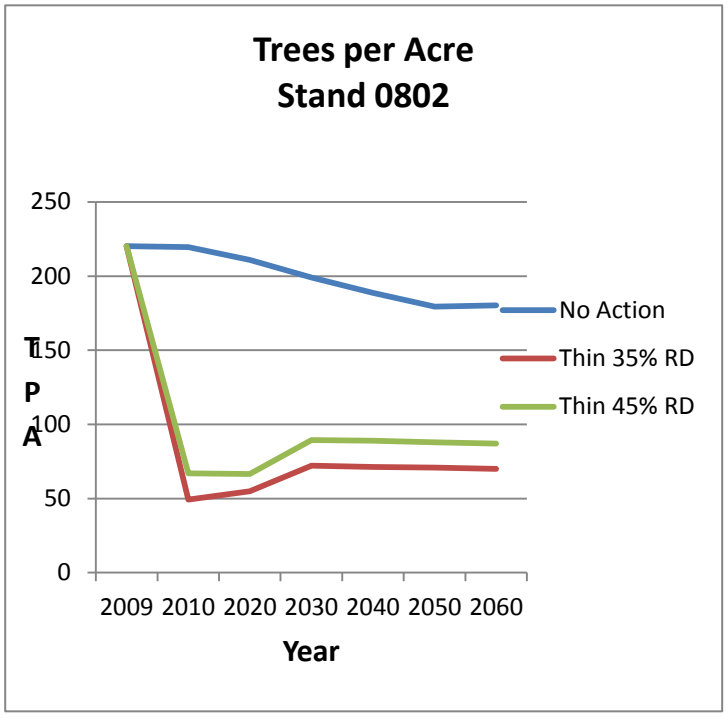
Table B-17. Stand 6048030-0802; 50 Year Stand Summary

No Treatment			35% RD Thin			45% RD Thin		
Stand Attribute	**Current Condition**	**50 years post-harvest**	**Stand Attribute**	**After Harvest**	**50 years post-harvest**	**Stand Attribute**	**After Harvest**	**50 years post-harvest**
Relative Density	89	93	Relative Density	34	48	Relative Density	44	59
Trees per acre	220	180 (-40)	Trees per acre	49	70 (+21) trees grow into >= 6"	Trees per acre	67	87 (+20) trees grow into >= 6
Canopy Closure	75	75	Canopy Closure	41	51	Canopy Closure	50	58
QMD Growth	17.6	20.8 (+3.2)	QMD Growth	25.4 (+7.8)	25.0 (-0.4) trees grow into >= 6	QMD Growth	24.5 (+6.9)	24.9 (+0.4) trees grow into >= 6
Basal Area per acre	372	424 (+52)	Basal Area per acre	173	240 (+67)	Basal Area per acre	219	294 (+75)
			Retain 48% of BA, Remove 50,482 mbf/ac			Retain 60% of BA, Remove 37,026mbf/ac, HTH again in 20 yrs (RD>=50)		

Figure B-17. Growth Data Stand #802







C. Simulated Treatments Discussion

FVS simulated treatments display higher tree mortality, lower tree diameter (QMD) growth and slower basal area growth projected over the next 50 years for the no treatment scenarios compared to thinning treatments to control stocking density. Tree mortality from dense stand conditions could otherwise be captured as timber harvest volume during thinning treatments that would release growing space to retained trees to grow into larger trees more quickly as displayed in the 50 year stand parameters.

Relatively stable stocking with low tree mortality after thinning treatments over the simulated timeframe meets the primary objective of sustainable harvest on lands allocated to Matrix. RD stays within the target 35-50% RD range for the thinning treatment to 35% RD and ranges 45-62% RD for the 45% RD treatment. A second thinning treatment opportunity is projected in 20 years for the 45% RD treatment when the stand again exceeds 50% RD.

Residual tree stocking from active treatments falls within the 'heavy thin' category (50-90 tpa). Treatments to medium or light thin tree stocking conditions to retain more trees may be done in riparian reserves, stands with high height to diameter ratios (particularly plantations) or on landform positions susceptible to windthrow. Retained trees would be managed for future harvests, seed source, stand structure and creation of large diameter snags/down wood to meet habitat and soil productivity standards and guidelines. These stands are projected to produce high quality timber product while providing for multiple-resource benefits.

Active treatments retained 45-69% (average 54%) and 56-80% (average 65%) of the initial basal area for the 35% RD and 45% RD treatments respectively. Thinning to retain higher amounts of basal area is anticipated where windthrow may be an issue adjacent to large openings. Harvest volume ranges 15,425-50,482 MBF per acre and 6,729-37,026 MBF per acre for the 35% RD and 45% RD treatments respectively. These harvest volumes are likely overestimated, particularly for stand 0802, due to the small sample size during the 2009 stand exams and the tendency for FSVEG to overestimate stand volume [9].

Exceptions occurred in stand 0604 where initial stand conditions had relatively lower stand density which permitted for increasing basal area growth and lower tree mortality over the next 50 years in the no treatment scenario, though QMD was still lower compared to both thinning treatments. Additionally, post-harvest QMD growth decreased and trees per acre increased for stand 0802 in approximately 20 years due to initial stand conditions having small trees in the understory which grew into trees >= 6" dbh over the simulated timeframe affecting these stand parameters. QMD growth was still higher compared to no treatment.

A 61" diameter, 226' tall Douglas-fir recorded in the plot data for stand 0802 was not retained over the simulated timeframe, though stayed in the stand longer with thinning treatments (10 years for no treatment versus 40 years for thinning treatment to 35% RD). These situations would receive a different 'Wide Thin gap' treatment to release and retain these desirable trees within the stand and over the landscape.

Canopy cover was not reduced below 40% for thinning treatments and ranged 51 to 63% versus 69-76% for the no treatment scenario in 50 years. Canopy cover recovery is influenced by a variety of factors including tree species present after treatment, growth response of crowns to open space, and the amount of in-growth of hardwoods and conifers.

[9] Pers. conv. Guenther Castillon, Assistant Forest Silviculturist, FSVEG coordinator, Rogue River-Siskiyou National Forest.

A precautionary note, FVS simulated treatments generate numbers that should not be considered absolute values for stand parameters. These simulations are more valuable for displaying the relative differences between treatment scenarios. More refined number will be determined during collection of more extensive stand exam information and during the development of site-specific silvicultural prescriptions to determine actual thinning intensity.

D. Other VDT Treatments

Gap Development
VDT may include creation of irregular shaped openings (i.e. gaps) interspersed within some thinning units to primarily treat laminated root rot infection centers. Forest heath treatments would harvest all susceptible tree species (Douglas-fir, white fir, western hemlock) within and along the perimeter of infection pockets and 50-100' out from the last symptomatic tree while favoring resistant or immune species for leave trees. Gaps may be site prepared and planted afterwards with Port-Orford-cedar seedlings (see planting) for improving stand health and stocking conditions to meet sustainable timber harvest objectives while enhancing structural and species diversity. Gap size is estimated to be ¼ to 2 acres depending on extent of infection centers and proximity to existing openings on adjacent private timber company lands. Larger gap sizes are estimated to occur in the northeastern corner to treat smaller connected root rot infection pockets (see Map B-11).

Additionally, portions of dense stands where live tree crowns are <15-20% and not likely to respond to thinning may also receive gap treatments.

Skips
VDT may include no-thin areas (i.e. skips). Skips can be strategically placed to protect riparian areas, hardwood thickets, minor tree species, pockets of large down wood, other unique stand attributes and inaccessible areas.

Wide-Thin Gaps
Wide-thin gaps (WTG) may occur around genetic trees selected for cone collection, Port-Orford-cedar root disease pockets favoring resistant trees (see POC root disease treatments), or release of desirable large trees from competing vegetation. Generally, one (1) to four (4) trees would be retained in WTG. The size of WTG would be approximately ¼ - ½ acre.

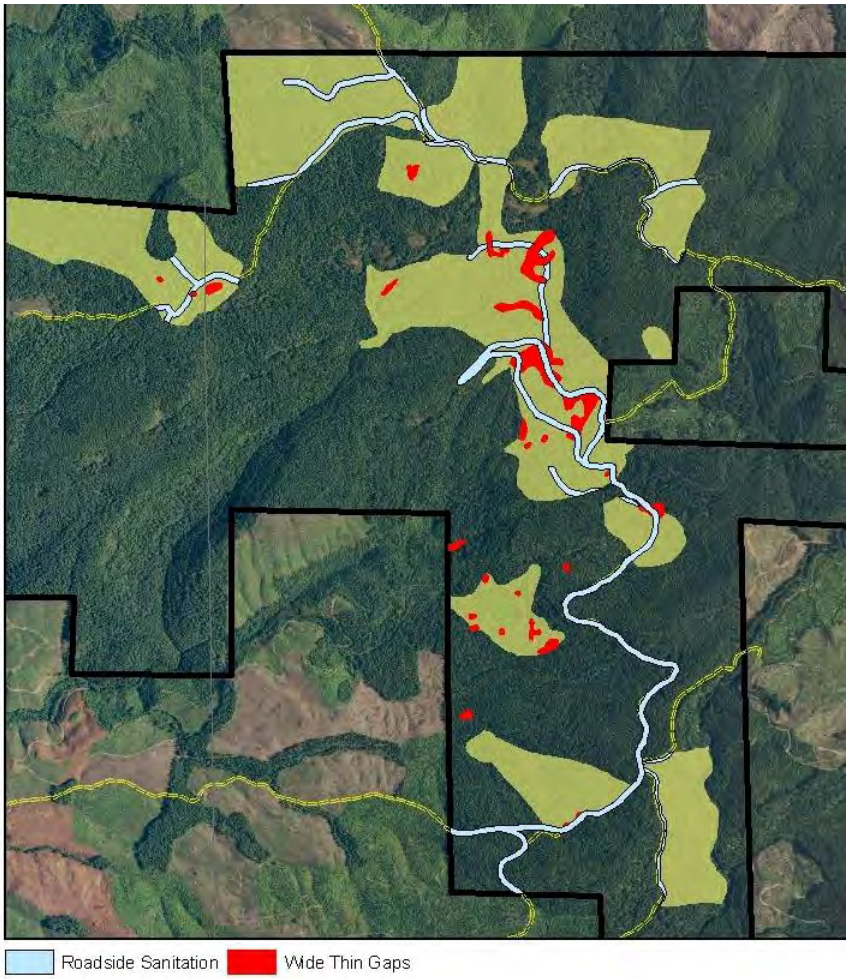
Thinning treatments would be designed to hasten development of late seral conditions to enhance riparian and upland areas, as recommended in the South Fork Coquille watershed assessment (USDA 1995), by increasing stand growth through VDT, creating structural diversity through skip and gap treatments and improving forest health and resistance to forest pathogens.

VDT treatments would harvest conifers with diameters ranging approximately 7-24 inches and larger. Extracted commercial timber volume is estimated to range eight (8) to twenty (20) thousand board feet per acre and could yield up to fifty-three (53) million board feet for the entire project.

E. Port-Orford-Cedar Root Disease Treatments

The POC Risk Key assessment for ER (see EIS Appendix B) recommends the following active treatments (Map B-13):

Map B-13. Port-Orford-Cedar Root Disease Treatments



Wide thin gap
Wide thin gaps to remove all live POC within PL infection pockets and retain non-host tree species on site. Thin all live POC within 2 to 3 crown radii from last infected POC along the perimeter of infection sites to separate healthy POC from potential root contact with infected POC. Pile and burn all POC slash and follow-up underburn to potentially mitigate disease presence[10].

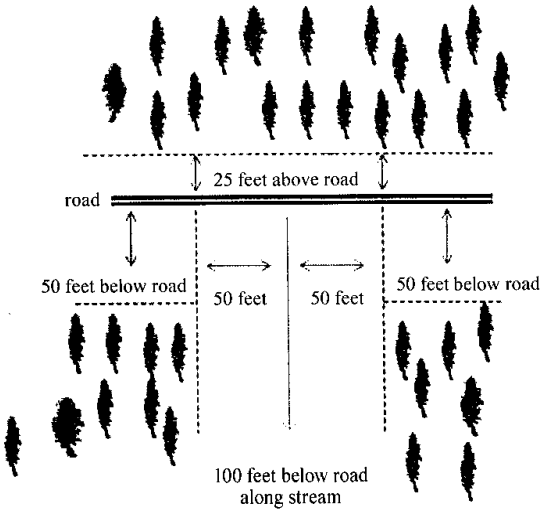
Field reconnaissance noted most infected POC within PL pockets to be sapling to small pole-sized trees with very few scattered overstory POC in candidate stands (except in plantation P-4 west of Doe Swamp). Wide Thin Gaps are anticipated to be mostly understory treatments.

Road Sanitation
Manage for non-susceptible tree species by removing all POC along road sides and high risk sites as follows:

100-feet below roads at stream crossings.
50-feet below roads
25-feet above roads

[10] Underburning was discussed and determined by Powers Fire to be undesirable due to cost, logistics of building fireline, current fuel loading from historical logging slash and associated fire suppression tasks.

Figure B-18. POC High-risk Sites



Planting

Restore POC within its natural range by planting non-PL infected areas and low risk areas with disease-resistant POC. Plant laminated root rot pockets with disease-resistant POC seedlings as described in 'Gap Development' and noncommercial units receiving biomass treatments.

Recommended planting spacing is twenty-five (25) feet apart or in approximately ten (10) tree clusters at 100-150 foot spacing to lessen the potential for root grafting (USDA 2004, ROD, pg. 36). These spacing guidelines can be flexible to meet site-specific conditions. Avoid stagnant water and plant POC in areas that maximize chances of maintaining moist surface soil year-round.

POC's distribution in Coos County appears primarily to reflect edaphic conditions (Zobel, 2011). During introduction of disease-resistant POC, the General Soil Type *Digger-Preacher-Remote* is an appropriate soil type to plant POC (based on POC's native distribution in historical cruise data in pre-harvest forests).

ER is within the 'Oregon Transitional' Block/Zone 340 (2,501-4,000 ft. elevation) for disease-resistant seed (Hamlin, 2005). Seed is collected from seed orchards established since 2001 at the Dorena Genetic Resource Center, USDA Forest Service, in Cottage Grove, Oregon. Seedlings should be grown primarily from this seedlot.

Plant openings created by WTG treatments in PL pockets with Douglas-fir where openings > ¼ acre. Western hemlock is anticipated to naturally regenerate in openings and does not need be planted. Do not plant POC as these PL pockets are considered high risk and should be managed for non-host species to reduce the potential for long-term PL disease persistence on site. Post-planting tree netting of seedling terminal buds may be needed to reduce big game browse damage on Douglas-fir.

Climate Change Consideration

In anticipation of potential climate change and species migration, combine seedlots for sowing POC seed for planting as follows:

Original Zone	Lower Elevation Zone	Southern Latitude Zone
340 (50%)	325 (25%)	440 (25%)

If a lower elevation or southern latitude source is not available, then increase the original zone percentage accordingly (Hamlin, 2009).

The Tyee Formation is the dominant geologic type in the coastal mountains in Douglas, Lane, and Lincoln counties and extends as far north as Tillamook County. Tyee supports moderate performance of POC in terms of both its incidence and volume. Knowing the relative performance of POC on these edaphic units should help to decide where POC could be introduced during efforts to move its range north as climatic warming continues (Zobel, 2011).

In areas proposed for timber harvest, road construction, reconstruction and maintenance; wash all vehicles before entering work site and wash all vehicles after working in PL infection sites (see mitigation measures in POC Risk Key assessment, EIS Appendix B for details).

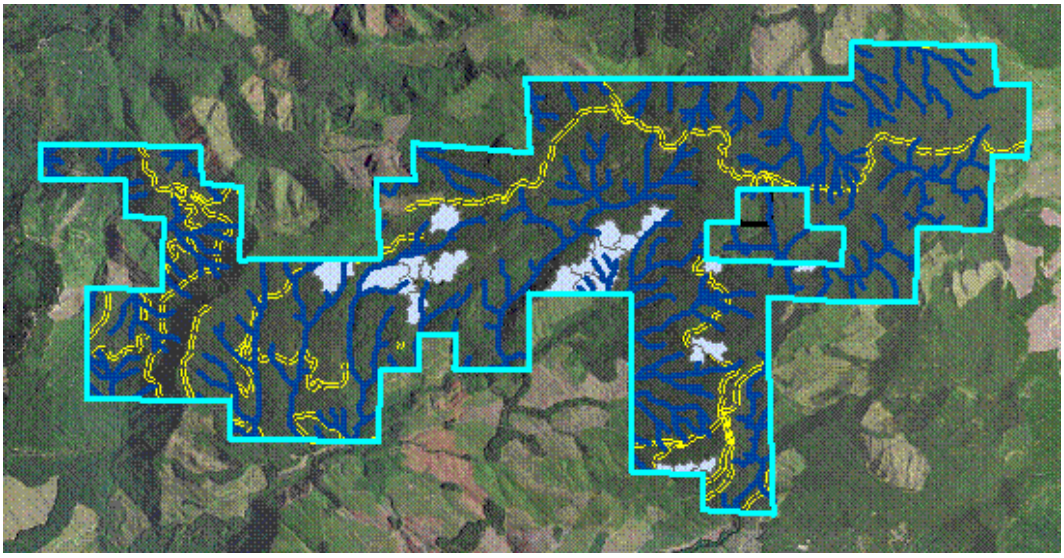
F. Riparian Reserve Treatments

Proposed treatments in Riparian Reserves are similar to upland treatments in Matrix forests. Primary objectives are to enhance riparian stand attributes to meet the Aquatic Conservation Strategy objectives of the Northwest Forest Plan (USDA/USDI 1994). Compliance with project design criteria for VDT treatments in Riparian Reserves would be documented in the silvicultural prescription.

Although most stands exceed 70% canopy cover (Map B-12), a data query of the Forest's existing vegetation GIS layer shows some polygons within candidate stands having an open cover class (i.e., 10% <= canopy cover < 40%). Where present, Riparian Reserves within these existing vegetation polygons are tributaries to Coal Creek and would not receive active management treatments due to current conditions not meeting the minimum 50% canopy cover desired in Riparian Reserves.

Queried polygons are within or encompass Alternative 2 proposed Units 310, 313, 314, 316, 318, 319, 322, 323, 326, 329, 332, 333, 335, 337. Computer-generated existing vegetation data will need ground verification at the stand-level for determining data accuracy and development of site-specific silvicultural prescriptions.

Map B-14. Existing Vegetation Polygons, Cover Class 2



10% <= Canopy Cover < 40% in blue shaded areas

G. Non-Commercial Treatments

Non-commercial treatments are proposed for 363 acres within the ER Planning Area. Options include restoration, rehabilitation, reforestation, removal or thinning of non-commercial sized trees. The purpose of Timber Stand Improvement is to comply with the National Forest Management Act of 1976 and the 1989 Land and Resource Management Plan.

Figure B-19. Example Non-Commercial Treatments



Unit 905

Portions of non-commercial treatment units have high height to diameter ratios on overstory trees and forest health issues with laminated root rot, shallow soils and windthrow (e.g., unit 908). These areas may be treated by removing small diameter material for biomass and planting with POC and other resistant tree species.

Plantation Treatments
Plantations with commercial-sized trees would be treated by VDT though may have a different prescribed tree spacing compared to adjacent stands due to closer spacing of planted trees. Some plantations within commercial unit boundaries may be considered non-commercial due to tree size, density and high height to diameter ratios. These areas may be treated (or skipped) by removing small diameter material for biomass and planting.

H. Fuels Management[11]

Harvest activities associated with the Proposed Action would add needles, limbwood, and tops to the existing fuel bed in varying degrees throughout each treatment area. Disturbed ground vegetation and larger woody material would contribute to the dead fuel loading. In comparison with the natural long-term accumulation of ground fuels, harvest would contribute fuels to the site at an accelerated rate. The fuels remaining after harvest would be mostly of the smaller size classes, as most of the larger fuels would be removed for utilization, unless contractual requirements specify that they be left on site.

The estimated fuel bed remaining after harvest is best described as a Fuel Model 11- Light Logging Slash, of the Fire Behavior Fuel Models. The Photo Series For Quantifying Forest Residues (GTR PNW-51), 3-DF-3-PC; with a substantial reduction 3.1-9.0 inch size class due to increased utilization also is representative of this fuel type.

[11] Input from Rick MacDonald, Fire Management Officer, Powers Ranger District

This fuel bed typically has 5 to10 tons per acres of 0 to 3 inch size class fuels. In the event of an un-planned fire start, the potential for rapid-fire spread would be higher than a stand in a natural condition (2 to 7 chains per hour in a natural state, compared to 6 to 9 chains per hour after harvest). Below, are fuels treatment options considered for the proposed units. Implementation of these fuels treatment methods would likely be one or a combination of several treatments.

No treatment: This method would be appropriate for sites where fuel loadings fall well below LRMP Standard and Guideline recommended maximums. When residual fuels exceed the guidelines, not treating the fuels may be appropriate in areas of low risk where risks may be assumed for a period, until the hazard has been reduced by natural processes.

Hand piling fuels concentrations: This method would be effective in breaking up fuel continuity thereby reducing fire spread rates. Hand piling, followed by burning of the piles, can remove most fuels from a site. Hand piling is most effective in continuous moderate fuel loadings (25 to 50 tons per acre), and is less effective in scattered light fuels. This method may also be employed in areas where no other disposal methods are prescribed, or in conjunction with non-burning types of treatments, but where the risks may warrant some sort of hazard reduction; such as the piling proposed along Roads 2000, 5000, 290, 440, and 448. On the commercially thinned units that are adjacent to the aforementioned roads, logging slash within 100 feet of these roads would be hand piled and burned.

Yarding of tops: This method would be effective in removing concentrations of the 0 to 3-inch size class fuels. In all treatment areas using ground-based or skyline yarding, tops of commercial trees would be left attached to a commercial log while yarding (Yard Tops Attached – YTA). The tops would be piled and disposed at the landing location.

Piling and Burning Landing Slash: This method would be effective in disposing of all remaining un-merchantable vegetation on log landings (piling and burning).

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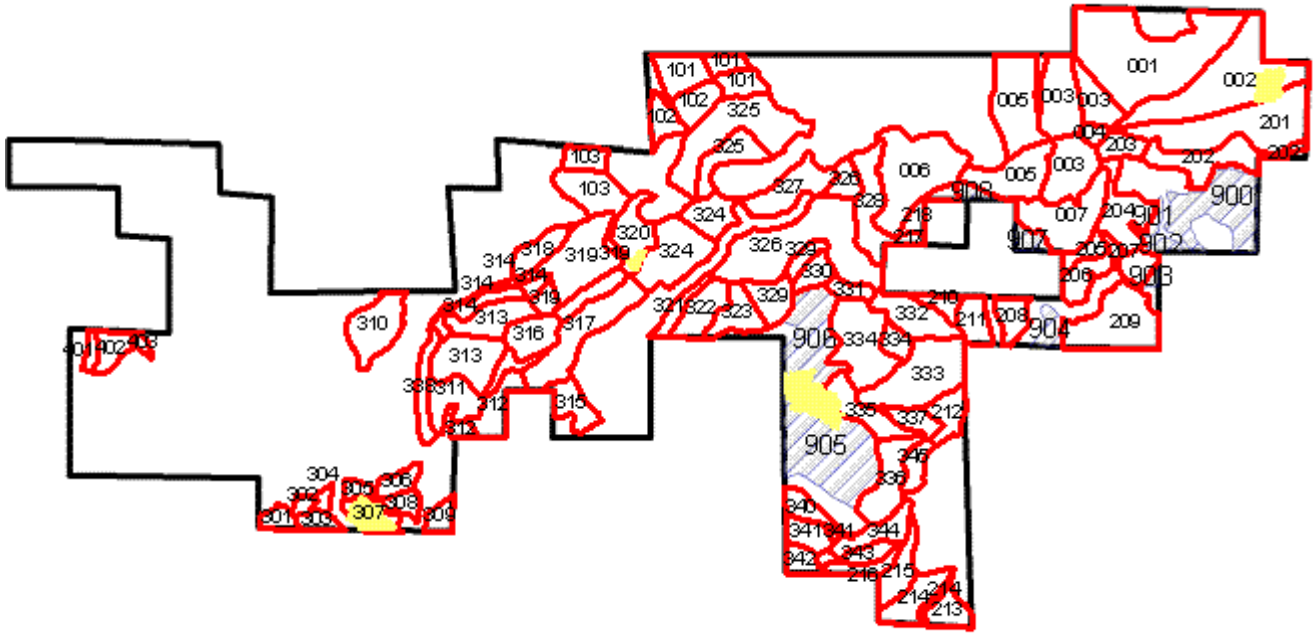
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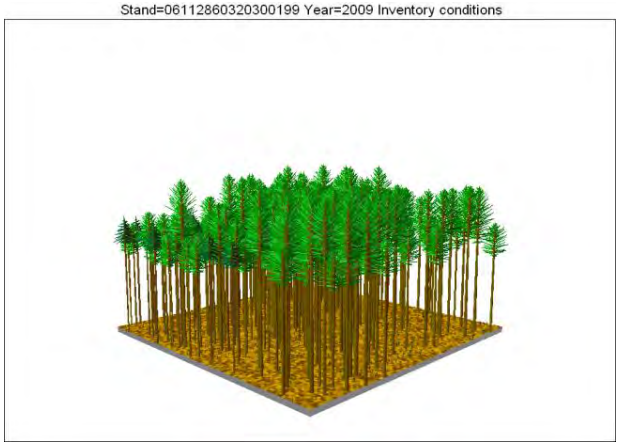
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ATTACHMENT A

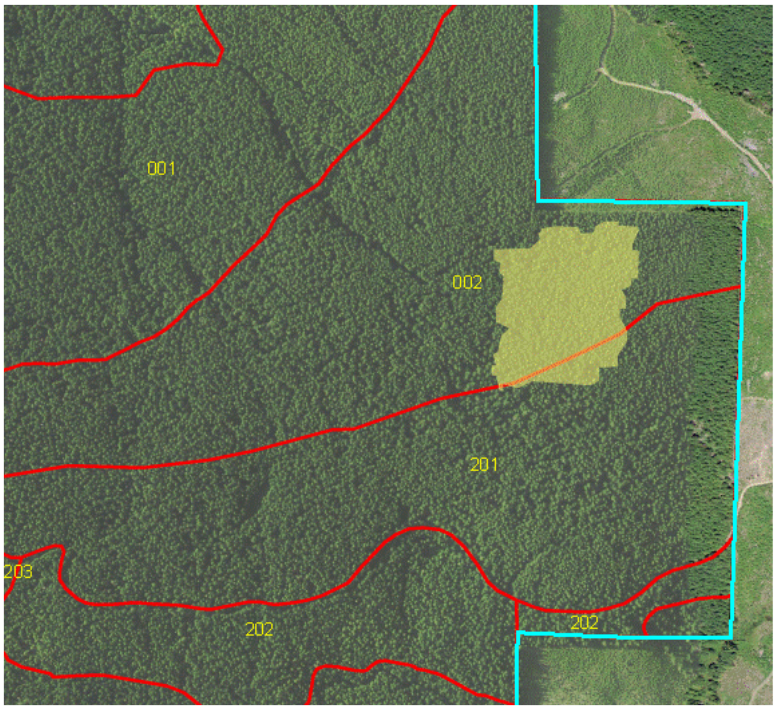
2009 Stand Exam Locations



Stand #199 (within ER2/201)







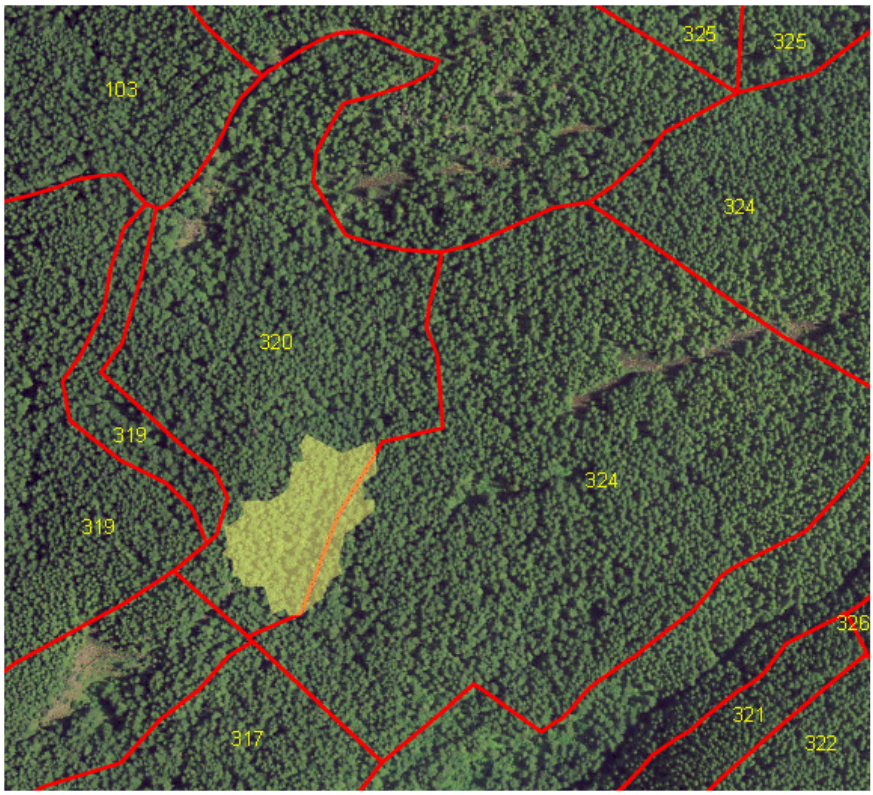
# TSE plots	location#	stand#	acres	ER unit (apprx)	Trees / ac	Canopy Cover+	Basal Area / ac	Tree Species (based on plot data)	QMD	SDI	RD (Curtis)	Merch BF/ac*	10 yr Radial growth (20th/ inch)
3	6032030	199	17	2/201	544/ (244)	77%	333/ (333)	82%PSME 14%TSHE 4%CACH	10.6/ (15.8)	597/ (560)	0.84	68,751	9-11, avg=10

+ Canopy cover projected by Stand Visualization System (SVS) from inventory conditions from FVS, version 6.21, ICASCA variant.
*** Board foot volumes projected by FSVEG, Report 17.**
**** Estimated volume is unrealistic due to small sample size and 61" DF, 226' tall present on one of the plots.**
( ) Attributes for trees >= 6" dbh

Stand #604 (within ER 320/324)

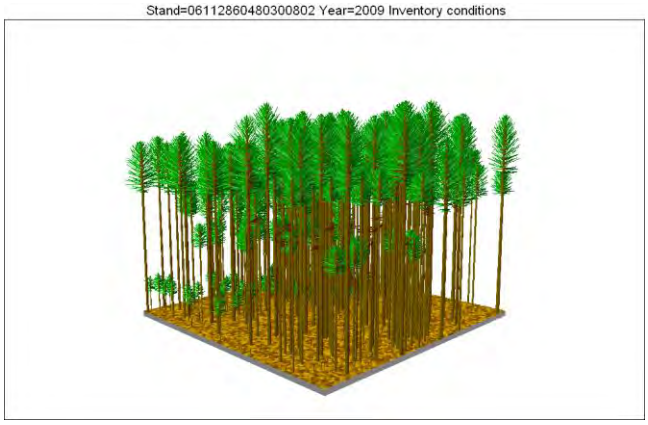




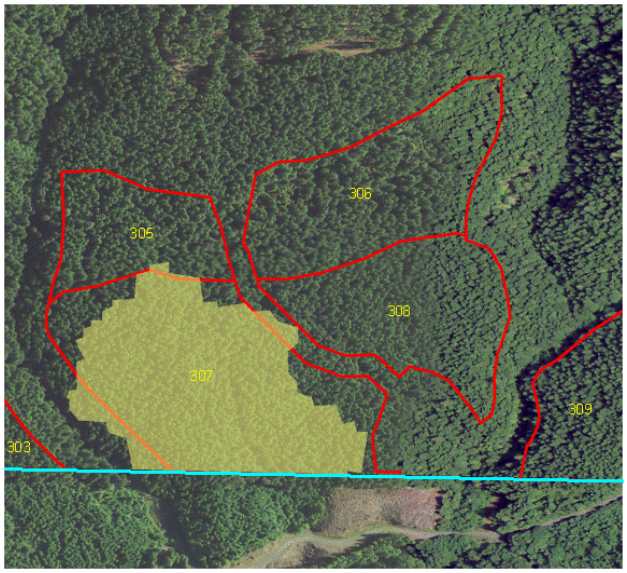


# TSE plots	location#	stand#	acres	ER unit (apprx)	Trees / ac	Canopy Cover+	Basal Area / ac	Tree Species (based on plot data)	QMD	SDI	RD (Curtis)	Merch BF/ac*	10 yr Radial growth (20th/ inch)
3	6048010	604	5	320/324	96/ (96)	58%	253/ (253)	100%PSME	22.0/ (22.0)	340/ (340)	0.54	58,599	15-31, avg=24

Stand #802 (within ER 307)



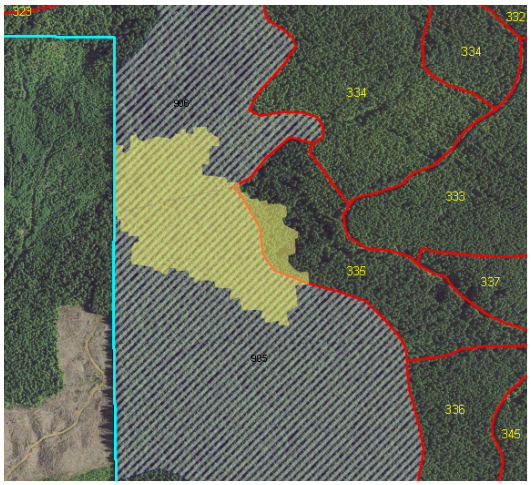




# TSE plots	location#	stand#	acres	ER unit (apprx)	Trees / ac	Canopy Cover+	Basal Area / ac	Tree Species (based on plot data)	QMD	SDI	RD (Curtis)	Merch BF/ac*	10 yr Radial growth (20th/ inch)
4	6048030	802	21	307	1670/ (220)	81%	376/ (372)	86%PSME 8%TSHE 6%CACH	6.4/ (17.6)	821/ (683)	0.89	106,689**	5-20, avg=11

Stand #747 (within ER 906/905)





# TSE plots	location#	stand#	acres	ER unit (apprx)	Trees / ac	Canopy Cover+	Basal Area / ac	Tree Species (based on plot data)	QMD	SDI	RD (Curtis)	Merch BF/ac*	10 yr Radial growth (20th/ inch)
8	6048010	747	38	906/905 (noncommercial)	152	50%	165	69%PSME, 16%CHLA, 10%TSHE, 5%CACH	14.1	264	0.44	34,493	7-28, avg=17

APPENDIX C

HYDROLOGY REPORT

EDEN RIDGE TIMBER SALES

Hydrology Report

Maureen Joplin, Hydrologist

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February, 2010

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EDEN RIDGE TIMBER SALES
APPENDIX C

HYDROLOGY REPORT

Maureen Joplin, Hydrologist **August 16, 2011**

I. INTRODUCTION

Eden Ridge Timber Sales and its "Planning Area" are located on public lands administered by the Rogue River-Siskiyou National Forest, Powers Ranger District.

The Proposed Action for this project (EIS Alternative 2) would enact the following vegetation management actions:

> 3,314 acres of commercial variable density management thinning treatments (in several separate timber sales), on 75 Units, producing approximately 53 million board feet of commercial volume; ground-based systems would be used on approximately 2,119 acres, or 64%; Skyline systems would be used on approximately 1,195 acres, or 36% of the treated area. Also included is use of approximately 31 miles of existing Classified roads, construction of 10.8 miles of new Classified road (in 43 segments), construction and decommissioning of 0.3 miles of temporary road, use and reconstruction of 6.1 miles of existing Classified road, and use of and maintenance of 5.5 miles of existing Classified road. Approximately 385 acres of non-commercial silvicultural treatments are also proposed.

Two other Action Alternatives (Alternatives 3 and 4) are also considered; see EIS Chapter II for more detail and maps regarding these alternatives, including no-action, that are analyzed herein.

The project focuses on forest stands clear-cut harvested in the 1920s and 1930s utilizing a railroad access system that is now overgrown (railroad grades) or in ruins (trestle stream crossings). This system has been largely replaced on both private and public timber lands by roaded access. Some National Forest System lands in the Planning Area that were previously harvested by railroad systems remain inaccessible by roads.

The Planning Area is located within a block of National Forest System lands that are surrounded by intensively managed, privately owned, timber production lands. The Forest Plan designates the Planning Area as "matrix", where timber production is an expected use. The Powers Ranger District is considering timber harvest and road construction that would result in commercial harvesting in the area over the next 5 years.

The Planning Area falls within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds (see Map C-1). Two watershed analyses have been completed that cover the Planning Area and contain a synthesis of scientific knowledge about watershed trends and conditions at watershed scales as well as by smaller sub-watersheds. Water quality analysis and management planning has been completed for the South Fork of the Coquille River by the State of Oregon. The Forest Service has also completed a plan for aquatic restoration specific to the South Fork Coquille River. These documents are listed below along with the subwatersheds that contain the Planning Area:

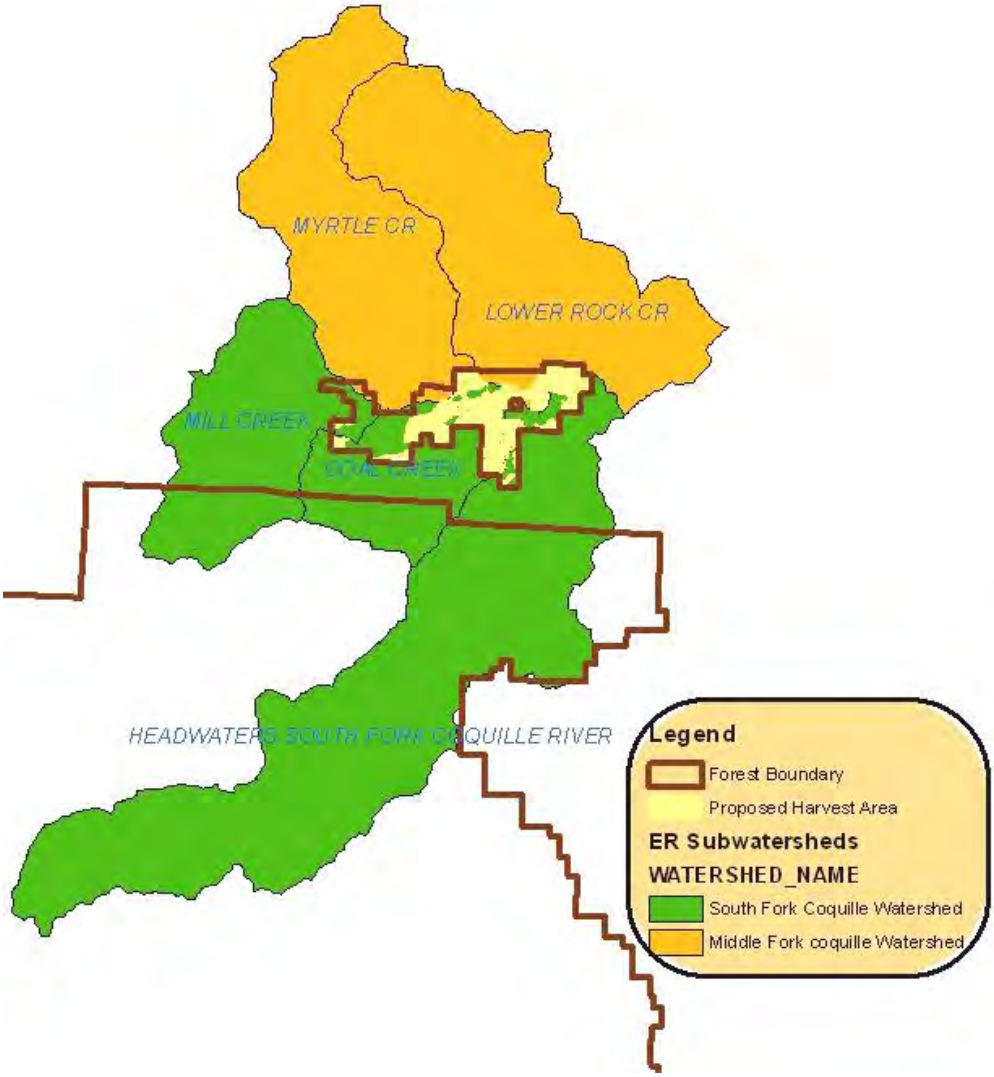
- Myrtlewood Resource Area, Coos Bay District, Bureau of Land Management, 1994. ***Middle Fork Coquille Analytical Watershed***. (Lower) Rock Creek and Myrtle Creek subwatersheds

- Powers Ranger District, Siskiyou National Forest, USDA Forest Service, 1995. ***South Fork Coquille Watershed Analysis*****.** Coal Creek, Headwaters South Fork Coquille (Wooden Rock Creek), and Mill Creek subwatersheds

- Oregon Department of Environmental Quality, 2001. ***South Fork Coquille River Total Maximum Daily Load Allocation and Water Quality Management Plan.***

- Powers Ranger District, Rogue River-Siskiyou National Forest, USDA Forest Service, 2007. ***Aquatic Restoration Plan, South Fork Coquille Watershed.*** This document includes summary information from both the SF Coquille Watershed Analysis and the Water Quality Management Plan.

Map C-1. Watershed Index Map



II. BACKGROUND

The Coquille River, formed by the confluence of its north and south forks, begins at the town of Myrtle Point. The South Fork, 62.8 miles (101.1 km) long, rises in southern Coos County, and flows generally north. It receives the Middle Fork, 40.3 miles (64.9 km) long, then joins the North Fork from the south at Myrtle Point. The combined river meanders generally west, past Coquille. It enters the Pacific at Bandon, about 20 miles (32 km) north of Cape Blanco (Wikipedia web site).

The nearest weather data collection station is located in Powers at an elevation of 286 feet. Weather in the coast ranges is moderated by the Pacific Ocean, especially in the summer when temperatures regularly drop to the 45 to 55 degree range. Average annual rainfall at Powers is about 61 inches with only a couple of these arriving as snow (Wikipedia Website). The Planning Area occurs along the ridgeline of mountains south of Powers at elevations ranging from 2,500 to 3,500 feet above sea level. The Planning Area receives annual precipitation ranging from 100-150" dominantly as rain (Oregon Climate Service, PRISM; Oregon Dept. of Forestry LocatOR website).

Although snow is common in the Planning Area, a persistent snowpack is unusual. The Planning Area is generally in a weather zone referred to as the "transient snow zone" (TSZ), characterized by both rain and snow. Rain-on-snow events are common during the winter and early spring and can result in sudden spikes in stream flow as rain and melting snow combine into runoff.

III. MANAGEMENT DIRECTION

The Northwest Forest Plan's (NWFP) Aquatic Conservation Strategy (ACS) has four components: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. It is guided by nine objectives which are meant to focus agency actions to protect ecological processes at the 5th-field hydrologic scale, or watershed, at the 6th and or 7th fields (subwatershed and or drainage), and at the site level.

Standards and Guidelines for Riparian Reserves are located on pages C-30 through C-38 in the Northwest Forest Plan (NWFP). Timber harvest is prohibited in Riparian Reserves except where needed to attain Aquatic Conservation Strategy objectives (refer to NWFP, page B-11).

The Siskiyou National Forest Land and Resource Plan (LRMP) provides standards and guidelines for soil and water resources on pages IV-44 through VI-48. Management prescriptions for Riparian areas are provided on pages IV-124 through IV-128. LRMP riparian areas extend at least 100 feet to either side of perennial channels; 150 feet is recommended for Class I and II streams. This would be less than the buffer widths provided by the Northwest Forest Plan of one to two site potential tree heights (175 feet and 350 feet, respectively) and its additional buffer of one site potential tree height for ephemeral channels.

The Siskiyou National Forest typically utilizes a standard site potential tree height of 175 feet for analysis purposes. For the project area a stream network was generated from a digital elevation model. A mapped perennial channel is initiated when a collection area reaches 25 acres. Field work verifying the presence of ephemeral or perennial channels was used to confirm the model was accurate. Mapping used for analysis of the alternatives displays the following riparian buffers:

Class I Streams: perennial, fish habitat	350 feet
Class II Streams: perennial, non-fish bearing	175 feet
Class III Streams: ephemeral or intermittent	175 feet

The Siskiyou LRMP prescribes that vegetation on lands in the S.F. Coquille River Basin be managed to maintain water temperature. Oregon state Total Maximum Daily Load (TMDL) allocations require streams to meet state temperature standards. Since the South Fork Coquille River exceeds temperature standards, the state has determined that no water temperature increases from anthropogenic sources is allowable (refer to Water Quality section of this report).

Under Northwest Forest Plan direction, Key Watersheds are not a designated area or matrix, but overlay all allocations. Timber harvest cannot occur in Key Watersheds or Riparian Reserves unless watershed analysis is performed to characterize the aquatic, riparian, and terrestrial features within a watershed and to guide activities toward meeting Aquatic Conservation Strategy goals (ROD, page B-20, USFS, 1994). Outside of Inventoried Roadless Areas (RARE II) management direction is to reduce existing system and non-system road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of road in Key Watersheds (Standards and Guidelines page C-7).

Water quality in Oregon is managed in compliance with Section 303(d) of the 1972 Federal Clean Water Act by the Oregon Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA). DEQ is responsible for designating streams and water bodies that require effluent limitations, and, for developing Total Maximum Daily Load (TMDL) allocations that will ensure water quality standards are met. The most recent listing of impaired waters is available on a DEQ website as ~~"O~~regon's 2004/2006 Integrated Report Database" (www.deq.state.or.us/wq/assessment/rpt0406).

The Coquille Subbasin has a completed TMDL that covers most of the Rogue River-Siskiyou N.F. occurring in that Subbasin. In order to implement the State's waste load allocations, federal land management agencies develop Water Quality Management Plans (WQMP) in cooperation with DEQ. A WQMP for the South Fork Coquille River above the Forest Boundary was completed in the year 2000; it addresses lands of all ownerships in this part of the watershed. On National Forest System lands, water temperature is the water quality parameter of most concern in this area.

IV. CURRENT CONDITIONS - CHANNEL CONDITION & MORPHOLOGY

Detailed descriptions of existing condition of the Planning Area may be found in watershed and water quality analyses cited above. Stream surveys were also conducted for Coal and Wooden Rock Creeks in 1991 and 1992, and are cited by the watershed analyses and the restoration plan. An additional stream survey was completed for Coal Creek in 2010. Information relevant to current condition in the Planning Area has been extracted and/or paraphrased from these documents and presented below in descriptions of existing condition.

A. AQUATIC RESTORATION PLAN - SOUTH FORK COQUILLE

The South Fork Coquille (SFC) is a Tier 1 Key Watershed as defined by the Northwest Forest Plan (1994) and is approximately 108,300 acres (169 sq. miles) in size. In 2005, the Rogue River-Siskiyou National Forest engaged in an Integrated Work Planning process. As part of that process, fifth-field watersheds across the Forest were prioritized for resource value and restoration potential. The South Fork Coquille ranked as number 1 on the Forest for fisheries, water, and wildlife values.

Past management activities on NFS land have increased upstream sediment delivery and depleted large wood recruitment into the streams. The primary limiting factors within the South Fork Coquille Watershed are:

- loss of mature forest within the Riparian Reserve;
- higher than optimum stream temperatures;
- in-stream fish habitat below potential condition;
- excessive fine sediment in stream channels; and
- obstructions at road crossings that inhibit upstream movement of fish and movement of large woody material to fish-bearing stream reaches.

Excess bedload is most evident where it is stored in unconstrained reaches. Aerial photo interpretation illustrates aggradation has buried large boulders and created wide gravel bars, literally filling pools and covering riparian vegetation. Fish habitat in all sub-watersheds within the South Fork Coquille Basin were identified as being adversely impacted by high stream temperatures and lack of large woody debris. Bankfull width-depth measures in several streams are indicative of channel widening. Channel widening increases solar radiation on surface waters and decreases depths available for fish. (Restoration Plan - Executive Summary)

Change in late seral successional stage in Riparian Reserves from 100 years ago was found to be substantial in all subwatersheds. For Wooden Rock Creek drainage (upper portion of Headwaters SF Coquille subwatershed), late seral successional stage has declined from 89% 100 years ago to a present level of 1%. Coal Creek subwatershed is similar with a decline from 85% to 1%. (Original data from South Fork Coquille Watershed Analysis, Iteration 1.1, September 1995)

1. Wooden Rock Creek

Summer flows at its mouth have been determined to be roughly twice the volume as the mainstem South Fork Coquille, which makes Wooden Rock a significant tributary. The lower 2.5 miles flows into a wide valley floor located on the gently dipping bedrock surface. Wooden Rock flows over both Tyee and Flournoy Formations that are dominated by sandstones. Weathering and erosion of these formations yields sand and gravel-sized substrate to the channel. The low gradient channel provides the best existing resident trout habitat above the Coquille River falls.

Wooden Rock has the highest densities of both trout and large wood in the upper basin (Chen 1991). Three large wood jams exist in the lower 2.5 miles of habitat. One jam has been estimated to contain over 50,000 cubic feet of wood. Increased trout densities appear to be related to increased amounts of cover. Three distinct reaches are separated by a series of barrier falls (at the 2.5-mile and 4.0-mile marks) in a stair step formation that prohibits upstream migration (Stream Survey, Summer 1992).

Populations above the barriers appear to be exclusively rainbow trout, but at much lower densities. (Original information from South Fork Coquille Watershed Analysis, Iteration 1.1, September 1995).

2. Coal Creek

Coal Creek is a key cold water contributor to the South Fork Coquille River. A dual-pipe culvert just upstream of the confluence with the South Fork Coquille River creates a partial barrier to anadromous adult salmonids and a full barrier to lamprey. A project is currently planned to remove the two culverts and replace them with a bridge. There are no other proposed restoration projects identified anywhere within Coal Creek or the rest of the project Planning Area. The Aquatic Restoration Plan states (p.20) that little timber harvest had occurred in Wooden Rock, Coal, or Hayes Creek subwatersheds, therefore that plan concentrated on other areas. The Restoration Plan refers to ~~r~~ecent" harvest, i.e., managed stands less than 30 years old that contain densely stocked plantations that need thinning.

Roads analysis performed for the Aquatic Restoration Plan rated the 3358 and 5000 roads as a high environmental concern based on the following factors:

- Percent of sub-watershed stream network with roads within one site tree height.
- Stream crossing frequency within the sub-watershed and on a per mile basis for each road segment.
- Number of miles of road in high erosion potential by sub-watershed and percentage of road segment in high erosion areas.
- Percent of road segment within one site tree height.
- Percent of sub-watershed stream system with roads within one site tree height.
- The presence of road crossings in streams containing coho salmon, coho salmon critical habitat, or coastal cutthroat trout within a sub-watershed and per each road segment.
- Whether or not it is a Northwest Forest Plan Key Watershed.

B. SOUTH FORK COQUILLE WATERSHED ANALYSIS (1995)

The Coquille Basin, including the South Fork, occupies the Klamath and the Coast Range Physiographic Provinces. These geologies produce fine grain sediments which are transported to stream channels. A strong maritime influence results in high winter precipitations and moderate year-round temperatures. Annual precipitation ranges from 50 to 110 inches per year, with very little snow pack. Thus, 90% of the mean annual discharge of the Coquille occurs from November to April, with less than 1% occurring during August and September.

The Upper South Fork Coquille Watershed straddles the Klamath/Siskiyou province which is separated by the Coquille River Fault Zone (Dott 1971) from the Coast Range province. Both geologies weather rapidly and produce fine grain sediments that are transported to stream channels. Therefore, sediment inputs are naturally high. (Page 9)

Soils on the steep Tyee sandstones have a tendency to fail as debris flows which scour streams to bedrock and deposit sediment and large wood at tributary junctions. Rockfall is common where Tyee bluffs overlie softer formations.

Turbidity, or water clarity, affects fish habitat and recreational uses such as fishing and sightseeing making it a critical component of the river value. Water samples in the analysis area were rated as first, second and third lowest in turbidity (highest quality) of all samples (DEQ, 1993) from Coquille (RM 24.5) to above Rock Creek (RM 81.0)

The water of the South Fork is clear most of the year except during winter storms when sediment from banks and slides can cloud the water for short periods. During these higher flows, it has been observed that streams flowing through the Klamath Province rocks (Sucker, Johnson, and Rock Creeks) are less turbid than streams on the Coast Range rocks (Yager 1995).

An exception to this tendency is the turbidity contributed by slides and surface erosion from road construction, timber harvest, and natural landslides. Without historical turbidity measurements, water clarity changes can only be pieced together by anecdotal accounts from long time residents and historical sediment delivery estimates. The following is a summary of representative historical accounts: From 1934 to the 1940's:

> "The river stayed clear during storms. There was only the Agness Road and the Pepper Road over Sand Rock Saddle down to Johnson Creek. The rest of the drainages had no roads. After the increase in logging and roads, the river started running muddy during high water and lots of debris was in it." (Townsend 1995)
>
> From the 1970's until recently:
> "The river would take up to a week to clear. It now clears in a couple of days." (Hallett 1995)
> "In the past, the clarity of the stream would return to normal in 8 days, but today it takes only 2-3 days. Decreased logging, improved practices within the last decade, and paving of Forest Service Road 33 located along the river have improved the stream's clarity." (Stinson, 1995) Sediment delivered from timber harvest and road construction significantly increased from 1940 through the early 1970's which would be associated with higher turbidity levels. The passage of time, decreases in logging activity, decreases in road construction, and improved practices have recovered water clarity from past decades.
>
> A 1964 flood following a major storm likely mobilized considerable quantities of instream wood, but the input, storage, and transport volumes are unknown. To evaluate the storm damage, the Forest Service assembled an evaluation committee in 1966. The committee found that "woody debris" buildup in streams greatly contributed to stream damage, and recommended that debris be removed from the stream channel. In response to that recommendation, state and federal regulations were made requiring removal of all debris from streams. As a result, private and federal activities removed massive amounts of wood for salvage or stream cleaning in the 1960's and 1970's." (Page A8)
>
> All streams within the key watershed have less than desirable levels of large wood. The riparian zones within the key watershed are lacking late seral conditions that were present historically which serve as a recruitment source for large wood." (Page A15) Three large wood jams exist in the lower 2.5 miles of habitat. One jam has been estimated to contain over 50,000 cubic feet of wood." Anecdotal accounts indicate abundant log and beaver dams, most of which have been removed in association with timber production." (Page A31, specific to Wooden Rock Creek)

1. Coal Creek

Coal Creek flows westward into the mainstem of the South Fork Coquille approximately one mile upstream of the Forest Boundary. Coal Creek derives its name from short-lived coal mining operations that existed there. It is unknown what effect these activities may have had on the stream channel. The relatively steep, confined character of the channel has high energy and debris transport capabilities and is very stable. Its sensitivity to disturbance is considered very low and recovery potential excellent. This accounts for fairly quick recovery from repeated past large disturbances.

The Coal Creek watershed has a broad upper flat and is steeply incised into the Tyee sandstones. A series of falls at the 1.4 river mile mark create an anadromous barrier for salmonids (Stream Surveys, 1989, 1992). Resident cutthroat and rainbow are present above this barrier.

The lower reach flows through a narrow confined canyon with substrates dominated by bedrock with boulders. The gradient for the most part is steep exceeding 4 percent. Deep plunge pools, cascades, and high gradient riffles are abundant. Cover for fish is provided in the way of depth, surface turbulence, and bed roughness elements (Chen 1991). A few large wood accumulations are present, but average only two pieces of large wood per mile. The remaining wood is composed of smaller pieces resulting from logging (Stream Survey1992).

In the upper portion of the surveyed reach, Coal Creek enters a wider valley floor which changes the gradient, wood accumulations, and habitat composition. There are deep pools created by large wood, cascades, low gradient glides, slower riffle habitat, and complex side channels (Chen, 1991). Streambed substrate changes from dominantly bedrock, to gravel and cobble. The channel is no longer confined and floodplains appear. The channel sensitivity to disturbance increases and its recovery potential decreases in this area. The lower gradient, variety of habitat types, density of juveniles, and deep holding pools indicate this section is key spawning and rearing area for winter steelhead.

Summer temperatures are 55^{o} to 62 ^{o}F., which are cooler than the mainstem. When the mainstem's summer temperatures approach 70 ^{o}F., juvenile salmonids congregate in Coal Creek. Debris flows from Coal Creek have deposited a large fan in the South Fork Coquille. Numerous juvenile steelhead were observed in summer 1994 in the pools just below the culverts on Forest Road #33 (USDA, 1994).

Disturbance History, Sediment and Large Wood

Over the years, many wood jams were removed for merchantable timber and firewood, or to aid fish passage. A debris flow that swept down Coal Creek from a debris avalanche in the gorge was triggered by a 1974 storm, a 25-year storm event. The channel was scoured down to bedrock in many places. This event destroyed riparian vegetation up to 200 feet laterally along the channel, allowing alder to become established and dominate the riparian area. The absence of historical stream survey records make it difficult to determine how the channel has changed as the result of the debris flow; however, the channel appears to have recovered from both the natural and human disturbances. The debris flow may have altered the channel shape and substrate composition by creating more bedrock reaches.

Coal Creek differs somewhat from the other tributary watersheds in having extensive harvest in sensitive areas which contributed to sediment and loss of large wood. Coal Creek is the highest at 17%, Wooden Rock Creek is second highest at 10% within a range of 4 to17%.

2. Coal Creek Level II Stream Survey, August 2010

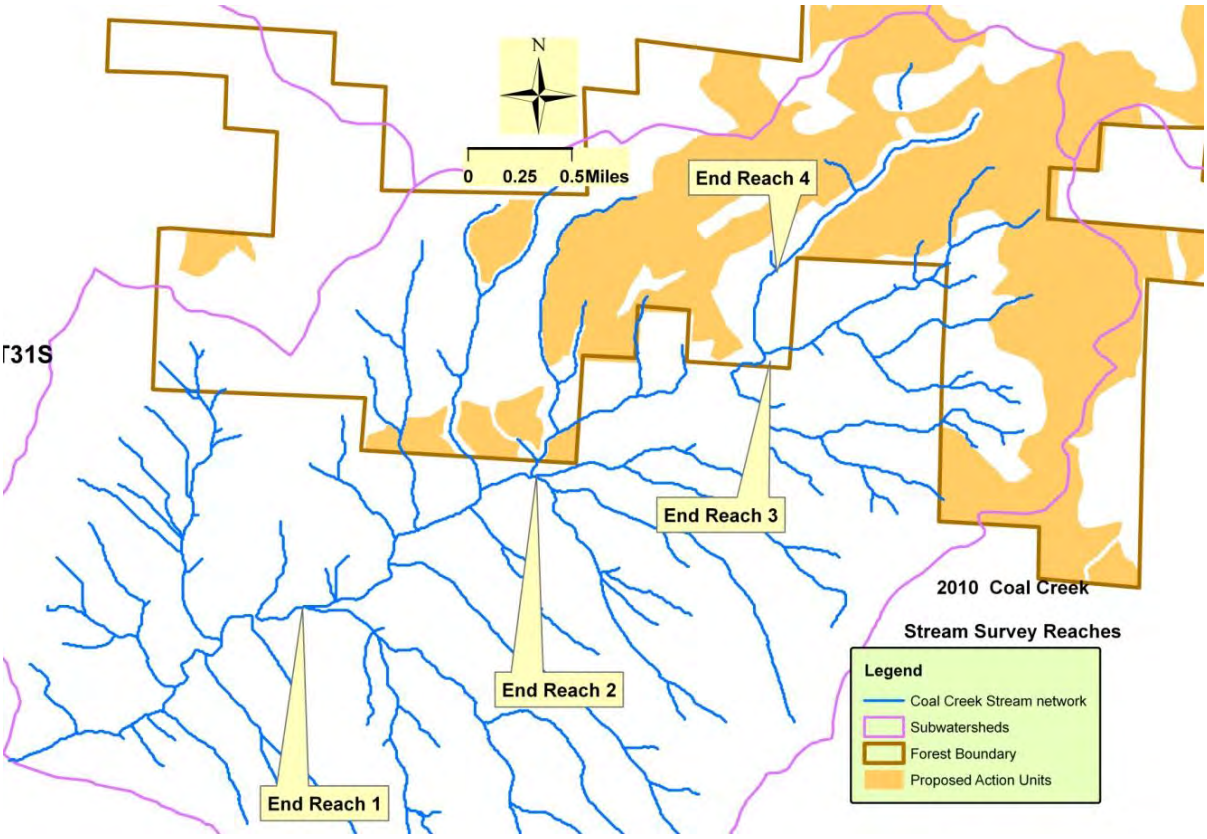
The Coal Creek watershed is located in the Coast Range Physiographic Province and is comprised largely of sandstones from the Tyee Formation. The Tyee Formation is characterized by steep slopes (cliffs), fine textured soils derived from sandstone parent rock, and bedrock confined stream channels.

Geomorphology of the Coal Creek watershed ranges from broad gently sloped mountain tops (Eden Ridge) to steeply sloped and incised canyons and inner gorges. Also observed were small sections of unconfined flat-bottomed alluviated channels featuring mild stream gradients, wood jams, stored sediments, elevated terraces, side channels, and minor floodplain development.

Tributary streams were generally moderate to high gradient, V-notched, and incised. Generally canyon widths were narrow and vary between 40 feet in Reach 4 to 80 feet in Reach 3. Channel sinuosity was low (1.02 – 1.09).

The stream survey extended 6.14 river miles from the mouth of Coal Creek and describes four reaches based on changes in stream flow and canyon morphology (Map C-2). The majority of the survey is located on private lands with the exception of Reach 4.

Map C-2. 2010 Coal Creek Stream Survey Reaches



The following is summary information from the individual stream survey reaches:

Reach 1

- Rosgen channel type B2a; moderately entrenched, structurally controlled, boulder dominated; high end of the slope range for this channel type
- Inner steam banks generally stable
- Average stream gradient 5.7% (moderately steep)
- Medium and large class large wood material (LWM) lacking
- Instream small class LWM scarce (15.1 pieces/mile)
- Inner riparian habitat consisted of small diameter alder, bigleaf maple, myrtle, vine maple, Douglas-fir, and western hemlock).
- Outer riparian vegetation consists of a small tree class Douglas-fir forest in Reach 1

Reach 2

- Rosgen channel type A2a+; steep, deeply entrenched and confined with structurally controlled (bedrock) slopes
- Inner steam banks generally stable
- Average stream gradient 13.7% (steep) with cascades and waterfalls (fish barriers)
- Medium and large class LWM lacking
- Instream small class LWM scarce (17.9 pieces/mile)
- Debris flow near end of reach at mouth of tributary entering Coal Ck. from the south
- Inner riparian habitat consists of small diameter alder, bigleaf maple, myrtle, vine maple, Douglas-fir, and western hemlock

Reach 3

- Rosgen channel type B3a; moderately entrenched in coarse materials at the high end of the slope range for this channel type
- Inner steam banks generally stable
- Average stream gradient 3.9% (mild to moderately steep) with small amounts of floodplain
- Medium and large class LWM lacking
- low gradient gravel dominated riffles and mid channel scour pools, moderate gradient cobble dominated rapids, plunge pools, and side channels
- instream small class LWM moderately abundant in Reach 3 (42.7 pieces/mile)
- Inner riparian habitat consists of small diameter alder, bigleaf maple, myrtle, vine maple, Douglas-fir, and western hemlock
- Outer riparian vegetation consists of early successional vegetation
- August 2010 stream discharge 6.84 cfs taken at beginning of reach

Reach 4

- Rosgen channel type A4; steep, deeply entrenched and confined; incised in coarse depositional materials.
- Inner steam banks generally stable
- Average stream gradient 9.2% (steep) with waterfalls
- Medium and large class LWM lacking
- steeply sloped narrow V-shaped canyon with a stream gradient of 9.2%
- several waterfalls ranging in height from 9 to 55 feet
- Instream small class LWM abundant (77 pieces/mile)
- Inner riparian habitat consists of small diameter alder, bigleaf maple, myrtle, vine maple, Douglas-fir, and western hemlock
- Outer riparian vegetation consists of a large tree class Douglas-fir and western hemlock forest early successional vegetation

Stream Survey conclusions regarding large wood recruitment are as follows:

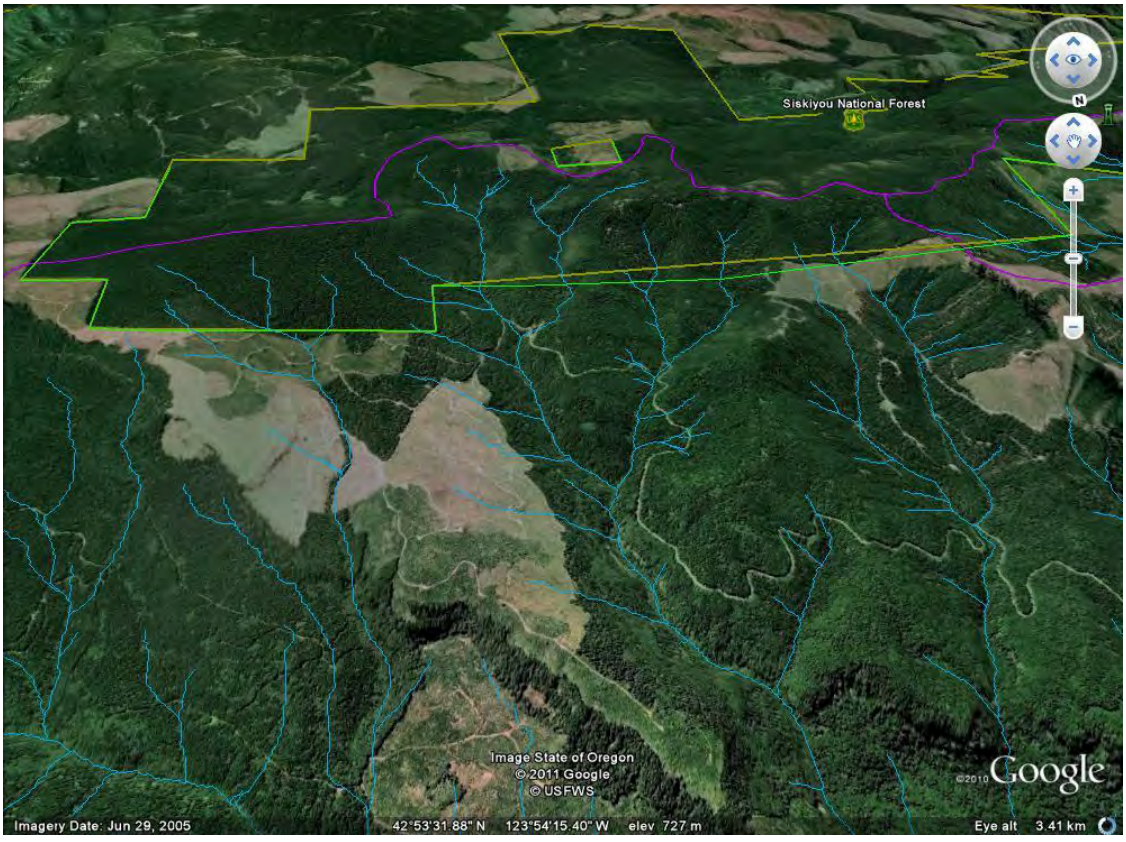
Large woody material, particularly medium and large class pieces are not common in Coal Creek, almost certainly as a result of past logging of the riparian forest and instream salvage logging. LWM densities increase on the portions of Coal Creek that flow across Forest Service land. On portions flowing across private timberland instream LWM is not common. Likewise, the riparian forest on publicly owned land is generally in a mid seral stage, regenerating from past logging but in most areas had matured to the point of providing small class LWM. Conversely, the riparian forest on private corporate land is in an early and pioneer seral stage and incapable of providing instream LWM.

C. CHANNEL MORPHOLOGY & LARGE WOOD - MIDDLE FORK COQUILLE

About 25% of the Planning Area lies within the Middle Fork Coquille watershed, along the watershed divide. Streams in this portion of the Planning Area flow northward and are first and second order streams, non-fish bearing, and dominantly ephemeral. Topography along the divide includes broad gentle slopes that give way abruptly to steep, often raveling, slopes and benches that dominate the upper Myrtle Creek subwatershed. This reflects the structural control of the Tyee sandstones (Figure C-1). Cliffs formed where the bedding is exposed readily erode into steep ravines that bottom in a bench formed by a more resistant sedimentary layer. Most of this rugged topography is outside the Forest boundary. Channel substrate is generally fine grained sediment generated by eroding Tyee Formation sandstones or exposed weathered bedrock. Field examinations on NFS lands found well developed understory vegetation and woody material sufficient to provide structural elements to small channels characteristic of the area. Large, well decayed wood is present as cull wood left by historic logging.

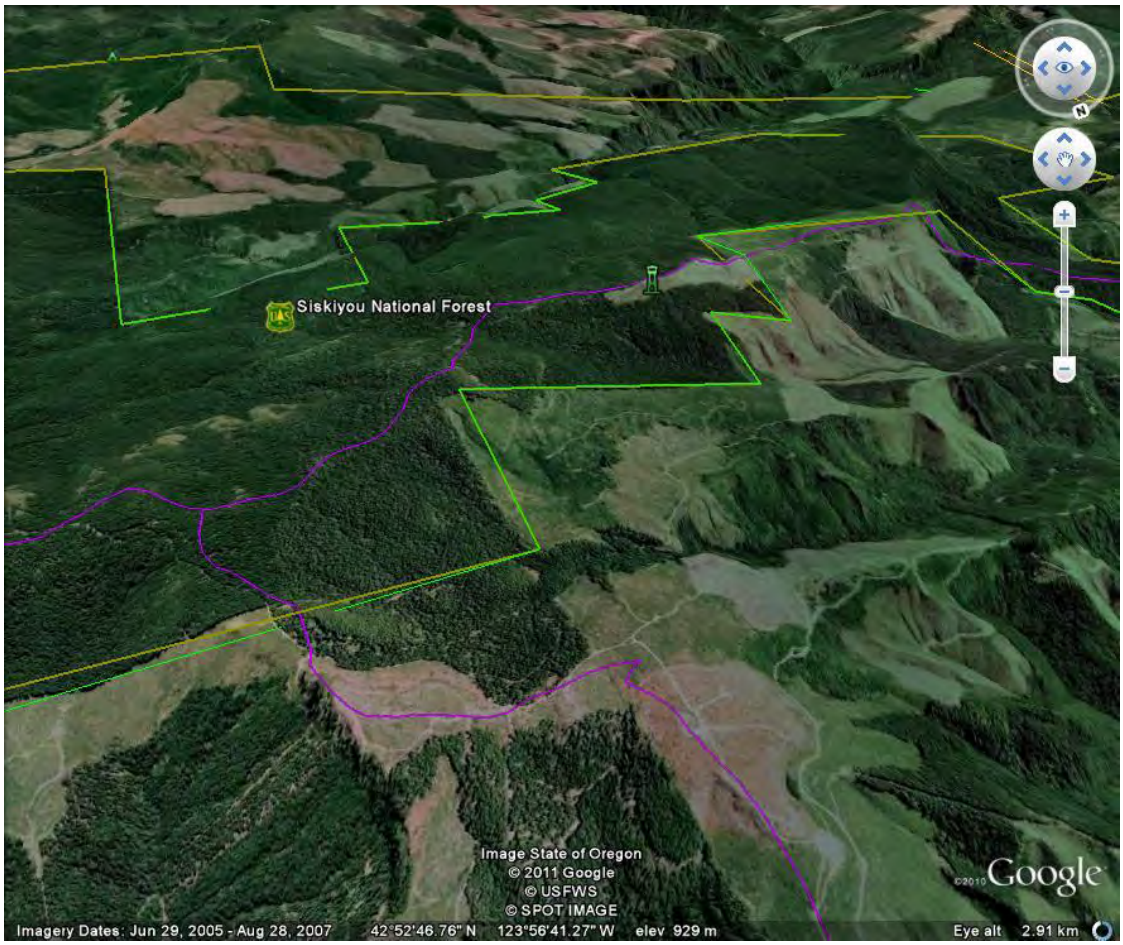
Benched topography supports shallow ponds or swampy areas, but true floodplains are scarce. Channels would be classified as Rosgen type A or B with substrates ranging from fine to small gravel, or bedrock where durable outcrops are exposed. In the Lower Rock subwatershed the watershed divide is broader and cliff-forming elements of the Tyee are more subtle. Streams in this area also drain a steep headwater area, but do not cut through nick points formed by prominent topographic benches (Figure C-2). Channel morphology is similar to that described above, with the exception of a single third order stream (Shields Creek).

Figure C-1. Oblique View Looking South of Eastern Portion of Planning Area



Green and yellow lines delineate the Forest boundary; purple mark the subwatershed divides. Coal Creek Canyon is visible in the background at the upper right. Gentle uplands dominate this area except for the headwater areas of the Lower Rock Creek subwatershed.

Figure C-2. Oblique View Looking South at Western Portion of Planning Area



Gentle uplands dominate this area except for the eroding bluffs (upper right area of photograph) of the Myrtle Creek subwatershed

D. CHANNEL MORPHOLOGY & LARGE WOOD - SOUTH FORK COQUILLE

The Coal Creek and Wooden Rock Creek subwatersheds of the South Fork of the Coquille River contain about 75% of the Planning Area. They are underlain by the Tyee sandstone and contain topography that is formed by the even, sloping surface of sedimentary bedrock. Streams are typically deeply incised with substrates that vary from sand and gravel to sandstone bedrock. These channels steeply join the prominent canyon confining the lower half of Coal Creek. This canyon cuts the Tyee formation deeply—canyon walls extend up to 700 vertical feet—and contains numerous bedrock nick points and waterfalls.

Stream morphology along Coal Creek is dictated primarily by the bedrock of the canyon walls and bottom. The 2010 Stream Survey reports Coal Creek is steep and dominated by coarse gravel, boulders and bedrock in confined reaches. Also reported are two old log jams composed of large but decayed wood. Watershed analysis (1995) documents a powerful debris flow that scoured lower Coal Creek of sediment, wood, and vegetation. Log jams composed of large wood are capable of resisting the high flows of Coal Creek, as is evidenced by the remaining structures. It is likely that Coal Creek contained a series of such jams when ~~-~~old growth" trees were the dominant vegetation.

Large wood is a common structural component in the Pacific Northwest that dissipates the energy of high flows and increases the retention time and quantity of sediment deposits. Large wood resulting from recruitment from late seral forests into streams forms a structural network that can trap sediment to depths of many feet. Removal of the structural wood results in erosion of the gravel deposits to bedrock. This was likely the case for confined reaches of Coal Creek. Older log jams are likely to eventually fail as a result of decay; any sediment retained by these structures would be transported to the South Fork Coquille.

There is no large wood data available from private timber lands; NFS lands currently supply small size class woody material; however most of these lands are not in close proximity to Coal Creek. Little or no source of medium and large class woody material are currently available, therefore confined portions of Coal Creek will remain high gradient, bedrock channels that transport sediment and small wood to the S.F. Coquille. The alluvial fan at the mouth of Coal Creek bears witness to this mode of sediment transport and deposition. Functionally, Coal Creek would be considered in degraded condition since its ability to trap and retain sediment has been compromised by the loss of both in-stream and recruitable large wood. The current decayed condition of existing wood jams suggests that these structures will eventually fail and be transported downstream. Regeneration harvest activity on private land along Coal Creek has continued during the writing of this report. Opportunities for recruitment of large wood into Coal Creek are expected to remain low for the foreseeable future.

Three proposed units are located in the headwater area of the Mill subwatershed. Field examination revealed first and second order streams that are ephemeral and well vegetated. Channels have a steep to moderate gradient, are V-shaped with low sinuosity, and colluvial slopes. Substrates are dominated by sand, silt, and small gravel. Drainage from these units continues onto private lands where channels are also ephemeral. LWM in the small size class is supplied by the stands on NFS land. None of this material would be transported downstream since streams are too small to transport it, and there is no known landslide activity in this location.

The Planning Area includes approximately four miles of Wooden Rock Creek along its eastern edge. The headwaters of Wooden Rock Creek are located on rounded, gently to steeply sloping topography. The main channel has a low gradient and a sinuous pattern with well developed floodplains. No stream survey information is available for this portion of the channel. Field examination of tributary channels near proposed units reveal that they are confined in V- or U-shaped valleys with low gradients allowing for the formation of small floodplains in some locations. Channel substrates include sand and gravel. Tributaries near proposed units wind through heavy vegetation and remnant large wood from historical logging. Large wood is present both as slope cover and as buried structural elements in the stream. Existing trees are large enough and in sufficient quantities to provide continued recruitment to the tributary channel.

The following discussion is extracted/paraphrased from the *Coal Creek Level II Stream Survey, August 2010.* This portion of the Stream Survey describes channel habitat and condition on Reach 4 of Coal Creek. Reach 4 occurs entirely within NFS land and is similar to other tributaries within the Planning Area, with one exception: many of the smaller upland streams visited during field examination contained large wood cull logs that were left by railroad era logging.

> Reach 4 is located in a narrow V-shaped colluvial canyon. There is very little channel sinuosity in Reach 4 and stream gradient is steep (9.2%), however, gravel dominated ‗flats' occur upstream of wood jams and waterfall sills. Estimated average canyon width is 40 feet. The high percent of channel substrate identified as sand and gravel is the result of small sediment being collected and stored behind wood jams and bedrock outcrops.

The riparian habitat in Reach 4 consists of a small and large tree class conifer forest of Douglas-fir and western hemlock. The riparian habitat, and conifer forest growing on adjacent hillslopes, is in a mid seral stage having regenerated from railroad logging that occurred in the 1940s. The riparian vegetation is currently characterized by a relatively even-aged stand with a high degree of canopy closure. No roads or old skid trails were noted in the surveyed section of Reach 4. The mid seral riparian forest appeared to have matured to the point of being capable of providing instream small class woody material.

Reach 4 contains a moderately abundant amount of small class woody material but lacks material in the medium and large size classes. Wood counts totaled 59 pieces of woody material (nearly all small class) for a reach density of 79.7 pieces/mile. Specifically, 57 pieces of small class woody material and 2 pieces of medium class material. No large class woody material was observed in Reach 4. A mid seral riparian forest regenerating from past logging combined with stream cleanout operations would explain the absence of medium and large class LWM.

No fish were detected in Reach 4. Reach 4 contained several waterfalls ranging in height from 9 feet to 55 feet. The last fish seen were at the end of Reach 3 and in Tributary 11.

V. CURRENT CONDITION - WATER QUALITY

Water quality standards are established to protect beneficial uses of the State's waters. Beneficial uses are assigned by basin in the Oregon Administrative Rules for water quality. The Planning Area occurs in the South Coast Basin which has beneficial uses listed below (Oregon Administrative Rule 340-041-0300; adopted by the Oregon Environmental Quality Commission, 2003).

Public Domestic Water Supply
Private Domestic Water Supply
Industrial Water Supply
Irrigation
Livestock Watering
Fish and Aquatic Life
Wildlife and Hunting
Fishing
Boating Water Contact Recreation
Aesthetic Quality
Hydro Power

The state adopted new stream temperature standards in 2004 (OAR 340-041-0028). For stream temperature, the state has defined the following categories:

- **Core cold water habitat**: streams where temperatures are maintained within the range considered optimal for salmon and steelhead rearing. Temperature in these waters should maintain a seven-day average maximum no higher than 16^{o}C (60.8^{o}F).
- **Salmon and trout rearing and migration:** These waters are expected to maintain a seven-day average maximum no higher than 18^{o}C (64.8^{o}F), except during times and places of salmonid spawning.
- **Migration corridors:** Some major rivers in Oregon are designated as being migration corridors only, and the seven-day average maximum temperature should be no higher than 20^{o}C (68^{o}F).
- **Spawning:** During places and times of spawning, the seven day average maximum temperatures are expected to be no greater than 13^{o}C (55.4^{o}F).

All streams in the South Fork Coquille drainage above the Forest boundary are designated –Core Cold-Water Habitat". Streams that drain northward from the Planning Area into the Middle Fork Coquille River are designated –Salmon and Trout Rearing and Migration". No additional criteria for spawning have been applied to streams within the Planning Area. This information is available to the public on DEQ's website (refer to Fish Use Maps, figures 300a and 300b). Information regarding streams listed by the State as impaired is provided in Table C-1 with updated water quality standards for temperature.

Table C-1. Status of Impaired Stream Listings

STREAM NAME AND RIVER MILES	PARAMETER FOR LISTING	SEASON	WATER QUALITY STANDARD	BENEFICIAL USE PROTECTED BY STANDARD	STATUS
South Fork Coquille Watershed					
Coal Creek 0 to 6.5 miles	Temperature	Summer	Rearing temperature 16°C (60.8°F)	Anadromous fish passage; Salmonid fish rearing	Attaining: some pollutant standards are met
Wooden Rock Creek 0 to 7.9	Temperature	Summer	Rearing temperature 16°C (60.8°F)	Anadromous fish passage; Salmonid fish rearing	Attaining: some pollutant standards are met
Hayes Creek 0 to 3.2	Temperature	Summer	Rearing temperature 16°C (60.8°F)	Anadromous fish passage; Salmonid fish rearing	Attaining: some pollutant standards are met
Middle Fork Coquille Watershed					
Myrtle Creek 0 to 17	Sedimentation	Undefined	The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed.	Resident fish and aquatic life Salmonid fish rearing Salmonid fish spawning	Insufficient data to determine whether a standard is met.
Rock Creek 0 to 14.8 miles.	Phosphate Phosphorus	Summer	Total phosphates as phosphorus (P): Benchmark 50 ug/L in streams to control excessive aquatic growths	Aquatic Life	Insufficient data
Rock Creek 0 to 14.8 miles.	Sedimentation	Undefined	The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed.	Resident fish and aquatic life Salmonid fish rearing' Salmonid fish spawning	Insufficient data

Status - An assessment category assigned to each record based on evaluating water quality information using the assessment methodology decision rules.

- **Category 1**: All standards are met. (This category is not used.)
- **Category 2**: Attaining - Some of the pollutant standards are met.
- **Category 3**: Insufficient data to determine whether a standard is met.
  - **3B:** Potential concern - Some data indicate non-attainment of a criterion, but data are insufficient to assign another category.
- **Category 4**: Water is water quality limited but a TMDL is not needed. This includes:
  - **4A:** TMDL approved - TMDLs needed to attain applicable water quality standards have been approved.
  - **4B:** Other pollution control requirements are expected to address all pollutants and will attain water quality standards.
  - **4C**: Impairment is not caused by a pollutant (e.g., flow or lack of flow is not considered a pollutant.)
- **Category 5**: Water is water quality limited and a TMDL is needed, Section 303(d) list.

The Oregon Dept. of Environmental Quality and its partners prepared a *Total Maximum Daily Load* assessment and *Water Quality Management Plan* (TMDL/WQMP) for the Upper South Fork Coquille watershed in 2001. The assessment addressed temperature exceedences in 303(d) listed streams and many of their tributaries, and concluded that ~~"~~no thermal loads are available for allocation to anthropogenic sources in this system". For the purposes of the Planning Area, this means that any increases in stream water temperature resulting from land management activities would be a violation of state water quality standards.

The Middle Fork Coquille River is listed as impaired for both dissolved oxygen (river mile 0 to 11.2) and temperature (river mile 0 to 39.6) and a TMDL is needed. None has been prepared as of the date of this report.

Table C-2, extracted from the WQMP, shows that stream temperatures in the mainstem South Fork Coquille exceed state standards and increase dramatically after flowing out of the Forest. Table C-2 indicates that none of the measured tributaries meet the current water quality standard for temperature. A stream survey of Coal Creek completed in August of 2010 reported stream temperatures ranging from 10°C to 16°C. The data provides confirmation that summer water temperature near the mouth of Coal creek hovers near the temperature standard; however, water in the most upstream reach of the survey is cooler than the temperature standard. The 2010 stream survey also measured the temperature of 11 tributaries to Coal Creek. Temperatures of these tributaries ranged from 11° to 16°C with all but one tributary cooler than 16°C.

Many factors can affect water temperature, and it is difficult to relate forest management activities directly to water temperature changes. It has become standard practice in the Pacific Northwest to utilize stream shading as a surrogate measure and predictor of long term water temperature changes. Effective shade from the forest canopy screens the water's surface from direct rays of the sun. Highly shaded streams typically have cooler stream temperatures due to reduced input of solar energy (Brown 1972, Beschta et al. 1987). DEQ has assigned limits to solar radiation reaching streams by utilizing effective shade as a surrogate target for solar loading. For the South Fork Coquille Subbasin, DEQ has adopted a target of at least 82% effective shade. Percent effective shade can be linked to specific areas and, thus, to management actions needed to solve problems that cause water temperature increases (Park 1993). Table C-3 lists existing and potential stream shade values, as well as other beneficial management goals contained in the WQMP (DEQ, 2001).

Table C-2. Average Seven-day-Maximum Temperature Measurements

Site No.	Location	Years of Record	Min 7-day of record	Max 7-day of record	Avg 7-day of record	Avg Delta T of record	Data Source
	Mainstem South Fork Coquille						
*	at Gaylord	1994 - 95	72.4 F	79.4 F	76.0 F	13.4 F	USFS
1	at fish trap	1994 - 95, 97	78.5 F	82.3 F	80.6 F	12.3 F	USFS
2	at Forest Boundary	1990 - 98	68.8 F	70.8 F	69.8 F	5.9 F	USFS
3	above Coal Creek	1995	67.3 F	67.3 F	67.3 F	14.1 F	USFS
4	at Sand Rock Flat	1997 - 98	72.6 F	75.4 F	74.0 F	9.3 F	USFS
5	above Rock Creek	1992, 1994 - 98	65.6 F	69.2 F	67.4 F	7.1 F	USFS
6	at Lockhart Bridge	1994 - 95, 97-98	69.9 F	74.7 F	72.1 F	11.6 F	USFS
7	below Buck Creek	1990 - 98	64.7 F	68.5 F	67.0 F	7.7 F	USFS
8	above Wooden Rock	1995 - 98	69.5 F	73.8 F	72.2 F	12.7 F	USFS
9	at Eden Valley Bridge	1995 -98	55.9 F	60.4 F	58.7 F	3.5 F	USFS
	Tributaries to South Fork						
10	Coal Creek at Mouth	1994			60.9 F	5.0 F	The Timber Co., USFS
11	Johnson Creek at Mouth	1990 - 98	63.4 F	67.9 F	66.0 F	8.4 F	USFS
12	Sucker Creek at Mouth	1998	67.3 F	67.3 F	67.3 F	9.6 F	USFS
13	Johnson Creek above Sucker	1998	61.8 F	61.8 F	61.8 F	7.0 F	USFS
14	Rock Creek at Mouth	1990 - 98	65.7 F	70.9 F	68.6 F	9.5 F	USFS
15	Rock Creek at Bridge	1991	68.3 F	68.3 F	68.3 F	11.9 F	USFS
16	Lockhart Creek at Mouth	1998	57.2 F	57.2 F	57.2 F	2.8 F	USFS
17	Wooden Rock Crk at Mouth	1994			68.7 F	10.6 F	USFS
18	Clear Creek at Mouth	1995 - 96	58.6 F	61.5 F	60.1 F	5.5 F	The Timber Co., USFS
19	Foggy Creek at Mouth	1994 - 98	64.8 F	69.0 F	66.6 F	8.0 F	USFS

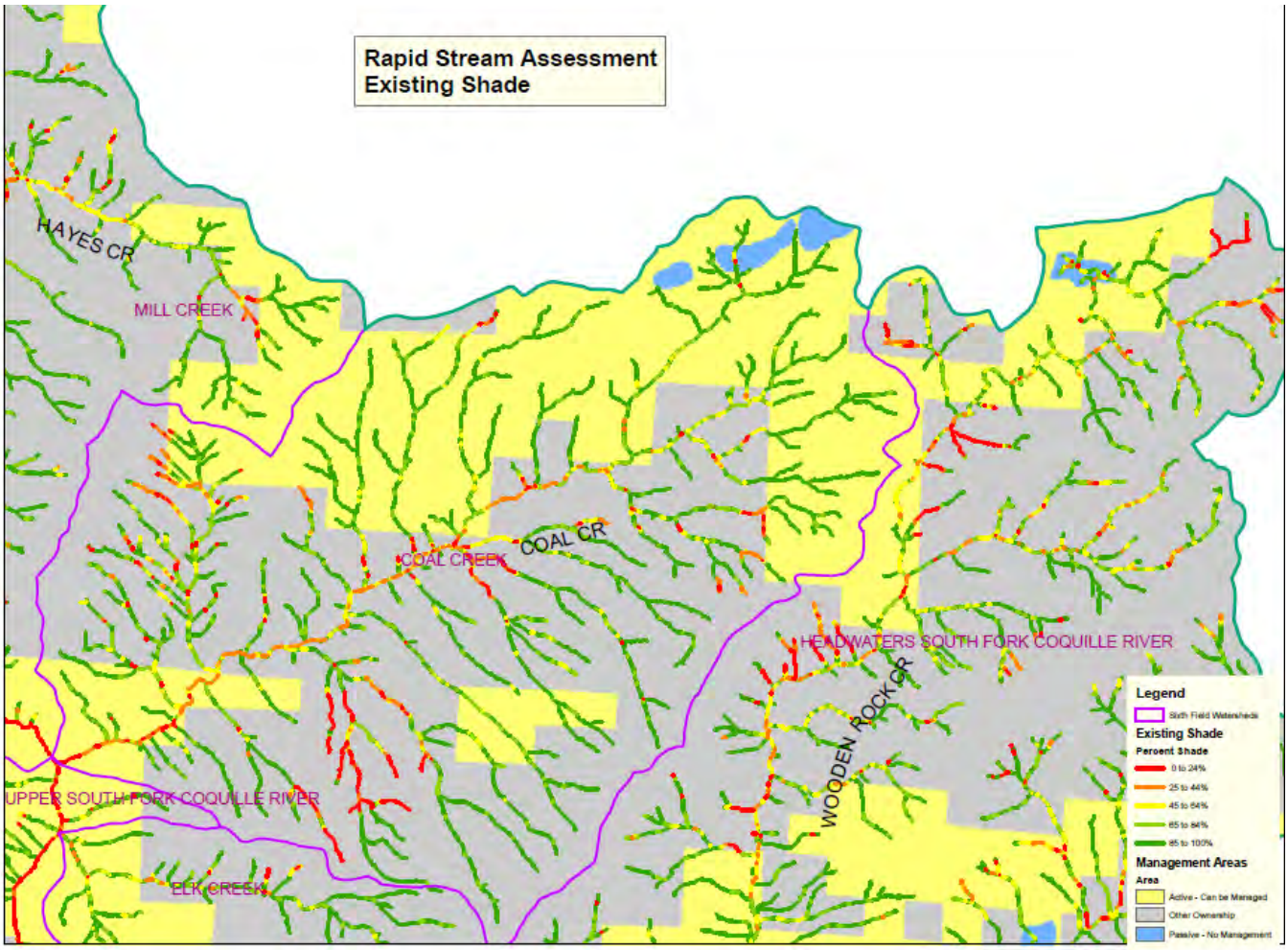
Table C-3. Average Existing and Potential Shade by Subwatershed

Element (Factor)	Location	Current Condition	Projected Value, Based on Lack of Disturbance	Time Frame	Resp. Party
Temperature-Shade	Mainstem*	Shade = 49 %	Shade = 75 %	120 years	USFS/PRVT
	Coal Creek*	Shade = 64 %	Shade = 82 %	60 years	USFS/PRVT
	Johnson Creek	Shade = 72 %	Shade = 84 %	60 years	USFS
	Rock Creek	Shade = 65 %	Shade = 83 %	120 years	USFS
	Squaw Creek*	Shade = 75 %	Shade = 86 %	55 years	USFS/PRVT
	Panther Creek*	Shade = 70 %	Shade = 85 %	55 years	USFS/PRVT
	Wooden Rock*	Shade = 66 %	Shade = 83 %	85 years	USFS/PRVT
	Clear Creek*	Shade = 77 %	Shade = 87 %	60 years	USFS/PRVT
	Foggy Creek*	Shade = 67 %	Shade = 85 %	80 years	USFS/PRVT
Temperature-Channel Form	Basin Wide, esp. Rock Crk	Mgmt Related Sed input in lrg Storms	Reduced Mgmt Related Sed. Input	20 years	USFS
	Basin Wide	Roads in High Sensitivity Areas	Upgrade/Eliminate These Roads	20 years	USFS
	Basin Wide	High Risk Stream Crossings	Upgraded Crossings w/o Diversion Pot.	10 years	USFS

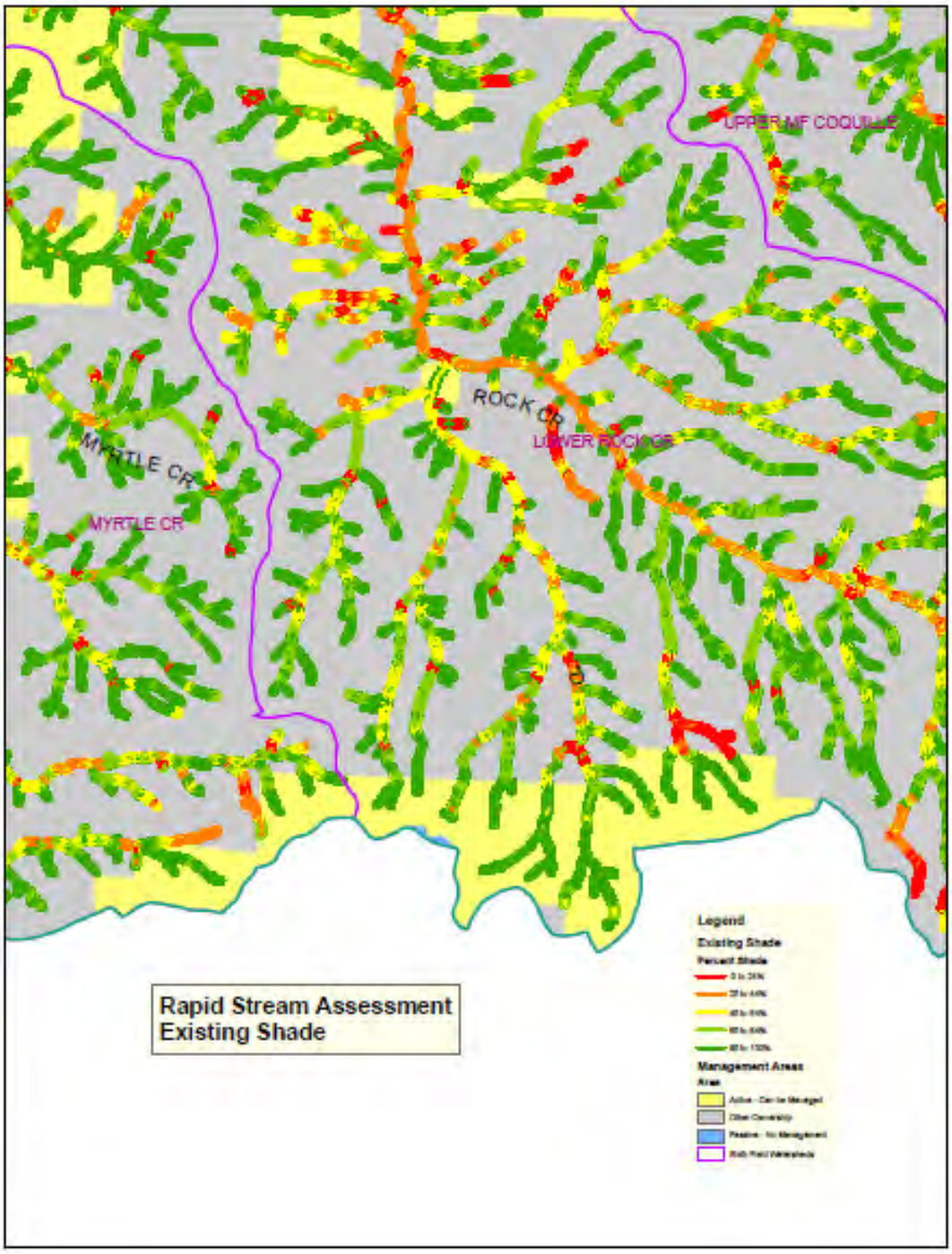
***Private timber companies own land in these drainages**

Stream shade provided by forest canopy is generally sufficient on small streams on NFS land within the Planning Area. Maps C-3 and C-4 display existing shade values for the Planning Area that were generated by the RAPID model. NFS riparian zones in the Planning Area are dominated by shade in the 85-100% category with scattered areas in the 65-84% shade category. Occasional spots in lower categories appear; many of these are adjacent to the Forest Boundary and probably reflect map/photo boundary location errors. Regeneration harvests present in 1996 are readily detected in Maps C-3 and C-4 as abrupt changes in existing shade from green to red/orange at the Forest Boundary. Existing vegetation was derived from aerial photography from 1996; therefore it does not reflect more recent regeneration harvests that have occurred on private timber lands adjacent to the Planning Area. For a more recent assessment of harvest activity and road density, refer to the discussion of cumulative watershed effects section of this report.

Map C-3. Existing Shade for Planning Area in South Fork Coquille Subwatersheds



Map C-4. Existing Shade for Planning Area in Middle Fork Coquille Subwatersheds



VI. HYDROLOGIC EFFECTS MECHANISMS & ANALYSIS FRAMEWORK

Hydrologic issues are examined in this report by describing the mechanisms for environmental effects as they relate to the proposed action and alternatives; followed by a description of the effect at the local and subwatershed scales. This report provides a context for effects by documenting levels of existing disturbance, discussing thresholds for watershed disturbance, and describing cumulative impacts that are based on the Action Alternatives in combination with reasonably foreseeable actions.

A. CHANNEL MORPHOLOGY AND LARGE WOOD

Streams where treatments are proposed under the Eden Ridge Timber Sales are located on steep hillslopes and on more gentle uplands adjacent to subwatershed ridges. Field examination revealed channel substrates with exposures of resistant bedrock strata, or sand and gravel weathering products of less durable layers of the formation. The Planning Area contains numerous small streams (only a few feet wide) that are first and second order channels, are intermittent or ephemeral, and may include boggy areas and seeps. Stream valleys are often V-shaped and the active channel less than ten feet wide. Small wood and vegetation are sufficient to provide channel and slope stability. Wood falling into the channel cannot travel downstream due to the lack of streamflow and topographic confinement.

Sediment transport in these small channels is moderated by the presence of heavy vegetation in the form of both trees and shrubs, and by wood present in the channel and on adjacent steep slopes. Wood falling directly into small channels contributes to their sediment capture and holding capacity. NFS lands in the Planning Area have little opportunity to provide large wood to the main stems of Coal Creek or Wooden Rock Creek since the majority is located in the uplands away from the channel. Proposed Units 308, 309 and 315 are close enough to provide wood to Coal Creek. Units 202, 209, 212, 213, and 214 are close enough to provide wood to Wooden Rock Creek. The remaining project units are too far away from large or mainstem channels to be an instream wood source, and/or are not drained by streams large enough to transport large wood.

All proposed units have been harvested in the past; the largest diameter trees observed in riparian reserves associated with units was approximately 24”; the majority are 6” to 18” diameter. In-channel large woody material in Region 6 is defined as a minimum of 50 feet long with a DBH of 36 inches at the small end. Currently, none of the trees within Riparian Reserves of the Planning Area meet this criterion, with the exception of downed cull logs left by historical harvest activity. The role of LWM as a structural element is critical in the larger channels of Wooden Rock Creek and Coal Creek. Both these channels transport large amounts of sand and gravel since these are the weathering products of the surrounding sandstone. Wooden Rock Creek is dominated by low gradient reaches with floodplains that can easily store fine sediment with moderate amounts of instream wood. Debris dams composed of smaller wood also provides for effective sediment trapping and retention. Such is not the case for Coal Creek, a steep, confined, bedrock channel with low sinuousity and no floodplain. Coal Creek is dependent on large wood distributed throughout the mainstem channel to dissipate the force of storm events and to provide durable wood material for large log jams that can form sediment dams.

Project activities could destabilize slopes and receiving streams by generating runoff from compacted roads and trails, and by intercepting and concentrating surface and subsurface water into erosive flows. Changes in flow and sediment load over time are primary forces in alteration of channel morphology. Road construction in subwatersheds that exceed generally accepted thresholds for road density is a concern, particularly if it occurs in mid- or lower slope positions where water is naturally more concentrated. New road construction or reconstruction on previously forested alignments (such as railroad grades) needs to be evaluated in terms of its ability to intercept and channel water both on upland slopes and at channel crossings.

B. SEDIMENT DELIVERY

Reduced canopy cover following timber harvest can allow more direct raindrop impact on the soil surface, increase the amount of rain reaching the soil, and change the accumulation and melting pattern of snow. Thinning activities can induce changes in soil properties that can accelerate natural rates of erosion and sediment delivery to streams.

Fine sediment-- especially clays that remain suspended except in very still water-- reduces water clarity, thus affecting water quality. Coarser sediment may bury stream gravels and pools or, change channel shape and flow in cases of high sediment input such as debris flows. Sediment delivery to the South Fork Coquille is a concern since this channel is critical habitat for coho salmon (below the town of Powers). Coal Creek and Wooden Rock Creek drain the Planning Area and are two major tributaries of the SF Coquille that provide cooler water. Debris flow activity has been documented in Coal Creek Canyon, and an alluvial fan at the mouth is a display of debris deposits. Watershed Analysis documents a severe debris flow in 1974 that resulted from a 25 year recurrence level storm event. The Powers Ranger District has had to clear the 33 Road of debris delivered at the mouth of Coal Creek repeatedly, in spite of two nine foot diameter culverts.

A reduced canopy cover could contribute to quicker runoff, which could increase sheet and rill and gully erosion as well as increase the erosive power of receiving streams. Compacted soils resulting from road/trail construction and the use of heavy equipment also contribute to increased runoff. Rapid re-growth of the understory after thinning typically balances removal of the canopy except where soil compaction discourages moisture infiltration and new growth. Harvest operations may trigger accelerated erosion in unstable areas if the combination of canopy removal, road reconstruction, and new road construction generates enough cumulative impact to result in increased or concentrated runoff. High risk areas include steep slopes associated with riparian reserves of higher order channels (3rd order and higher) within the transient snow zone.

Roads intercept runoff from upslope areas, so both existing and increased road density is a concern. The intercepted runoff and rain falling directly on the surface of the road is collected in a drainage ditch on the uphill side of the road. Roads also intercept near-surface groundwater flowing through the slope. The flow in the drainage ditch is periodically discharged underneath the road through a culvert to prevent excessive road erosion and flooding. This effectively concentrates flow on the hillside at the point the flow discharges from underneath the road. This concentrated flow often causes a channel to form which, during storm events, transports flow to streams more rapidly than prior to road construction. This has the effect of increasing the drainage network, thereby increasing peak flow and runoff speed. Roads, by increasing the drainage network, have the potential to increase peak flows through concentration of runoff and more rapid routing to stream channels (Wemple 1996). The increased energy of peak flows results in elevated rates of erosion and sediment transport. Roads create unprotected ditches, cut slopes and fills that can contribute sediment to streams. Elevated sediment is either stored or transported downstream and may contribute to morphological changes (filling of pools, channel widening) and/or degraded water quality.

Road density may be used as an indicator of the potential for channel network expansion to increase peak flows. Densities under 2 miles per square mile are considered low; over 3 miles per square mile suggest a concern for sediment. Subwatersheds containing the Planning Area have road densities well over 4 miles per square mile (Watershed Analysis).

Slope distance of roads and road culvert discharge points from surface channels are also important. For example, a road near the top of a slope and far from a natural channel will intercept the storm water it receives directly and whatever flows to it from the small slope area uphill. By contrast, a road in a midslope or lower slope position will intercept runoff from a much larger upslope area, as well as subsurface flow penetrated by the roadcut, that will be concentrated in ditches and released into existing channels via culverts. Existing and proposed roads can have long term adverse effects on water and sediment transport that must be considered and mitigated during thinning treatment. Roads can also increase sedimentation through structural failure. Road structural failure is most commonly caused by culvert embankment failure and slope failure.

C. WATER YIELD (PEAK FLOWS)

Stream response to storms and runoff is generally measured in terms of increased water flow volume and velocity. Precipitation and snowmelt increase stream flow until a peak is reached and stream flow declines toward ground-water supported levels. The speed and duration of stream response is a function of the size and drainage network configuration of the watershed, topographic and vegetative watershed characteristics, and storm/runoff event size and duration. Peak flows are categorized in terms of their return interval, that is, the estimated time interval between specified flood events. The two year return interval generally determines basic stream morphology since it occurs regularly over the long term and thus distributes the bulk of the long term sediment load (Rosgen 1996). Data for this interval is also more readily available than for longer intervals. Uncertainty regarding peak flow behavior increases with increasing recurrence interval because data is lacking for larger more infrequent storm events. Uncertainty also increases with size of the drainage basin because of increasing variability, especially from human induced watershed effects (i.e., reservoirs, urban development, water use) (Grant et al. 2008). In forest management, peak flow increases are considered a primary contributor to increased risk of cumulative watershed effects (CWE). If project analysis demonstrates that no peak flow increases would be generated, or reasonably anticipated, direction to avoid CWE contained in the LRMP and NWFP are satisfied.

For the past several decades, watershed response to forest harvest has been studied quantitatively through paired watershed studies in small drainages. Streamflow response to primarily clear cut harvest and road construction has been measured and reported over a wide range of forested landscapes with an equally wide range of results (Moore and Wondzell, 2005). In a recent State-of-the-Science review (2008) Gordon Grant of Oregon State University presented conclusions based on a review of paired watershed studies. Grant selected studies that occurred primarily in the Pacific Northwest region and within the rain-on-snow hydrologic regime. Of particular interest is the stated goal of Grant‘s study to anticipate impacts resulting from current thinning forest practices based on results from past forest regeneration harvest practices. Grant‘s (2008) analysis presents the following generally accepted conclusions regarding the change in peak flows resulting from forest harvest in small basins:

Canopy removal increases peak flow as follows:

- During the fall season, through reduced evapotranspiration
- During the winter and spring through increased snow accumulation and melt
- During all seasons through reduced rain/snow interception

Canopy removal decreases peak flow:

- During all seasons by reducing fog drip.

Grant et al. (2008) observed that flows altering stream morphology are those with recurrence intervals greater than one year. Rosgen (1996) has shown that floodplain morphology is shaped by bankfull flows that correspond to the one to two year recurrence interval. Grant et al. (2008) places our upper limit of detection for changes in peak flow at the six year recurrence interval. Study data consistently shows that as storm events become larger, the increase in peak flow change decreases and the significance of the change becomes undetectable.

Storm events become increasingly rare as magnitude increases; there are practical limits to the length of time stream flow has been recorded and to the accuracy of measurement of very large events. All of these factors contribute to the six year detection limit. With these limitations in mind, Grant et al. displayed how peak flow change measured within the rain-on-snow regime changes with the percent of area harvested. There is a general trend for peak flow increases to decline as harvest area drops. Once harvest acreage drops below the 15% level (for transient snow zone), peak flow changes are undetectable. For the rain dominated areas the harvest level generating detectable peak flow increases is about 29%.

Grant proposed two classes of stream channel that are most susceptible to peak flow changes resulting from flows in the one to five year range of recurrence interval: gravel bed channels and sand bed channels. These are generally higher order streams (3rd order and up). In the Planning Area these would be Coal Creek and Wooden Rock Creek. First and second order mountain streams typically are shaped by storm events with 10+ year recurrence intervals.

Grant (2008) provides a general guideline for assessing harvest peak flow effects in the table reproduced below. Roads play a leading role in the generation of increased peak flows at the small basin scale. This is due to their ability to intercept and concentrate subsurface and surface water. Road networks combine with stream networks to accelerate water drainage from the land. Note also that thinning would be expected to generate a low risk of increased peak flows as compared to equivalent timber removal in large patches.

Cumulative Watershed Effects (CWE) analysis for the alternatives was performed by comparing the percent of (sixth field) subwatersheds affected by proposed activities with the thresholds provided by Grant et al. (2008). Comparisons included consideration of existing watershed condition, road density, and reduced hydrologic recovery in managed stands harvested less than 30 years previously.

Figure C-3. Potential Considerations for Peak Flow Increases

Likelyhood of peak flow increase (High ← → Low)			Potential considerations
High	Moderate	Low	Road density
All or most	Some	Few or none	Road connectivity
Fast	Moderate	Slow	Drainage efficiency
Large	Small	Thinned	Patch size
Absent	Narrow	Wide	Riparian buffers

D. WATER QUALITY – TEMPERATURE (S.F.COQUILLE TMDL, 2001)

Stream temperature is an expression of heat energy per unit volume, which in turn is an indication of the rate of heat exchange between a stream and its environment. The heat transfer processes that control stream temperature include solar radiation, longwave radiation, convection, evaporation and bed conduction (Wunderlich, 1972; Jobson and Keefer, 1979; Beschta and Weatherred, 1984; Sinokrot and Stefan, 1993; Boyd, 1996). With the exception of solar radiation, which only delivers heat energy, these processes are capable of both introducing and removing heat from a stream.

Anthropogenic increase in heat energy is derived from solar radiation as increased levels of sunlight reach the stream surface and raises water temperature. The pollutant (solar heat energy) is a source of stream temperature increase that is within management measures and is targeted in this TMDL.

Table C-4. Factors that Influence Stream Surface Shade

Description	Measure
Season	Date
Stream characteristics	Aspect, Bankfull Width
Geographic Position	Latitude, Longitude
Vegetative Characteristics	Buffer Height, Buffer width, buffer Density
Solar Position	Solar Altitude, Solar Azimuth

Over the years, the term shade has been used in several contexts, including its components such as shade angle or shade density. For purposes of this TMDL, shade is defined as the percent reduction of potential solar radiation load delivered to the water surface. Thus, the role of effective shade in this TMDL is to prevent or reduce heating by solar radiation and serve as a linear translator to the solar loading capacities.

The percent effective shade is perhaps one of the easiest and straightforward stream parameters to monitor/calculate and is most helpful in directing water quality management and recovery efforts. Using solar tables or mathematical simulations, the *potential daily solar load* can be quantified. The *measured solar load at the streams surface* can easily be measured with a Solar Pathfinder or estimated using mathematical shade simulation computer programs (Boyd, 1996 and USFS, 1993).

Potential causes for water temperature increases would be associated with canopy removal at temporary and permanent stream crossings for both roads and skyline corridors. Canopy removal elsewhere on roads and for thinning outside the primary shade zone would not affect stream temperature since there is no surface water present.

E. CUMULATIVE WATERSHED EFFECTS

The project Planning Area is surrounded by private timber production lands that have been, and continue to be, harvested by regeneration methods. Existing watershed disturbance as of 2009 was analyzed for both private and NFS lands in project subwatersheds in order to provide a realistic context for the contributions of the Action Alternatives to cumulative watershed effects.

For most of the Planning Area, risk for adverse CWE is at the moderate/high threshold level. Risk analysis utilized a process developed for the Pacific Northwest in response to a request from the National Marine Fisheries Service regarding determination of the cumulative effects to fish populations protected under the Endangered Species Act of 1973.

The process is documented as *Determining the Risk of Cumulative Watershed Effects Resulting from Multiple Activities* (USDA, Forest Service, 1993). This process was developed by Forest Service fish biologists and hydrologists from Regions 1, 4 and 6, and reviewed by forest industry, National Marine Fisheries Service, and tribal representatives.

Evaluation of peak flow data in Oregon and Washington was conducted by Grant et al. (2008) in a publication titled *Effects of Forest Practices on Peak Flows and Consequent Channel Response: A State-of- Science Report for Western Oregon and Washington*. Discussions and conclusions in the Grant et al. report are relevant to, and update, the analysis process developed in 1993 because peak flow changes are an indicator of watershed response to management actions and represent a host of indirect effects. Grant et al. states:

> ~~"~~In general, the magnitude of channel morphologic changes because of peak flow increases alone are likely to be much less significant than other impacts associated with forest harvest activities. Effects of deforestation on landslides, debris flows, and surface erosion are well documented (e.g., Reid 1993, Sakals et al. 2006, Sidle et al. 1985) and these are likely to have far more direct effects on channel structure than peak flows alone, as these processes typically involve direct introduction of sediment into stream channels. In particular, accelerated geomorphic processes associated with forest roads are likely to have some of the most pronounced effects on forest streams (e.g., Wemple et al. 2001)."

This section describes the indicators used for the assessment of existing watershed condition as of 2009, including modifications based on information provided in Grant et al. (2008) and based on the author's professional judgment.

The 1993 USDA/USFS protocol provides a means of assessing the relative risk of incurring adverse cumulative effects from actions which, individually, would be ~~"~~not likely to adversely affect" fish production. For the Planning Area, this protocol is used to assess the existing condition resulting from past and recent timber management on both National Forest System and privately owned lands.

Grant et al. (2008) concluded that watershed studies at the scale of larger drainage areas (more than approximately four square miles) are rare, and that variables specific to a particular watershed could influence study results more than timber harvest (for example basin condition and vegetation types). For this reason, 6th field subwatershed boundaries were used for analysis rather than the 5th field watershed boundary. In this case, the subwatersheds involved have a similar management history, geology, and soil characteristics (refer to Watershed Analyses, USFS 1995 and BLM, 1994). The Planning Area is contained in five subwatersheds that experience rain, fog and transient snow associated with a marine influenced climate (USFS Watershed Analysis, 1995). The Planning Area is dominantly in a precipitation regime dominated by rain, with rain-on-snow occurring at the highest elevations.

Watershed condition and channel condition rating factors used for this analysis are described below:

- **Hydrologic Maturity** (forest canopy recovery) -- A coarse filter for ~~"~~immature vegetation" that is often used is the percent of clear cut (regeneration harvest) forested stands less than 30 years old. Watersheds with more than 30% of such stands are at high risk (USDA 1993). Likewise, Grant et al. (2008) predicted peak flow changes would become detectable when stands less than 30 years old occupy more than 29% of the area in rain-dominated zones, and more than 15% in the transient snow zone.

- **Road Density** -- areas that exceed 3.6 mi/sq.mi. in high relief watersheds, and that exceed 4.6 mi/sq.mi. in low relief watersheds are considered to be at high risk of adversely impacting water quality and water yield (USDA 1993).

- **Temperature** -- used as an indicator of habitat and channel condition (USDA 1993); stream temperature should not exceed fish tolerance or state thresholds.

- **Large Woody Material** -- used as an indicator of habitat and channel condition (USDA 1993).

1. Hydrologic Maturity Assessment for Planning Area

Forest canopy cover was assessed by inventorying stands less than 30 years old in the affected subwatersheds up to the year 2009 (see Attachment 1 for methodology). This assessment captures private timber land harvest activity as well as that on BLM and NFS lands. Table C-5 summarizes this assessment as percent of each subwatershed harvested and provides a risk rating. Harvest from 2005 to 2009 is provided to show where the most recent activity has occurred.

Table C-5. Regeneration Harvest as Percent of Subwatershed

Subwatershed	Total Regeneration Harvest 1977-2009	Regen Harvest 2005-2009	Risk Rating (USDA, 1993)
Coal Creek	41%	11%	High
Headwaters SF Coquille	10%	2%	Low
Mill Creek	23%	2%	Moderate
Myrtle Creek	32%	8%	High
Lower Rock Creek	40%	12%	High

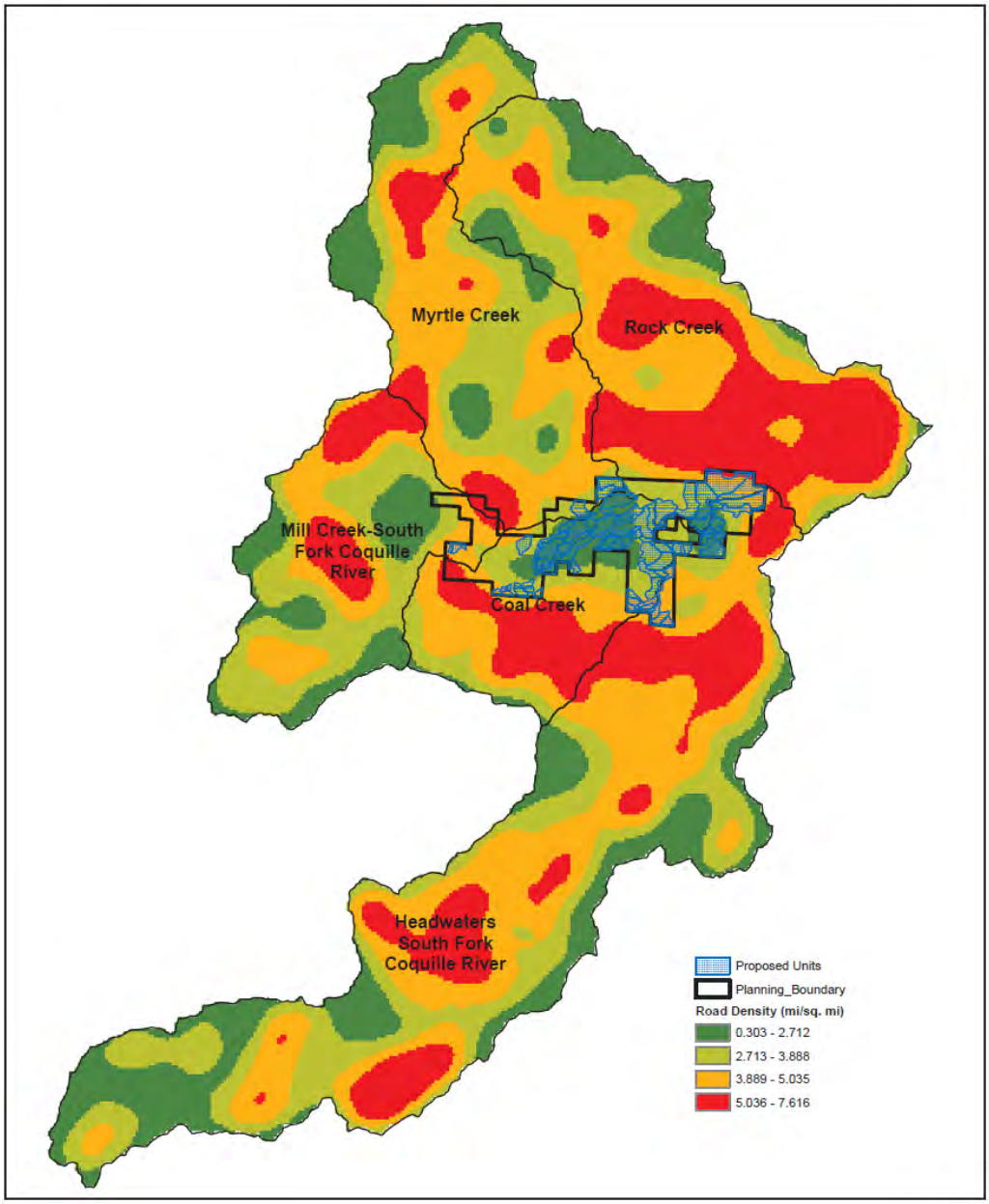
2. Road Density Assessment for Planning Area

Subwatersheds in the Planning Area would be classified as ~~l~~low relief" for the purposes of road density threshold comparison. Table C-6 shows that except for Lower Rock Creek subwatershed, existing road density for the project subwatersheds is at the moderate risk levels for low relief watersheds (below 4.6 mi./sq.mi). Lower Rock Creek subwatershed is in the ~~h~~high risk" category.

Road density, expressed as miles/square mile is an easily calculated index of watershed disturbance and a useful coarse filter for determining current watershed condition as a basis for risk of cumulative watershed effects (USDA, 1993). Road density information has been updated to 2009 specifically for the subwatersheds in the Planning Area (see Attachment 1 for methodology).

Map C-5 depicts road densities that include state/county and classified (BLM/FS) roads, but do not include temporary roads or skid trails (no data). High risk ratings begin at 4.6 miles/sq.mi. (USDA, 1993). The map below shows that most NFS lands in the Planning Area have densities less than 3.8 miles/sq.mile. NFS lands along the edges of the Forest/private land boundary have road densities higher than 3.8 miles/sq.mile. Subwatersheds that include the Planning Area would be rated ~~m~~oderate" or ~~h~~igh risk" for watershed effects associated with roads.

Map C-5. Subwatershed Road Density



3. Large Woody Material Assessment for Planning Area

Coal Creek subwatershed forms the core of the Action Alternatives in that it contains the majority of the harvest units, proposed road construction, and haul routes. Other subwatersheds are peripherally involved along subwatershed divides. The 2010 Stream Survey for Coal Creek found little or no medium or large size class woody material and little potential for future recruitment (refer to detailed information under Existing Environment section of this report). Coal Creek would be rated –Poor" for large woody material, as an indicator of habitat and channel condition (USDA 1993) based on the condition of the main channel. According to watershed analyses and stream surveys, quantities of large woody material in stream channels, and quantities available for recruitment to stream channels, are low throughout the affected watersheds.

Within the last 100 years, standing and downed conifers were removed from, and roads were built along, the majority of riparian areas in the Middle Fork Coquille River basin. Since red alder responds to heavy disturbance activities such as logging and road building, the riparian areas were converted from mixed conifer stands with a hardwood understory to red alder-dominated stands with a shrub understory." (P16).

> ~~T~~he entire length of the Middle Fork Coquille River and portions of nearly every tributary stream are constrained by roads. In general, the drainage has a deficit of in-stream structure (large woody debris) and channel complexity, with the exception of a few isolated stretches on some tributaries." (P17, 18).

4. Stream Temperature Assessment for Planning Area

Existing shade maps show that most streams on National Forest System land within the Planning Area are well shaded by the existing tree canopy. This is generally not the case on the mainstem channels, which have long reaches through private timber lands. Although both Coal Creek and Wooden Rock Creek contribute cooler water to the South Fork Coquille River, their temperatures at the confluences are at or higher than state standards. This suggests that subwatershed condition as a whole is not currently good enough to bring stream temperatures in these two subwatersheds into compliance with state standards. This is reflected in the State's decision to allow no increase in water temperature that could result from management activities for the S. Fork Coquille.

The main channel of Coal Creek is poorly shaded by trees; canopy cover is generally below 64% shade. The channel is well shaded by the steep and narrow canyon through which it flows. Streams within the proposed units and on NFS land in the Planning Area are generally well shaded by conifers and occasional hardwoods such as big leaf maple, myrtle, and alder. RAPID analysis indicates that stream shading on NFS land is dominantly 84 percent to 100 percent. Wooden Rock Creek, in the vicinity of the Planning Area, is dominated by shade values below 64% along the mainstem. Since this channel is oriented mainly north-south there is little opportunity for topographic shading during the warmest part of the day.

The Middle Fork Coquille River is also listed for temperature; however it is unlikely that the small amounts of runoff from lands in the Planning area have a measurable influence in such a large and actively harvested watershed. The State has yet to make a determination regarding the sources of elevated stream temperature in this watershed.

5. Overall Risk of Adverse Cumulative Watershed Effects as of 2009

Table C-6 summarizes the existing condition information and provides an overall risk rating for detectable watershed effects for each subwatershed in the Planning Area. Note that for all but the Headwaters S.F. Coquille subwatershed, the risk is ~~h~~high".

Table C-6. Summary of Risk of Adverse Watershed Effects

Subwatershed	Hydrologic Maturity Risk Factor	Road Density Risk Factor	Temperature Effective Stream Shade Increase Needed	Large Woody Material	Overall risk of Adverse Watershed Effects
Coal Creek	High	Moderate	18%	Poor	High
Headwaters SF Coquille	Low	Moderate	16%	Fair	Moderate
Mill Creek	Moderate	Moderate	(no data)	Poor*	High
Myrtle Creek	High	Moderate	(no data)	Poor*	High
Lower Rock Ck	High	High	(no data)	Poor*	High
*condition based on generalized description/history from watershed analysis					

Table C-7 shows that private land holdings dominate each of the project subwatersheds, except for the Headwaters SF Coquille. Ongoing regeneration harvest on private lands is expected to continue. The risk for adverse cumulative watershed impacts (i.e. peak flow increases, channel morphology shifts), as assessed above, would remain at or somewhat above current levels. Based on recent harvest activity levels, it would be reasonable to assume that the risk of adverse watershed effects in the Headwaters SF Coquille subwatershed would remain at moderate levels when averaged over the entire subwatershed. Within the Headwaters subwatershed, private timber production land dominates the Wooden Rock Creek drainage.

The S.F.Coquille Watershed Analysis identifies Wooden Rock Creek as an important tributary to the S.F. Coquille within the Headwaters subwatershed. Wooden Rock Creek discharge is twice that of the main stem at the confluence and provides low temperature water into the temperature-sensitive S.F.Coquille. Increasing risk of adverse watershed effects resulting from continuing regeneration harvest on private lands is anticipated for the Wooden Rock Creek drainage (refer to Existing Shade Maps, showing low stream canopy along Wooden Rock Creek, and Oblique Views showing regeneration harvests). For this portion of the Headwaters subwatershed, risk of stream water temperature increases and risk of peak flow increases would be high.

Table C-7. Private Ownership by Subwatershed

Subwatershed	Acres in Private Ownership	% of subwatershed	% of subwatershed harvested in the last 30 years	% of Private Subwatershed Acreage Estimated to be Available for Future Harvest
Coal Creek	6,000	60	41	19
Headwaters SF Coquille	9,904	25	10	15
Mill Creek	10,966	79	23	56
Myrtle Creek	17,918	89	32	57
Lower Rock Creek	21,481	84	40	44

Risk of adverse watershed effects in the remaining subwatersheds are at high levels and are likely to remain at high risk levels as a result of continuing regeneration harvest on private lands. Table C-7 indicates that large portions of the project subwatersheds have been regeneration harvested over the last 30 years, and much is still available. All but a few per cent of the harvested acreage over the last 30 years have occurred on private timberlands. Private lands still available for harvest could maintain the risk for adverse watershed effect at a high level for decades.

The mainstem of Coal Creek has lost structural elements and is currently degraded in its ability to trap and store sediment. No substantial recovery of this condition is anticipated. Likewise, substantial improvements in water temperature in the SF Coquille River downstream of the Forest Boundary are unlikely given the overwhelming lack of existing shade along the river and the current harvest trends on the private uplands.

VII. HYDROLOGIC EFFECTS OF ALTERNATIVES

A. NO ACTION ALTERNATIVE

Under this alternative, no direct effects from harvest or thinning activities would occur on National Forest System lands in the Planning Area. There would be no potential for changes to channel morphology, large woody material, sediment delivery, and peak flows as a result of NFS land management activities in the Planning Area.

As noted above, the risk of adverse watershed effects in the remaining subwatersheds are at high levels and are likely to remain at high risk levels as a result of continuing regeneration harvest on private lands. Private lands still available for harvest could maintain the risk for adverse watershed effect at a high level for decades.

B. ACTION ALTERNATIVES - DIRECT AND INDIRECT EFFECTS OF ROAD CONSTRUCTION

The Proposed Action includes almost 11 miles of new permanent road construction and a third of a mile of temporary road. Road density is used as an indicator for increased risk of cumulative watershed effects. Road density increases are minor in all subwatersheds except for Coal Creek where density would increase by approximately 0.43 miles/square mile to a total of 4.62 mi./sq.mi. (refer to Cumulative Watershed Effects sub-section). This number suggests that road density is a concern and that road placement and design should avoid high risk areas.

Proposed new system roads would cross approximately 1.6 miles of Riparian Reserve. Proposed temporary roads would cross approximately 0.25 miles of Riparian Reserve. These disturbances would cause localized impacts associated with vegetation removal and surface disturbance within the road construction zone. For proposed system roads this loss of vegetation would be permanent, as would the routing of streams through culverts and modification of both surface and subsurface slope runoff water flow.

Field examinations along the railroad grade proposed for conversion indicate that subsurface slope flows in the area are minimal. The grade has cuts that expose up to 15 vertical feet of cut bank. Few seeps were observed and the grade retains water at only a few locations within its 3.5 mile length. Proposed system road construction would occur primarily along watershed divides and secondary ridgelines. Perennial channels are less than 10 feet wide (three feet or less of active channel is typical) except for the unnamed tributary bordering Unit 338. This tributary contains a channel with a relatively wide and saturated valley bottom of about 40 feet in the proposed crossing location.

New road construction occurs mainly in the uppermost areas of the watershed where streams are first and second order. During the summer months, surface discharge from these channels drops to less than a few gallons per minute and may be intermittently subsurface. Constructed stream crossings would occur on proposed new permanent roads and on existing railroad grades proposed for conversion to permanent road. These roads and crossings would not be anticipated to result in measureable increases to water temperature for the following reasons:

- All of the crossings are located on first and second order streams. These channels are only a few feet wide and have small discharges.
- Sun exposure would be 100% blocked as the water flows through the culvert. Exposure upstream and downstream of the culvert would occur over a few linear feet and would be reduced by adjacent forest canopy; this limited exposure is not enough to cause a measureable change in water temperature.
- The largest watershed area above these crossings totals approximately 60 acres. Others are 30 acres or less. This presents very little drainage area to collect surface water to these crossings. Stream discharge from such small drainage basins is low, especially during the summer when ground water levels are lowest.

Skyline corridors would remove minor amounts of canopy in the primary shade zone where the corridor crosses perennial streams. Skyline corridors that cross Riparian Reserves are required to be 12 feet or less in width, and no less than 150‘ apart, and be utilized with full log suspension. Surrounding trees and understory would make shade loss resulting from these gaps in the canopy negligible. The open area would be occupied by the growth of neighboring trees within a few years. No measureable increase in water temperature is anticipated at corridor locations.

Proposed roads located in tractor Units 303, 307, 308 and 309 are exceptional among the proposed new roads in that they are located at the midpoint of the Coal Creek watershed near the main channel. Road Q1 crosses approximately 0.11 miles of private land, and would require a steep gradient (estimated at about 20%) for approximately 500 feet. Units 303, 307, 308, and 309 are located in an area that is considered sensitive to hydrologic impacts; slope position and distance to Coal Creek are low. Sediment and runoff generated by road construction on these units could reach Coal Creek. The temporary road and its two crossings present surface disturbance that could shed sediment both during construction and during crossing removal and rehabilitation. The following mitigating measures are recommended for these units:

- Unit 309: Harvest treatment should be excluded from the zone between the south bank of Coal Creek and the slope break. This would avoid disturbance of oversteepened slopes that would shed sediment directly into Coal Creek.
- Units 303, 307, 308 and 309: Sediment transport would be monitored by the sale administrator. Any visible sediment input to Coal Creek originating from these units would require implementation of mitigating measures that would capture/prevent sediment transport recommended by a soil scientist, hydrologist, or engineer.

The haul route for the proposed project would utilize existing NFS and private system roads. Hauling to support the proposed sales would occur only during the dry season and during dry conditions. Haul roads would all be engineered for effective drainage and armored with rock to provide an all-weather surface. It is unlikely that sediment generated from use of haul roads under these conditions would exceed background levels. Field examination of the haul route indicates that fine sand and silt originate mainly from road cuts and ditches. Slope failures, visible rills and gullies are rare, occurring sporadically on oversteepened colluvial slopes or fills. Best Management Practices for road maintenance would be sufficient to capture sediment that may be generated by proposed hauling.

Table C-8. Proposed Road Construction

Subwatershed	New Road Construction (miles)			Temp Road construction (miles)		
	Alt.2	Alt 3	Alt.4*	Alt.2	Alt.3	Alt. 4
Coal Creek	6.61	1.87	0.25	0.29	.03	0
Headwaters SF Coquille	2.27	1.31	0	0	0	0
Mill Creek	0	0	0	0	0	0
Myrtle Creek	0.78	0.54	0	0	0	0
Lower Rock Ck	1.15	0.68	0	0	0	0
Total	10.81	4.4	0.25	0.29	0.03	0
*Reconstruction along 3 rail grades includes new road construction where stream crossings replace rail trestle bridges.						

Table C-9. Road Density Increase by Subwatershed

Subwatershed Square miles	Existing Road Density (miles/sq.mi.)	New Road Construction Density Increase (Mi/sq.mi)			Temporary Road Density Increase		
		Proposed Action-Alt.2	Alt. 3 Reduced Roads	Alt. 4 No New Roads	Proposed Action-Alt.2	Alt. 3 Low Risk Units & Roads	Alt. 4 No New Roads
Coal Creek 15.55	4.19	0.43	0.12	0	.02	<0.01	0
Headwaters SF Coquille 62.86	4.25	0.04	.02	0	0	0	0
Mill Creek 21.77	3.94	0	0	0	0	0	0
Myrtle Creek 31.29	4.12	0.02	.02	0	0	0	0
Lower Rock Creek 39.91	4.68	0.03	0.02	0	0	0	0

C. ACTION ALTERNATIVES - DIRECT AND INDIRECT EFFECTS OF HARVEST THINNING

Table C-10 displays areas proposed for commercial thinning and the percent of the subwatershed they would affect. Figures are low for all of the subwatersheds except Coal Creek. As shown in Table C-5, 41% of the subwatershed has been regeneration harvested in the last 30 years. Proposed commercial thinning presents stand impacts that are less severe than regeneration harvest (Grant et al., 2008); however, quantitative data is scant. Grant et al. (2008, Figure C-3) provide a generalized guide to impact levels on peak flows. Watershed impacts tend to be low for both rain-dominated and transient snow zone regimes up to about 40% harvest levels. Impacts rise to moderate in for the 40 to 80% harvested range and jump to high at 100% harvest levels. Moore and Wondzell (2005) found that harvest effects on peak flows generally recover within 10 to 20 years. These figures are for regeneration harvest not for thinning.

Based on these crude guidelines, the proposed commercial thinning would introduce at most, a moderate risk of increasing or altering peak flow response in the Coal Creek subwatershed, and would introduce no detectable risk in the other project subwatersheds. Based on the discussion below, it is likely that the proposed thinning would have a low risk of increasing peak flows in Coal Creek.

The Action Alternatives contains elements that lower the potential risk of peak flow increases as follows:

- Harvest treatment would be a variable density thin. This would leave an intact and growing forest canopy to attenuate storm events.
- Avoidance of the primary shade zone--provides undisturbed buffer between harvest areas and stream channels.
- Limitation on canopy removal in Riparian Reserve of 50%--provides a shaded buffer between harvest areas and stream channels.
- Limitation of equipment use in Riparian Reserve—prevents compaction that may reduce water infiltration within 100‘ of stream channels.
- Limitation of skid trail impacts—reduces potential for compaction that may cause increased runoff from storm events/snowmelt.
- Wet weather/seasonal use restrictions—prevents compaction of wet/saturated materials and displacement that could result in concentrated surface runoff.
- Harvest is concentrated in upper portions of watersheds where stream discharges are low.

Table C-10. Harvest Thinning by Subwatershed

Subwatershed	Subwatershed Acreage	Acres of Proposed Commercial Thin Harvest			% of Subwatershed Affected by Proposed Commercial Thinning		
		Alt. 2	Alt. 3	Alt. 4	Alt. 2	Alt. 3	Alt. 4
Coal Creek	9,952	1,760	1,615	1,427	18%	16%	14%
Headwaters SF Coquille	40,233	585	637	642	1.5%	1.6%	1.6%
Mill Creek	13,935	33	33	33	<1%	<1%	<1%
Myrtle Creek	20,028	172	172	172	1%	1%	1%
Lower Rock Creek	25,544	764	783	783	3%	3%	3%

D. ACTION ALTERNATIVES - DIRECT AND INDIRECT EFFECTS OF YARDING ACTIVITIES AND LANDING CONSTRUCTION

Proposed yarding activities include those conducted by ground based heavy equipment (~~t~~ractors”) and those conducted by skyline cable equipment operating from a landing. Surface disturbance resulting from ground-based equipment utilizing limited skid trails can be limited to approximately 15% of the area. Skyline yarding typically disturbs approximately 5% of the surface area; helicopter operations are estimated at 2%[1]. Direct surface impacts are discussed in the soil report for this project. Hydrologic impacts resulting from tractor use would be low due to the design constraints of the project.

[1] Percentages derived from Geology & Soils Report; EIS Appendix D.

Tractor units are limited to areas where slopes are 35% or less and equipment would not travel closer than 100‘ to any stream channel. This effectively limits heavy equipment use to upland areas. Under the Proposed Action, tractor units account for approximately 2,119 acres (64%) of the total harvest acreage. Under LRMP standards and guidelines, a maximum of 15% or 318 acres could incur direct surface disturbance from heavy equipment use. This number includes past disturbances within an activity area.

Table C-11. Project Acreages by Logging System for Action Alternatives

Logging System	Proposed Action Alt. 2	Alternative 3	Alternative 4
Ground Based	2,119	1,786	1,441
Skyline	1,195	941	457
Helicopter	0	513	1160
Total Acres	**3,314**	**3,240**	**3,058**

Table C-12. Percent of Subwatershed Affected by Ground Based Equipment

Subwatershed	Subwatershed Acreage	Acres of Proposed Ground Based Commercial Thin Harvest			% of Subwatershed Affected By Ground Based Commercial Thinning		
		Alt.2	Alt.3	Alt.4	Alt.2	Alt.3	Alt.4
Coal Creek	9,952	1,189	947	654	12%	9.5%	6.5%
Headwaters SF Coquille	40,233	225	209	170	.5%	.5%	.4%
Mill Creek	13,935	8	8	8	<.1%	<.1%	<.1%
Myrtle Creek	20,028	65	46	33	.3%	.2%	.2%
Lower Rock Ck	25,544	632	576	576	2.5%	2.3%	2.3%

Proposed tractor acres contain approximately 255 acres of Riparian Reserve. Harvest would occur within the Riparian Treatment Zone which is approximately 2/3 of the total defined Riparian Reserve (one site potential tree height from the stream channel), excluding the Primary Shade Zone. This would be about 170 acres occurring mainly along first and second order channels. Units 307, 308 and 309 are the only exceptions in that they border the main channel of Coal Creek. These units are located in a hydrologically sensitive area due to their proximity to Coal Creek. Refer to mitigating measures recommended under the *Direct and Indirect Effects of Road Construction* discussion, above.

Skyline units have the same 15% LRMP soil disturbance limitation. Skyline yarding is capable of accomplishing harvest with surface disturbance of 5% of the activity area; equivalent to roughly 60 acres out of the 1,195 acres of skyline units.

Project design eliminates most equipment use near Riparian Reserves. Skyline corridors that cross Riparian Reserves are required to be 12 feet or less in width, and no less than 150‘ apart, and be utilized with full log suspension. Harvest near perennial streams stops at the primary shade zone. Riparian Reserve within skyline units is estimated to total 201 acres. Approximately one third of this area would be occupied by the primary shade zone; thus, of the total 1,190 acres of skyline units, about 134 acres would be included in the skyline harvest area (Table C-13). Hydrologic impacts from skyline yarding are expected to be low since the overwhelming majority of the activity occurs in the uplands where stream widths are narrow. No measureable water temperature increases are anticipated.

Table C-13. Project-wide Riparian* Logging System Comparison by Action Alternative

Alternative	Ground Based Yarding		Skyline Yarding		Helicopter Yarding		Total Riparian Harvest Acres	Coal Creek Subwatershed Only
	Total Acres	Riparian Acres	Total Acres	Riparian Acres	Total Acres	Riparian Acres		
Proposed Action Alt. 2	2,119	255	1,190	134	0	0	389	182
Alt. 3	1,786	157	941	173	513	56	386	161
Alt. 4	1,441	77	457	97	1,160	203	377	103
***actual estimated riparian harvest; does not include primary shade zone**								

E. OVERALL RISK OF ADVERSE CUMULATIVE WATERSHED EFFECTS FROM PROPOSED ACTION

The Proposed Action (Alternative 2) would present no measureable increase in risk for adverse cumulative watershed effects in the Headwaters SF Coquille, Mill Creek, Myrtle Creek or Lower Rock Creek subwatersheds. This is due to:

- The minor involvement of these subwatersheds in the Proposed Action (refer to tables above).
- The location of units/roads at or near ridges and watershed divides where effects would be minimal.

Risk of adverse cumulative watershed effects in the Coal Creek subwatershed is currently high since the main channel is already in a degraded condition. The addition of the proposed harvest acreage and road construction within this degraded subwatershed may contribute to additional risk of adverse effects; however, limited stand management could be conducted without increasing risk if the impacts could be limited to the site scale. The following conditions would allow containment of impacts to the local or unit level (site scale):

- NFS lands contain hydrologically mature stands with large in-stream and upland wood present; this provides vegetative buffers that would counter increased runoff or sediment transport.
- NFS lands are located mainly in the uplands where streams are small and discharges are low; risk of hydrologic impact from this portion of watershed is low.
- The majority of the proposed units are located thousands of feet away from the main channel.
- Proposed thinning is designed to enhance the growth and vigor of the stand by removing intermediate and suppressed trees.
- Stream buffers and equipment limitations are designed to eliminate off-site impacts.

Some proposed units are located in areas that have a greater potential for hydrologic impacts. These units are listed in Table C-14. Their combined acreage is relatively small; however these units are would present more risk of measurable impact than the rest of the project.

Table C-14. Units Located in Sensitive Watershed Areas – Proposed Action

Unit Number	Logging System	Acres	Concern for Elevated Resource Damage
301, 302, 304, 305, 306	Skyline	49	Proximity to Coal Creek; location within Coal Creek canyon on steep slopes; requires new road construction
303, 307, 308, 309	Tractor	63	
312, 315, 321, 338	Skyline	104	Steep slopes adjacent to major tributaries of Coal Creek
Total Acres		**214**	

F. ALTERNATIVE 3 – DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

1. Direct and Indirect Effects

The direct effects of Alternative 3 are similar to those described for the Proposed Action except for those areas where harvest and/or road construction has been eliminated, or where the logging system has been changed to ~~h~~helicopter".

Tables C-9, 10, & 11 show the change in harvest acreage and road construction under all alternatives. Approximately 1.5 miles of new system road would be constructed within the defined Riparian Reserve; temporary road would be about 0.03 mile. Harvested acreage would not change except within the Coal Creek and Headwaters S.F. Coquille subwatersheds. The only substantial change is for the Coal Creek subwatershed where about 363 acres would be eliminated from proposed harvest; and about 361 acres would be harvested by helicopter.

Under Alternative 3, tractor units contain approximately 100 acres of Riparian Reserve. Harvest would occur on approximately 2/3 of the total defined width of Riparian Reserve (one site potential tree height from the stream channel), excluding the primary shade zone. Actual harvest would occur on about 67 acres, mainly along first and second order channels. Units 307, 308 and 309 are the only exceptions in that they border the main channel of Coal Creek. Mitigation for units located along Coal Creek is the same as that recommended for the Proposed Action. The following mitigating measures are recommended for these units:

- Unit 309: Harvest treatment should be excluded from the zone between the south bank of Coal Creek and the slope break. This would avoid disturbance of oversteepened slopes that would shed sediment directly into Coal Creek.
- Units 303, 307, 308 and 309: Sediment transport would be monitored by the sale administrator. Any visible sediment input to Coal Creek originating from these units would require implementation of mitigating measures that would capture/prevent sediment transport recommended by a soil scientist, hydrologist, or engineer.

Alternative 3 includes 260 acres within skyline units, and 84 acres within helicopter units. Actual harvest within Riparian Reserve would be approximately 173 and 56 acres, respectively. Total actual harvest within the Riparian Reserve under Alternative 3 would be approximately 386 acres (refer to Table C-12). There is little change in the acres of Riparian Reserve harvest between the Proposed Action and Alternative 3; however, the logging system utilized shifts more toward skyline and helicopter systems as shown in Table C-12.

Helicopter logging eliminates the ground disturbance associated with tractor logging and eliminates yarding corridors resulting from skyline yarding. Helicopter landings require larger areas (one to two acres) than log decks to accommodate landing clearances, fueling, and support vehicle parking.

Most of the units converted to helicopter logging under this alternative are in the upland areas that would be logged with tractors under the Proposed Action. As described under the Proposed Action, these areas would sustain direct effects of the logging system used but are not considered –sensitive" to disturbance. Some of the units located in sensitive areas of the subwatershed described under the Proposed Action (Table C-13) are eliminated, or the logging system changed, under this alternative. Units 304 and 338 are eliminated; Units 307 and 308 would be harvested by helicopter instead of utilizing tractors supported by construction of Roads Q1-Q4 (1.4 mi.). Table C-14 information has been modified to reflect these changes and is presented in Table C-15 below.

Table C-15. Units Located in Sensitive Watershed Areas – Alternative 3

Unit Number	Logging System	Acres	Concern for Elevated Resource Damage
301, 302, 305, 306	Skyline	43	Proximity to Coal Creek; location within Coal Creek canyon on steep slopes
303, 309	Tractor	26	
312, 315, 321	Skyline	80	Steep slopes adjacent to major tributaries of Coal Creek
Total Acres		**149**	

Road construction/reconstruction mileage is substantially reduced under this alternative. Most of the reductions are to roads located in areas with low hydrologic impact sensitivity: upland areas near the watershed divide and along ridgelines. Road Q, as identified above, is an exception. Under Alternative 3 this road construction would be excluded, removing the most likely project-generated sediment source into Coal Creek.

2. Cumulative Effects

Under Alternative 3, the risk for cumulative adverse watershed effects remains small for all subwatersheds, except Coal Creek. Risk levels for the Coal Creek subwatershed are less than those in the Proposed Action due mainly to the reduction of road construction (refer to Table C-8). Road density would be elevated slightly over existing levels but would remain in the –moderate" range for this risk factor. The relatively small reduction in harvest is not likely to have an impact on cumulative effect risk since tree removal is limited to thinning (see discussion under the Proposed Action) and since the acreage involved is less than 4% of the subwatershed.

G. ALTERNATIVE 4 – DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

1. Direct and Indirect Effects

Alternative 4 would eliminate new system road construction and reduce reconstruction to 1.3 miles. Reconstruction includes 0.7 miles on an existing railroad grade; therefore, new road segments may need to be constructed at up to three first or second order streams that had previously been crossed with rail trestle bridges. This would result in loss of approximately one acre of the Riparian Reserve to permanent stream crossings. These crossings account for approximately 0.25 miles of new construction in the Coal Creek subwatershed, but would not substantially add to the existing road density (Table C-8, 9). In the other project subwatersheds there would be no increase in road density over existing levels.

Site-scale surface disturbance and indirect effects resulting from road construction or reconstruction (refer to discussion under the Proposed Action) would be eliminated except at the three stream crossings discussed above; and, except for road surfacing and removal of trees/vegetation on the existing road/rail templates.

Many upland units would be harvested using helicopter methods and some would be eliminated (refer to project alternative maps in EIS). All of the units identified as being located in areas with high hydrologic resource sensitivity under Alternatives 2 and 3 would be eliminated from the harvest except for Units 312 and 315. Both of these units would be harvested by helicopters under this alternative, removing harvest disturbance associated with skyline logging on these units under Alternatives 2 and 3.

In the upland units, direct disturbance would be avoided, except for landings, on 1,160 acres that would be helicopter harvested. Helicopter landings would account for approximately 20 to 40 acres with each landing being one to two acres in size. Landings would not be located in the Riparian Reserve and are generally on ridgelines or divides; they represent a minor, scattered surface disturbance that would have little to no hydrologic impact.

Alternative 4 contains the least riparian reserve harvest and utilizes skyline and helicopter loggings systems most (refer to Table C-11). The remaining ground-based harvest of 1441 acres would be limited by the LRMP standard and guide to 15% of the activity area subject to detrimental soil condition (refer to Soils Report for additional detail).

This represents roughly 216 acres of the ~~"t~~ractor" ground under Alternative 4. Harvest by thinning rather than by regeneration represents a further reduction in surface disturbance simply by cutting and removing fewer trees and less slash.

2. Cumulative Effects

Alternative 4 presents the least ground disturbance of all of the Action Alternatives. Harvest acreage reductions between alternatives are low. Table C-9 shows only a 6% decrease between the Proposed Action and Alternative 4. Reductions in surface disturbance are gained by eliminating road construction and increasing use of helicopter logging systems. Table C-10 shows the distribution of logging systems by harvest acres.

Alternative 4, like the others, presents no risk of adverse watershed effects in any subwatershed but Coal Creek. Ground based equipment harvest would include 15% of the subwatershed. Surface impact due to harvest by skyline and helicopter yarding would be a minor contribution to overall watershed disturbance.

Coal Creek subwatershed has been 40% regeneration harvested in the last 30 years, therefore Alternative 4 could still contribute to the risk of adverse cumulative watershed effects. Grant et al. (2008) suggested that harvest alone is relatively benign in increasing peak flows except at levels above 80% harvest. Roads are responsible for the bulk of peak flow increases. Since Alternative 4 avoids new road construction and any significant contribution to subwatershed road density, it is unlikely that peak flow increases from NFS land in Coal Creek would occur.

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ATTACHMENT 1
DATA SOURCES FOR GIS ANALYSIS – February, 2010

Process for Road Density Calculations and Logging Activity by Time Period for ER TIMBER SALE GIS Support (Cole Belongie, GIS SPECIALIST- DRM/CSA 2)

Road Density

1. Collected Road data for the 5 watershed areas (Coal Creek, Headwaters South Fork Coquille River, Mill Creek – South Fork Coquille River, Myrtle Creek, & Rock Creek) from Rogue River Siskiyou corporate data library (T\FS\Reference\GIS\r06_rrs\Data\Transportation.mdb\Transporation\RoadEvent & T\FS\Reference\GIS\r06_rrs\Data|WBD_SW_OR.gdb\rrsis_huc6) and BLM road data that covers highways and public roads (T\FS\Reference\GeoTool\r_06\DatabaseConnections\idb – sde.default as myself.sde\S_USA_OR.Transportation\S_USA_OR.HighwayBLM & S_USA_OR.RoadPublicBLM).
2. Ran an "Identity" against the watersheds to find the miles of road for each watershed. Totaled the miles of road in each watershed and divided it by the area of the watershed. Broke down the numbers by the FS Roads, Other Roads, and All Roads combined for each watershed (table provide to resource staff).
3. Ran a "Kernel Line Density" Analysis on the linear road features for the watersheds. Used an output cell size of 100 x 100 meters and a search radius of 1 mile. The output was done in square kilometers and square miles (map provided). Reclassified the results into 4 classes using Natural Breaks (Jenks).

Logging Activity by Time Period

Data used for this analysis included:

- Change Detection Map (created by PNW FS Lab for Northwest Forest Plan Interagency Regional Monitoring Program) Data used for years of 1977 – 2002, http://www.reo.gov/monitoring/reports/10yr-report/map-data/index.shtml
- LANDSAT data 1979, 1989, 1999, 2005, & 2009 http://glovis.usgs.gov/
- NAIP imagery 2006 Half Meter and 2009, 1 meter (ArcGIS Image Service published by USDA Forest Service RSAC)
- Rogue River – Siskiyou Corporate & Regional Forest Service GIS data listed above including FS ownership (T:\FS\Reference\GIS\r06_rrs\data_sis/ownership)

Processes:

1. The PNW change detection map displays the stand-replacing fires and harvests that occurred between 1972 and 2002 in the Oregon portion of the area governed by the Northwest Forest Plan. These disturbances were detected through a classification-based change detection process that was performed using a series of Landsat images (both MSS and TM). Disturbances are both geo-referenced and temporally referenced in approximately 4-year intervals. It should be noted that this layer does not depict partial disturbance, nor does it show stand-replacing disturbance unrelated to fire and harvest (i.e. landslides, river course changes, etc.) Only the "Cut" disturbances were used for this analysis ranging from 1977 – 2002.
2. The regional change detection raster data was "Extracted by Mask" to the 5 area watershed analysis area. The data was then converted to polygons and the pertinent years to the study were pulled out leaving only the 6 time periods that were relevant to the study (77-84, 84-88, 88-92, 92-96, 96-00, & 00-02). That data was also spilt to show only Non-FS land to calculate the acres of FS and Other logging activities.

3. The Landsat data from various years was acquired to supplement the PNW change detection data and to verify the polygons for the study area. The data was also used along with the NAIP imagery to heads up digitize logging activity polygons for the years not covered by the PNW change detection data. The downloaded Landsat bands from various Landsat Satellites were combined for each year acquisition to display the data in False Color. The False Color display was utilized to show healthy vegetation in red and to show bare soil, urban areas, etc. in a blue – green color. This makes spotting clear cuts and logging activity fairly easy. The GIS function of "Composite Bands" was used to combine the relevant Landsat bands and the correct display combinations were retrieved from various Landsat and NASA informational websites.
4. Potential logging activity was located on the Landsat images and then compared to the time period before and after to narrow down during which time period the logging happened. For example, if logging activity appeared on the 1999 Landsat imagery, the 1989 image was checked to see if that activity was identified then. If not, the 2005 image was checked to see if the area had started to regenerate, these checks allowed the time period and the validity of the logging activity to be verified.
5. The NAIP imagery was also used to identify logging activity due to the good resolution and true color properties. This data was also used to refine the analysis. The 5 watershed area does contain some agriculture and small town environments. The NAIP imagery was used to differentiate the open agricultural land, wide river banks, and urban environments from the areas that could be potentially confused with logging activity from the Landsat imagery alone.
6. Heads up digitizing was done at various scales (averaging 1:24,000) to collect the data mostly for the time period from 200-2009. An attribute was added to the digitized polygons to track and discern ownership. During this process none of the polygons from the PNW change detection map that overlapped these years (ex. 1996 – 2002) were doubled counted. During this process 30 more polygons were also added to the years of 1979-1999 (totaling 540 acres). These polygons were determined to have been missed by the large scale regional analysis, dropped due to the resolution of the data, or partial disturbances mentioned above.

7. All data for logging activity was gathered and an "Identity" function was run on the data in GIS to populate it with the watershed name in which it fell. The acres were then calculated for each polygon using the "calculate geometry" function in GIS. All ownership and Non-FS land were calculated separately allowing logging activity from FS land to be easily determined. Acres of logging activity were totaled for each time period (provided spreadsheet) by watershed and then divided by the watershed acres to get the percentage of watershed area.

Considerations:
Some judgment calls were made during the digitizing process. The best available data was used to eliminate as many errors as possible. The scale and accuracy of all data used for the analysis was the limiting factor in the final results. The change detection map created by the PNW was relied on for a majority of the historic data.

ATTACHMENT 2
Products of GIS Analysis For Eden Ridge Timber Sales
February, 2010

Logging	Watershed Name	Acres	Percentage of Watershed Acres
Cut 77-88	Coal Creek	319.74	3.21
Cut 88-00	Coal Creek	1465.42	14.70
Cut 99-05	Coal Creek	1233.62	12.38
Cut 05-09	Coal Creek	1113.09	11.17
Cut 77-88	Headwaters South Fork Coquille River	2601.79	6.48
Cut 88-00	Headwaters South Fork Coquille River	2026.16	5.04
Cut 99-05	Headwaters South Fork Coquille River	1419.72	3.53
Cut 05-09	Headwaters South Fork Coquille River	802.71	2.00
Cut 77-88	Mill Creek-South Fork Coquille River	954.97	6.79
Cut 88-00	Mill Creek-South Fork Coquille River	1069.35	7.61
Cut 99-05	Mill Creek-South Fork Coquille River	1010.70	7.19
Cut 05-09	Mill Creek-South Fork Coquille River	248.29	1.77
Cut 77-88	Myrtle Creek	858.25	4.29
Cut 88-00	Myrtle Creek	2143.64	10.73
Cut 99-05	Myrtle Creek	1867.09	9.34
Cut 05-09	Myrtle Creek	1562.64	7.82
Cut 77-88	Rock Creek	1546.85	6.06
Cut 88-00	Rock Creek	2961.10	11.59
Cut 99-05	Rock Creek	2657.66	10.40
Cut 05-09	Rock Creek	3137.86	12.28

Watershed Name	Watershed Acres
Coal Creek	9967.09
Headwaters South Fork Coquille River	40172.39
Mill Creek-South Fork Coquille River	14058.37
Myrtle Creek	19987.13
Rock Creek	25543.11

Forest Service Roads

Watershed Name	Miles of Road	Area of Watershed (Sq. Miles)	Road Density (miles per sq. mile)
Coal Creek	9.76	15.58	0.63
Headwaters South Fork Coquille River	166.58	62.81	2.65
Mill Creek-South Fork Coquille River	16.60	21.98	0.76
Myrtle Creek	2.18	31.25	0.07
Rock Creek	2.89	39.94	0.07

Other Roads

Watershed Name	Miles of Road	Area of Watershed (Sq. Miles)	Road Density (miles per sq. mile)
Coal Creek	55.52	15.58	3.56
Headwaters South Fork Coquille River	100.15	62.81	1.59
Mill Creek-South Fork Coquille River	69.97	21.98	3.18
Myrtle Creek	126.45	31.25	4.05
Rock Creek	184.04	39.94	4.61

All Roads

Watershed Name	Miles of Road	Area of Watershed (Sq. Miles)	Road Density (miles per sq. mile)
Coal Creek	65.28	15.58	4.19
Headwaters South Fork Coquille River	266.73	62.81	4.25
Mill Creek-South Fork Coquille River	86.57	21.98	3.94
Myrtle Creek	128.63	31.25	4.12
Rock Creek	186.93	39.94	4.68

Total Miles of Roads **734.14**

APPENDIX D

GEOLOGY& SOILS REPORT

Eden Ridge Timber Sales
Geology & Soils Report

/s/ Joni D. Brazier **Date: September 30, 2011**
Joni D. Brazier, Soil Scientist
Rogue River - Siskiyou National Forest

I. Introduction

The Eden Ridge Timber Sales project is located on the Powers Ranger District of the Rogue River – Siskiyou National Forest. The Planning Area is approximately 6,516 acres and is located approximately 4 air miles southeast of the city of Powers, Oregon at the closest point, with a legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon. Elevations range from 2,500 to 3,500 feet. It is located within a block of National Forest System lands which are surrounded by private timber production lands.

The Proposed Action (Alternative 2) proposes to treat 3,314 acres on 75 units, with commercial harvest treatments. These harvest treatments would primarily include commercial thinning, but also include some small group selection (gap treatments) to treat laminated root rot *(Phellinus weirii)* pockets, eradication treatments mostly in the understory in areas infested with Port-Orford-cedar root disease *(Phythophthora lateralis)*, and sanitation treatments along roadsides in areas with uninfested Port-Orford-cedar. In addition, 9 units totaling 363 acres are proposed for noncommercial thinning treatments.

Proposed logging systems include ground-based on 2,119acres within 39 units, and skyline (cable) systems on 1,195 acres within 36 units. To access treatment units, there is proposed approximately 10.8 miles of new Classified road construction (in 43 segments), construction and decommissioning of 0.3 miles of temporary road, reconstruction of 6.1 miles of existing Classified road, and maintenance of 5.5 miles of existing Classified road.

This report will describe background geology and analyze effects to existing soil resources within the Eden Ridge Timber Sales Planning Area, more specifically, soil productivity and slope stability. Strongly associated resources are described and analyzed in the following specialist‟s reports:

a) Hydrology
b) Silviculture

II. Management Direction

Land management direction is contained in the Siskiyou National Forest (SNF) Land and Resource Management Plan (LRMP) (UDSA Forest Service 1989) as amended by the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994). The Eden Ridge Planning Area contains three Management Allocations. The majority of the area is allocated to Matrix, as carried forward from the 1989 LRMP as General Forest Prescription (Management Area (MA) 14), as well as NWFP Riparian Reserve and LRMP Management Prescription MA-11, and LRMP Prescription Special Wildlife Sites (MA-9). However no harvest treatments are proposed in MA-9 areas.

The authorities governing Forest Service soil management are outlined in Forest Service Manual (FSM) 2550 – Soil Management (WO Amendment 2500-2010-1, Effective November 23, 2010). Regional direction for maintaining and protecting the soil resource from detrimental disturbance to soil productivity is given in FSM 2500 – Watershed Protection and Management, Region 6 Supplement No. 2500-9801.

The Siskiyou National Forest (SNF) LRMP provides standards and guidelines (S&Gs) for soil and water resources on pages IV-44 through IV-48. In regard to soils and geology, they include S&Gs for detrimental soil conditions, soil erosion, mass movement, and large woody material.

Detrimental soil conditions include compaction, displacement, puddling, and severely burned soil conditions. Detrimental soil conditions are further defined in FSM 2500, Region 6 Supplement No. 2500-98-1. On the Siskiyou National Forest, the total area of detrimental soil conditions should not exceed 15 percent of the total acreage within the activity area, including roads and landings (Siskiyou National Forest, 1989).

Surface organic matter (duff, litter) is vital for protecting surface soils from erosion. Mineral soil exposure (loss of duff and litter) should not exceed the following limits (ibid.):

- 40% mineral soil exposed on soils classed low-to-moderate erosion hazard;
- 30% mineral soil exposed on soils classed high erosion hazard;
- 15% mineral soil exposed on soils classed very high erosion hazard.

Standards and Guidelines for large woody material stress the importance of addressing site-specific needs. In general, five to twenty pieces of large woody material per acre should remain on each site; material should be from a range of decomposition classes; each piece should be at least 20 inches in diameter at the large end and contain at least 40 cubic feet volume (ibid.). To better guide site-specific needs, additional tools based on Plant Association Groups (PAGs) and down wood information collected with stand exam data, are used to refine the large woody material prescriptions. Because the Forest‟s PAG data is at a finer scale, the Forest is currently using plant series data from new PAG classifications, delineated by geographical regions (Cascades, Siskiyous, Coast), for determining snag and down wood objectives on the Rogue River-Siskiyou National Forest (refer to the Silvicultural Diagnosis, Appendix B, for more detail).

In addition, the Northwest Forest Plan requires that all unstable areas and potentially unstable areas be managed as Riparian Reserve.

III. Affected Environment

A. Geology

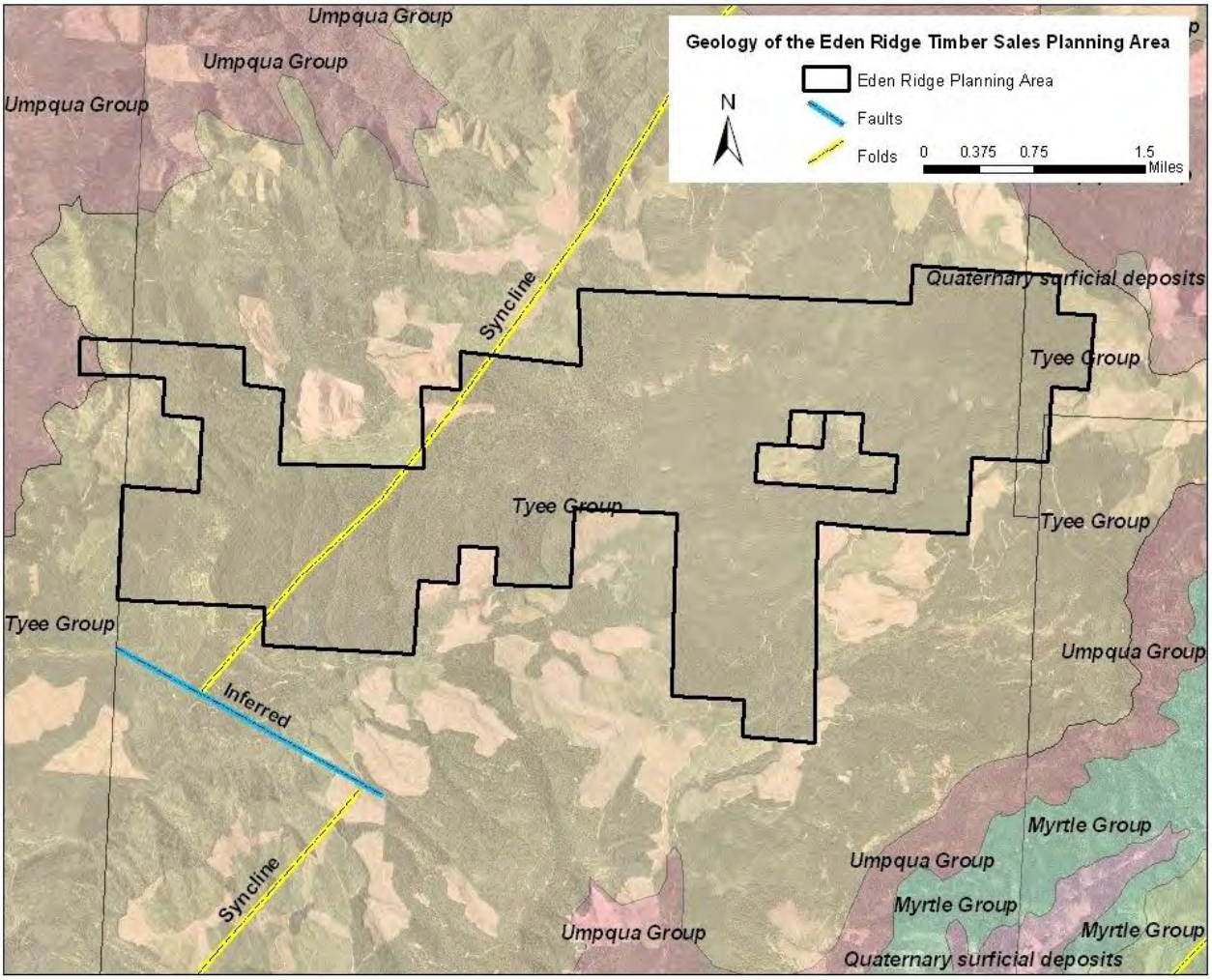
The South Fork Coquille River forms the boundary between two major physiographic provinces, the Coast Range Province to the north and the Klamath Mountain Province to the south (USDI Bureau of Land Management, 1994). The Eden Ridge Planning Area is just within the south end of the Coast Range Province. The Planning Area is almost entirely overlying the Tyee Formation. A small sliver of the Umpqua Formation is within the very northwest corner of the Planning Area; however no activities are proposed in this area in any of the alternatives, therefore it will not be discussed further in this report.

The Tyee Formation is prominent along the Central Oregon coast from approximately Salem southward to Myrtle Point (Beaulieu, 1971). South of Myrtle Point, isolated outcrops cap various ridge tops along the axis of a major syncline fold (ibid.), and the Eden Ridge Planning Area is an example of this (see Map D-1).

The Tyee Formation is of middle Eocene age (approximately 49 million years), and is made up of thick marine sediments deposited in a forearc basin from rivers with watersheds that extended into the interior of Idaho (Orr et al., 1992). Tyee sandstone is considered "arkosic", or rich in white mica, quartz, and potassium feldspar, and matches the minerals of the Idaho batholith (Orr et al., 1992).

It is composed of thick rhythmically bedded, cliff-forming, buff to greenish-gray sandstone with thin interbedded dark colored mudstone; the sandstone is composed of medium to coarse-grained, micaceous, arkosic, and lithic wacke (Beaulieu, 1971; Meyer & Amaranthus, 1979). Some conglomerates of andesite, quartzite, chert, and basalt as well as local coal beds are also located in this formation (ibid.).

Map D-1. Geology of the Eden Ridge Timber Sales Planning Area (*data from* DOGAMI, 2009)



B. Slope Stability

The Tyee Formation exhibits northerly strikes and dips gently, meaning that it has not been as greatly folded and faulted as, for example, much of the Umpqua Formation it overlies (Beaulieu, 1971). This is exhibited in the relatively gently sloping topography of Eden Ridge over the majority of the Planning Area. Very steep slopes and cliffs are found bordering the gently sloping sandstone slabs, and are associated with fluvial processes where drainage systems have downcut through the resistant sandstone layers as the landmass has been subjected to tectonic uplift, which is still occurring. Soils on these steep slopes have a tendency to fail as debris flows (USDA Forest Service, 1995).

Where Tyee bluffs overlie softer siltstones, rock fall is common, and benches within the bluffs often result from large naturally-occurring deep-seated slumps and transitional failures (ibid.). An example of this can be seen in Figure C-2 within the Hydrology Report, which shows an oblique view of eroding bluffs and benches on the northern side of the Planning Area in the Myrtle Creek subwatershed.

The slopes to the north of and going below the 448 Road in Section 18 were examined for slope instability based on the indication this area is a deep seated slump (Meyer and Amaranthus, 1979). Benchy terrain was encountered with locations of very small seeps/sag ponds toward the western end. No evidence of current instability was found however, and a review of the recently clear-cut private lands to the north, downslope and within the same headwaters of Myrtle Creek, indicate this is not an active area of instability, though ancient movement gives the terrain its current shape.

An example of inner gorge instability is found along first order streams within the Planning Area on the southwest end (section 26, area of Proposed Action Units 307, 308), where streams are flowing through steep, V-shaped inner gorge systems. Flows are regularly cutting the toeslopes of these steep walls, resulting in localized bank failures and slumping, and trees tipping into and across the channel. A review of the forest landslide layer has no records of landslides on the forest in the Planning Area, and none were found during field reviews.

B. Soils

Soils in the Planning Area are developing from Tyee sandstone. Elevations range from approximately 2,080 to 3,540 feet, with average annual precipitation ranging from 100 to 150 inches, predominantly as rain in the winter. A strong maritime influence results in typically moderate year-round temperatures.

Map D-2 displays the soil map units within the Planning Area, and Table D-1 lists these map units with some soil characteristics (USDA SCS, 1989).

Map D-2. Soils of the Eden Ridge Timber Sales Planning Area (*data from* USDA SCS, 1989)

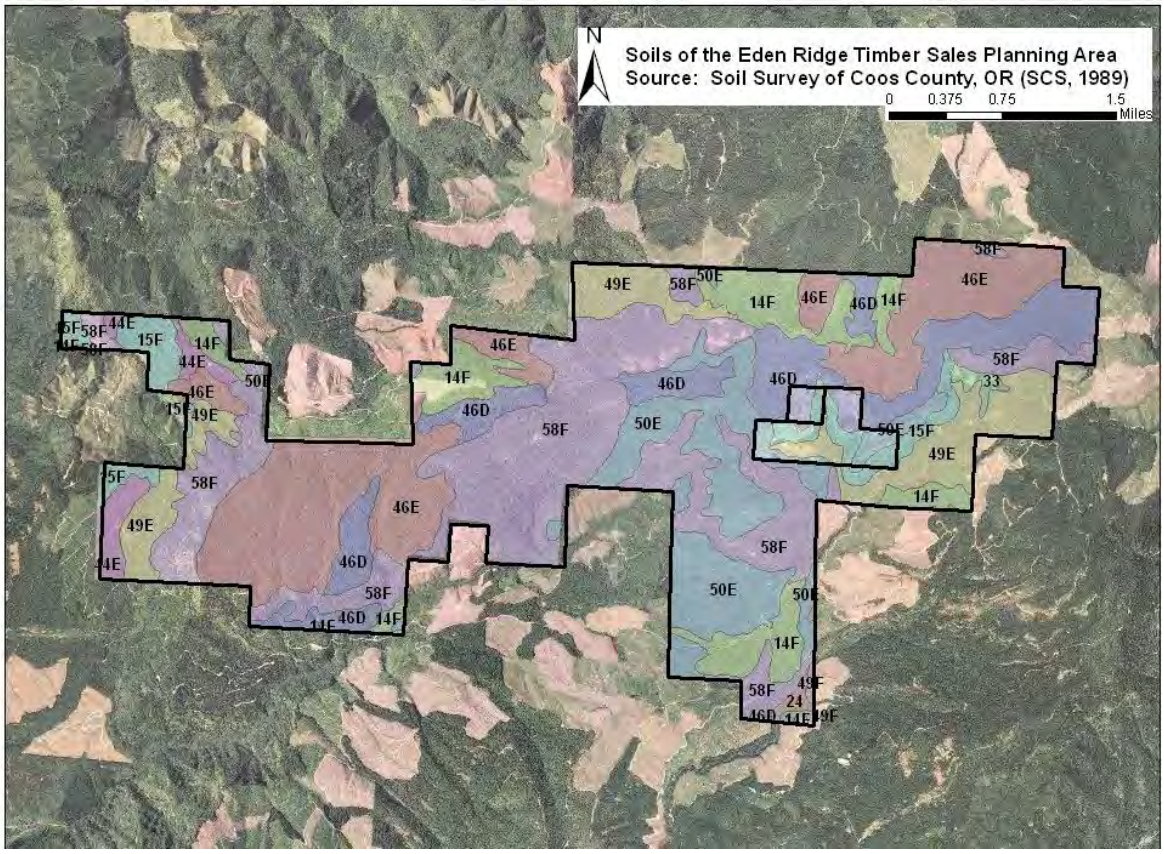


Table D-1. Soil Characteristics of Soil Map Units within the Eden Ridge Planning Area

Map Unit	Map Unit Name	Soil Characteristics
14F	Digger-Preacher-Umpcoos association, 50-80% slopes	**Digger (30%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on side slopes. **Preacher (30%):** Deep; well drained; surface – loam/14" depth; subsoil – clay loam; located on ridgetops & side slopes. **Umpcoos (25%):** Shallow; well drained; surface – v. gravelly sandy loam/3" depth; subsoil – v. gravelly sandy loam; located on very narrow ridgetops & steep side slopes along drainageways.
15F	Digger-Umpcoos-Rock outcrop association; 50-90% slopes	**Digger (30%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on concave side slopes. **Umpcoos (25%):** Shallow; well drained; surface – v. gravelly sandy loam/3" depth; subsoil – v. gravelly sandy loam; located on convex side slopes above rock outcrop & narrow ridgetops. **Rock outcrop (25%):** Hard, fractured sandstone located on precipitous side slopes along drainageways & on very narrow ridgetops.
24	Gardiner sandy loam; 0-3% slopes	**Gardiner (85%):** Deep; well drained; surface – sandy loam/9" depth; subsoil – loamy fine sand; located on floodplains.
33	Kirkendall silt loam; 0-3% slopes	**Kirkendall (80%):** Deep; well drained; surface – silt loam/7"depth; subsoil – silt loam; located on floodplains.
44E	Preacher-Blachly association; 30-60% slopes	**Preacher (60%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on broad ridgetops and benches of mountains. **Blachly (25%):** Deep; well drained; surface – silty clay loam/7" depth; subsoil – silty clay; located on broad ridgetops and benches of mountains.
46D	Preacher-Bohannon loams; 3-30% slopes	**Preacher (50%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on concave areas on benches, side slopes and broad ridgetops. **Bohannon (30%):** Moderately deep; well drained; surface – loam and gravelly loam/11" depth; subsoil – gravelly loam; located on convex side slopes.
46E	Preacher-Bohannon loams; 30-60% slopes	**Preacher (40%):** Deep; well drained; surface – loam/14" depth; subsoil – clay loam; located on concave side slopes. **Bohannon (30%):** Moderately deep; well drained; surface – loam and gravelly loam/11" depth; subsoil – gravelly loam; located on ridgetops and convex side slopes.
49E	Remote loam; 30-50% slopes	**Remote (75%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on side slopes of mountains.
49F	Remote loam; 50-75% slopes	**Remote (75%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on side slopes of mountains.
50D	Remote-Digger-Preacher complex; 12-30% slopes	**Remote (35%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on narrow ridgetops & steeper side slopes. **Digger (30%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on narrow ridgetops & steeper side slopes. **Preacher (25%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on broad ridgetops & less sloping side slopes.
50E	Remote-Digger-Preacher complex; 30-50% slopes	**Remote (35%):** Deep; well drained; surface – loam/5" depth; subsoil – gravelly & v. gravelly clay loam; located on convex side slopes & narrow ridgetops. **Digger (25%):** Moderately deep; well drained; surface - gravelly loam/6" depth; subsoil - gravelly, v. gravelly, and v. cobbly loams; located on convex side slopes & narrow ridgetops. **Preacher (20%):** Deep; well drained; surface – loam/14"depth; subsoil – clay loam; located on concave, less sloping areas.
58F	Umpcoos-Rock outcrop association; 70-99% slopes	**Umpcoos (40%):** Shallow; well drained; surface – v. gravelly sandy loam/3" depth; subsoil – v. gravelly sandy loam; located on ridgetops & in more gently sloping areas. **Rock outcrop (35%):** Hard, fractured sandstone located on steeper areas along drainageways & on upper slopes of mountains.

D. Soil Productivity

The main General Soil Map Units in the Planning Area are 10 – Preacher-Bohannon; 11 – Digger-Preacher-Remote; and 13 – Umpcoos-Rock outcrop-Digger. Natural productivity is rated as High for General Map Unit 10, Moderate for General Map Unit 11, and Low for General Map Unit 13 (USDA SCS, 1989). Refer to the Silviculture Report for additional discussion of soil productivity, including maps displaying the location of soils based on productivity, and the vegetation communities they are supporting.

The following table (Table D-2) displays the relative sensitivities of each of the soil map units in the Planning Area to disturbance (Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/), based off of various soil properties. The higher the rating, the higher the sensitivity the soil has to disturbances that can affect soil productivity.

Table D-2. Sensitivities of Soils in the Planning Area to Selected Disturbances

Map Unit	Site Degradation Susceptibility	Soil Compaction Resistance	Soil Rutting Hazard	Erosion Hazard (Road/Trail)	Erosion Hazard (Off-Road, Off-Trail)	Soil Restoration Potential
14F	Highly susceptible	Low	Severe	Severe	Very severe	High
15F	Highly susceptible	Low	Severe	Severe	Very severe	High
24	Moderately susceptible	Moderate	Moderate	Slight	Slight	High
33	Slightly susceptible	Moderate	Severe	Slight	Slight	High
44E	Highly susceptible	Low	Severe	Severe	Severe	High
46D	Moderately susceptible	Low	Severe	Severe	Moderate	High
46E	Highly susceptible	Low	Severe	Severe	Severe	High
49E	Highly susceptible	Low	Severe	Severe	Severe	High
49F	Highly susceptible	Low	Severe	Severe	Very severe	High
50D	Moderately susceptible	Low	Severe	Severe	Moderate	High
50E	Highly susceptible	Low	Severe	Severe	Severe	High
58F	Highly susceptible	Low	Slight	Severe	Very severe	Moderate

The following paragraphs give a brief explanation of each rating, summarized from the Descriptions in the Web Soil Survey. Refer to the complete descriptions for more detail.

Site Degradation Susceptibility: Rates each soil for its susceptibility for soil degradation to occur during disturbance, seen conversely is the soil‟s buffering capacity to resist change. Ratings represent relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion and /or redistribution, and loss of adequate rooting depth.

Soil Compaction Resistance: Rates each soil for its resistance to compaction, which is predominantly influenced by moisture content, depth to saturation, percent of sand, silt, and clay, soil structure, organic matter content, and content of coarse fragments.

Soil Rutting Hazard: This rating indicates the hazard of surface rut formation through the operation of forestland equipment. Soil displacement and puddling may occur simultaneously with rutting. “Slight” indicates soil is subject to little or no rutting; “Moderate” indicates rutting is likely; “Severe” indicates that ruts form readily.

Erosion Hazard (Road/Trail): Ratings indicate the hazard of soil loss from un-surfaced roads and trails. Ratings are based on soil erosion factor K, slope, and content of rock fragments. “Slight” indicates that little or no erosion is likely; “Moderate” indicates some erosion is likely, and roads/trails may require occasional maintenance, and that simple erosion-control measures are needed; “Severe” indicates that erosion is expected, roads/trails require frequent maintenance, and costly erosion-control measures are needed.

Erosion Hazard (Off-Road, Off-Trail): Ratings indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. Ratings are based on slope and soil erosion factor K, with soil loss caused by sheet or rill erosion where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance.

Soil Restoration Potential: Rates each soil for its inherent ability to recover from degradation (i.e. soil resilience). Soil resilience is dependent upon adequate stores of organic matter, good soil structure, low salt and sodium levels, adequate nutrient levels, microbial biomass and diversity, adequate precipitation for recovery, and other soil properties.

Overall, the soils within the Eden Ridge Planning Area are sensitive to disturbances that can have an adverse effect to soil productivity. Interestingly, these soils also show an inherent ability to recover well from these disturbances, either naturally or through implementation of restoration activities. This has been apparent in field reviews throughout the Eden Ridge area looking at the residual effects of past actions, discussed below.

The Eden Ridge Planning Area was extensively railroad logged in the 1920s and 1930s utilizing steam donkeys, and was likely covered in slash or burned. There is evidence indicating a wildfire burned through northern areas of the Planning Area as well during these historical harvest operations.

Field reviews looking at soil condition from these past impacts were conducted throughout the Planning Area, particularly focusing in stands being proposed for treatments with this project. Within the stands, outside of railroad grade impacts, no detrimental disturbance still measurable affecting site productivity was found. Decomposing organic litter is providing a consistent blanket across the forest floor to protect surface soils from erosion. Occasional evidence of soil displacement from gouging along a steam donkey trail was found, but soil pits and shovel resistance tests, as well as observation of vegetation cover, did not indicate a measureable difference inside and outside of that past direct disturbance 60 to 80 years later.

Railroad grades, on the other hand, while in places are supporting large trees, are predominantly still heavily compacted and inhibiting or slowing vegetation establishment. These field observations validate the resiliency these soils have to disturbance and their ability to recover naturally over time when given the opportunity, particularly considering the high level of disturbance experienced in the 1930s and 40s.

Recent stand management has occurred in the Planning Area, though none of these commercial timber sale units are within proposed stands for this project. An area that has experienced recent thinning using skyline harvest systems was reviewed on the western end of the Planning Area. Soil sampling through the stand did not reveal any detrimental disturbance from the recent commercial thinning activity, let alone any measurable cumulative impacts to site productivity from the historical steam donkey/railroad logging.

IV. Effects Mechanisms and Analysis Framework

A. Slope Stability

Slope stability can be impacted by management actions, through actions that alter soil holding strength of root systems through vegetation changes, change drainage patterns through soil movement or compaction, or undermine slopes. Specific activities as related to the Eden Ridge Timber Sales project include road construction and reconstruction, silviculture treatments, and logging systems.

Roads
Road building in forest land is widely recognized as one of the primary causes of debris avalanches in managed forests (Sidle, 1980). Roads change the surface and subsurface water flow patterns, which can cause concentrations of flow and soil saturation where it didn"t exist before, leading to a slope failure. Roads have the potential to accelerate slumps, earthflows, and possibly creep landslides (Megahan, 1986).

The added weight of fill material on steep slopes, combined at times with improperly routed water that causes saturation of the fill slope, often results in eventual failure. Also roadcuts in steep, unstable terrain can trigger debris avalanches by removing downslope support.

Road maintenance provides an opportunity to minimize risk of slope failures along road prisms, by providing proper drainage, and recognizing and improving areas that are recognized to be at risk of failure.

Silviculture Treatments
Through increasing the depth of the saturated zone in the soil, and reducing root strength, the removal of trees can increase slope failures (Megahan, 1986). When the majority of vegetation is removed, such as in a clearcut, the amount of water in the soil profile is increased for a time due to a reduction in plant uptake and transpiration, as well as reduction in canopy interception. Roots increase the strength of soil by helping to bind soil particles together, and to reinforce a soil mass by anchoring it to the underlying bedrock, particularly in shallower soils (Ziemer, 1981a). When trees die or are cut, the roots die and decay, resulting in a decline of reinforcement by the roots; approximately 50% of the original root reinforcement is lost within 2 years after deforestation, with 90% gone within 9 years (Ziemer, 1981a). However, if only some of the vegetation is removed, such as in a thinning, the loss of root strength is greatly reduced. This is because the remaining trees" root systems are still there to anchor the soils, and they take advantage of the reduction in competition by expanding their root systems (Ziemer, 1981b). Based on the silvicultural treatments proposed (thinning), it is not expected that there would be a measurable effect that would result in an increase in slope failures in the Planning Area (refer to effects discussion, below).

B. Soil Productivity

Soil productivity can be impacted by management activities, through actions that reduce effective ground cover, displace soil, cause soil compaction or otherwise adversely impact soil structure, destabilize slopes, and change nutrient cycling processes through vegetation and down wood manipulation. Specific activities as related to the Eden Ridge Timber Sales Project include road construction and reconstruction (including temporary road construction and decommissioning), silviculture treatments, activity fuels treatments, and use of heavy equipment logging systems.

Roads
Of any of the forest management activities being proposed with this project, the road system being used/reconstructed/constructed is expected to result in the greatest opportunity for soil erosion per unit area (Megahan, 1986).

Existing System Roads (and historical railroad grades)

Existing system roads are considered a long term commitment of the soil resource to something other than soil productivity. The use of existing system roads during the implementation of this project would not result in a change to the current condition of the soils that are committed to supporting the transportation system. However, where system roads have been closed for a period of years, some level of road reconstruction and maintenance would be necessary to make them suitable for treatment access.

Road (and railroad grade) reconstruction generally requires the removal of vegetation and the reshaping of the former road prism, possibly including ditches, from a road in disrepair. The road may have achieved some degree of restoration from past use, but whatever that degree, it would be reversed. The conditions of roads needing reconstruction vary greatly, from those with near complete restoration to those with hardly any. Reconstruction of these routes, however, has far less impact to soil productivity (since it had long since been comprised) than to native soil sites, and that is the benefit of reusing them over new construction. Nonetheless, soil is compacted and short-term erosion from newly exposed soils is likely.

New System Roads

The construction of new system roads would be a long term commitment of the soil resource to something other than soil productivity. Road construction requires the removal of vegetation and the reshaping of the ground to form a road prism. Minimal disturbance would be on flat terrain where surface soils would be displaced during grading operations, and the surface compacted. On slopes, cut-and-fill slopes would be created, displacing a much greater amount of surface and subsurface soil and potentially bedrock, and affecting a wider area along the route due to creation of cut slopes and fill slopes.

Temporary Roads and Landings

Construction of temporary roads (and associated landings) detrimentally compact soils and contribute to erosion by allowing water to run overland rather than naturally infiltrate at the point of raindrop impact, resulting in indirect impacts on pathways for water movement. Properly designed and constructed temporary roads require structures for channeling this now-redirected water flow to desired locations.

Temporary roads and landings are expected to have an irretrievable reduction in soil productivity since they are bladed (soil is mixed and displaced) and compacted. Even once rehabilitated, the soil profile is modified to a degree that may take many decades to return to the productive state of the undisturbed forest soils adjacent to it. Landings also, with their likely deep compaction, and soil mixing from construction and recurrent disturbance are expected to produce irretrievable reductions in soil productivity.

Nonetheless, their use is temporary, with the expectation that following use they would be returned to the highest degree of productivity reasonably achievable.

Silvicultural Treatments

Silvicultural treatments being proposed include: commercial thinning (i.e. "variable density thinning") and non-commercial thinning. Variable density thinning may include the creation of irregular shaped openings ("gaps"), no-thin areas ("skips"), and wide-thin gaps and roadside sanitation that focus on selectively thinning to manage Port-Orford root disease issues. These actions have the potential to affect soil productivity, and organic matter and large woody material through changes to vegetation. Detrimental disturbance as it relates to these silvicultural treatments will be discussed under Harvest Systems, below.

Vegetation uptakes nutrients from the soil in a mostly soluble, inorganic form, and converts them to an organic form for metabolism. Most of a tree‟s nutrients are distributed in the leaves, twigs, and branches; as the tree discards leaves, branches, bark, or dies, the plants organic nutrients are returned to the soil. Organic material returned to the soil is decomposed and the nutrients are mineralized (i.e., converted to an inorganic form) by soil organisms depending on the soil‟s physical conditions (such as moisture, temperature, aeration, etc…) (Farve and Napper, 2009). All of the silvicultural treatments manipulate to various extents the vegetation component that is a part of the nutrient cycle of the soils it is directly growing on. However, since all of these treatments maintain a component of the original forest system, including some overstory vegetation and the forest floor organic litter layer (i.e., they are not harvest systems such as clear-cuts that drastically change the vegetation component), it is not expected that direct or indirect effects to soil productivity as it relates to nutrient cycling would be measurable.

In the forest, precipitation is intercepted, retained, and redistributed by the tree canopy. Water ultimately evaporates from the canopy (interception) or drips through (through-fall) or runs down the stems (stem flow) to the forest floor. Tree canopies intercept precipitation, moderating and metering its fall to the soil surface. They also redirect this intercepted moisture toward the drip line of the tree, and away from the base of the trunk. In extreme rainfall conditions in the absence of deep-crowned tree cover, such as following clear-cut or shelterwood logging, the rate of water striking the surface could exceed the rate of the soil‟s ability to absorb it, with localized sheet erosion a likely result.

Such effects are generally only relevant to degrees of canopy removal associated with clear-cutting or shelterwood logging, or high intensity stand replacement fire. The treatments in the Eden Ridge Timber Sales Project, however, are variable density thinning, or select removal of diseased or susceptible trees forming small gaps, where a measurable direct or indirect effect of this sort is unlikely, since there would still be various levels of an overstory component.

As discussed in Chapter II, prescribed amounts of snags and downed wood would be left on a per-acre basis consistent with historical fire regime effects and plant association (plant series) capabilities where existing amounts are below such levels. However, this mitigation is only effective where such snags are available in adequate numbers. Where they are not so available, there would be an opportunity to create more from remaining live trees. Snag creation would have a positive effect on long-term soil productivity since snags are a source of future down logs, which are a critical component of long-term soil productivity.

There is a limit to this mitigation, however. Snag creation invariably creates "hard" snags, not those in advanced stages of decay. Ideally, a stand would have representatives of snags in all stages of decay at any one time. Since timber management activities exert a disproportional impact on soft snags (since they are most likely to be felled as hazards) than hard snags (more likely to be retained as non-hazards), and they can only be replaced with created or retained hard snags, the inevitable result is an imbalance between the number of snags in advanced decay (near-term down logs) and hard snags (likely to remain hard as either a snag or down log) for a few decades.

Harvest (Logging) Systems

Logging systems (ground-based, skyline-cable, and aerial) have the potential to adversely impact soil productivity through detrimental compaction, displacement, erosion, and loss of effective ground cover/organic matter. Ground-based systems typically have the greatest potential for effects, whereas aerial systems typically have the least potential for adverse effects.

Ground-based Systems (tractor, rubber-tired skidder, harvester-forwarder)

Ground-based logging systems have the greatest potential to adversely affect short and long-term soil productivity. Logging and other equipment can compact and „puddle" soils over which they operate (landings, skid roads, roadways, etc). Tractor, or ground based logging has the greatest potential to cause **soil compaction**, which decreases soil volume and pore space and modifies soil structure and results in a decrease in gas, water, and nutrient exchange, slows root penetration, and can aggravate soil drought, especially in Mediterranean climates such as that of SW Oregon (Atzet et al., 1989), though soil drought may be less of a concern here where there is a much stronger maritime weather influence. **Puddling** is the destruction of soil structure, primarily when wet, by severe compaction, to the point where ruts or imprints are made and the soil structure has been so destroyed as to prevent water from infiltrating into the soil profile.

Compaction may inhibit occupation of the soil by organisms that assist in the decomposition of wood to soil organic material that improves site productivity, and help to aerate the soil. Compaction also possibly inhibits the growth of beneficial fungi (mycorrhizae) that provide nutrients to plant roots (Keslick, 1997). Ectomycorrhizal fungi form an essential interface between soil and trees. They usually colonize more than 90 percent of the feeder roots of host plants (Goodman and Trofymow, 1998). Plant development is also restricted in compacted soils due to poor aeration and impeded root growth. As a result, soil productivity is adversely affected (Floch, 1988).

Soil moisture content, soil characteristics, and force affect the level of compaction that can occur from harvest systems. Fine-textured soils dominated by expandable clay minerals, and well-graded, coarser textured soils are most likely to compact when moist, whereas finer textured soils dominated by non-expandable clay minerals, and of poorly graded, coarser textured soils such as most pumice and coarse ash soils, are less affected by soil moisture (Atzet et al, 1989).

Compaction from logging activities is now routinely mitigated, by designating and minimizing the number of skid trails used; by requiring logging equipment to use only those roads and skid trails created during past timber harvest where feasible; using equipment and or techniques shown effective to prevent or minimize compaction (such as low psi (pounds per square inch) or operating on slash to disperse weight); and allowing operations only during conditions when soils are unlikely to be detrimentally compacted beyond the 15% LRMP allowances (such as on dry or frozen ground; or over deep snow with a firm base). These mitigations have been proven successful and are applied to all Action Alternatives in this project.

Detrimental displacement is defined as the removal of more than 50% of the soil"s „A" horizon (topsoil) from an area greater than 100 square feet that is at least 5 feet in width. This displacement occurs by natural means, such as heavy rains that cause erosion on exposed surfaces (such as skid trails and skyline corridors), or by mechanical means such as churning tractor treads or dragging of logs across the ground. **Erosion** is a form of detrimental displacement. The majority of erosion occurs by sheet erosion (the even removal of thin layers of soil by water moving across extended areas of gently sloping land) and is difficult to detect, as there are no dramatic effects to alert one to its occurrence. Rills and gullies, however, are dramatic examples of erosion that are easily detected.

Detrimental displacement is routinely mitigated by designating and minimizing the number of skid roads and skyline corridors used; requiring a minimum of one-end log suspension to prevent soil gouging; and placing percent slope limitations on ground-based harvest equipment. Additionally, erosion associated with skid trails and skyline corridors can be effectively mitigated by the placement of cross drains (water bars); drainage dips; placement of down wood and slash; and erosion control seeding (or any vegetative cover on exposed soil). These measures have been used for many decades and there has been considerable monitoring and demonstration of their effectiveness.

Large woody material, such as large logs, and standing snags (future large down logs), are critical components in the development and retention of productive soils. Snags are routinely felled if they are believed to be a safety hazard to operations. Operation of logging equipment can mechanically damage/destroy downed logs in advanced stages of decay. Logging and burning has the potential to eliminate these features, particularly those in advanced degrees of decay, from the landscape if care isn"t taken to retain them in adequate sizes, numbers, and distribution across the landscape.

Skyline-Cable Systems

Using cables to suspend one or both ends of logs as they are pulled from the stand to the landing largely eliminates the potential for compaction and puddling within the stand. What remains, however, is the potential for detrimental soil displacement if one or both ends of the log are dragged across the ground from the stump to the landing. Full suspension (where the log is lifted entirely off the ground during yarding to the landing) and one-end suspension (where one end of the log is allowed to drag along the ground), are effective mitigations that are now regularly employed to minimize detrimental displacement, as well as the use of a pre-designated skid trail or skyline corridor layout. Skyline systems typically result in approximately 5% detrimental soil conditions.

Aerial Systems

Helicopter logging has the least impact of all logging systems on soil productivity. This is a form of full suspension, with no part of the log being drug across the ground, except for very short distances as logs are lifted off the ground from a central point between logs. Such logging eliminates any potential for equipment-generated detrimental soil displacement, compaction, or puddling and their attendant erosion effects. Helicopter logging does, however, require larger, though fewer landings, with the associated compaction and displacement effects (typically around 2%).

An exception to this is the practice of pre-bunching in helicopter units. Pre-bunching is the short-distance yarding (using small and lightweight yarding equipment) of numerous logs to a reduced number of collection sites within the stand where they would then be picked up by the helicopter. The potential soil benefit is the elimination of skid roads, with their multiple soil compacting and soil displacing passes by heavy equipment with logs in tow; but the practice still induces some level of soil compaction and displacement for short distances in single passes.

Activity Fuels Treatments

Activity fuels treatment refers to the slash and accumulated fuel resulting from the proposed density management treatments. Several methods of activity fuels treatment are being proposed, and include the following: burning tree tops that were yarded to landing sites, and burning materials accumulated by harvest activity that is piled.

Leave Tops Attached

This treatment requires that the top of the tree be yarded to the landing along with the last log (or whole tree if small enough). In some small tree cases, this practice may mitigate the potential for detrimental soil displacement from the dragging log end as the limbs of the top cushion and elevate that end and prevent soil gouging and displacement.

With the increased interest in harvesting biomass, there has been an increased need to understand how removing the branches and needles from the site might be affecting short and long-term soil productivity. Most studies have been based on models and/or nutrient budgets which forecast likely effects; however long-term field studies have also been started. In a review of literature regarding the effects of whole tree harvesting on soil productivity, Farve and Napper (2009) refer to a summary of effects by Waring and Running (2007: 214) that found that "a whole-tree harvest can remove as much as three times the nutrients as compared to a conventional bole-only harvest….however, since the soil nutrient (belowground) pool contains most of the nutrient capital of a forest ecosystem (by several orders of magnitude), in general, removal of the whole tree during timber harvesting should result in only a small percentage of nutrient loss from the forest ecosystem." With implementation of the Eden Ridge Timber Sales Project, where only a portion of trees are being removed instead of all the trees, the impacts of leaving tops attached is expected to be even less, and likely immeasurable. Therefore this will not be analyzed further.

Handpile burning

Heat produced during the combustion of aboveground fuels (i.e., dead and live vegetation, litter, duff) is transferred to the soil surface and downward through the soil by several heat transfer processes (radiation, convection, conduction, vaporization, and condensation). As heat is transferred downward into and through the soil, it raises the temperature of the soil. The greatest increase in temperature occurs at, or near, the soil surface. Within short distances downward in the soil, however, temperatures can rapidly diminish so that within 2.0 to 3.9 inches (5 to 10 cm) of the soil surface the temperatures are scarcely above ambient temperature (Neary et al., 2005).

Typical physical effects to soil that can occur from fire include changes to soil structure (particularly as a result of loss of organic matter), changes in porosity and bulk density, loss of cover (i.e., canopy, litter, duff), water repellency, and runoff and erosion vulnerability.

Organic matter plays a key role in soil structure in the upper part of the mineral soil at the duff-upper A-horizon interface, in that it acts as a glue that helps hold mineral soil particles together to form aggregates. Fire can impact the organic matter content in soil by killing the living organisms at temperatures as low as 122 to 140^{o}F, and by destructively distilling to completely consuming nonliving organic matter at temperatures of 224^{o}F and 752^{o}F, respectively (Neary et al., 2005).

Loss of the organic matter component in the soil breaks down the soil structure, which in turn results in a reduction in the amount and size of soil pore space. When the soil structure collapses, it particularly reduces the amount of macropore spaces, and increases the bulk density of the soil, resulting in a loss to soil productivity.

When fire results in the loss of canopy, litter, and duff cover, it exposes the mineral soil to erosion processes. The litter and duff layers also act as an insulator that protects the underlying soil layers from heating, and if they are consumed, it exposes the mineral soil to greater soil heating impacts. Fire-induced water repellency may occur when combustion of organic matter vaporizes hydrophobic organic substances that then move downward in the mineral soil and condenses into a water repellent layer. This in turn increases risk of soil erosion. Water repellent layers have the greatest impact within the first year after fire, as they tend to break down fairly quickly.

Typical chemical effects to soil that can occur from fire include nutrient losses, cation exchange capacity loss, and changes to pH. Nitrogen is the most limiting nutrient in wildland ecosystems, and as such requires special consideration when managing fire. Nitrogen loss increases with increasing temperatures through volatilization, with no loss of N at temperatures below 392^{o}F all the way up to complete loss of N at temperatures above 932^{o}F (Neary et al., 2005). The amount of N lost is generally proportional to the amount of organic matter combusted, and burning during moist litter and soil conditions have shown a decrease in the amount of total N lost compared to dry conditions (DeBano et al., 1979; cited in Neary et al. 2005).

Nitrogen that is not volatized either remains as part of the unburned fuels or it is converted to highly available NH_4-N that remains in the soil (DeBano et al., 1979; Covington and Sackett 1986; Kutiel and Naveh 1987; DeBano 1991; cited in Neary et al. 2005). This temporary increase in fertility from available N is usually short-lived and is quickly utilized by vegetation within the first few years after burning (Neary et al., 2005).

The cation exchange capacity of soil can be impacted by fire through the destruction of organic matter. The negatively charged particles of organic matter adsorbs otherwise highly soluble positively charged cations, which prevents them from being leached out of the soil. As the amount of organic matter is destroyed from fire, so too is the soils cation exchange capacity.

Cation nutrients (i.e., Ca, Mg, Na, K, NH_4) become concentrated in the ash following fire, and can be lost in several ways such as volatization (but this takes very high temperatures), particulate loss in smoke, runoff and erosion, and there can be a long term loss of cations to leaching due to the soils reduction in cation exchange capacity. Cation exchange capacity rebuilds over time with new accumulation of organic matter. The release of soluble cations from the organic matter during combustion can temporarily increase soil pH, but this is dependent in part upon the amount and chemical composition of the ash. Thick layers of ash (termed the ash-bed effect) found from severe burning conditions tends to have the greatest impact on raising soil pH.

Typical biological effects to soil that can occur from fire include loss of microorganisms, loss of meso- and macrofauna, and loss of roots and reproductive structures such as seed banks. Impacts from fire to microorganisms as well as their recovery can be very complex because so many variables are involved. In general it can be stated that "intense wildfire can have severe and sometimes long-lasting effects on microbial population size, diversity, and function", whereas at the other end of the spectrum, "low-severity underburning generally has an inconsequential effect on microorganisms." (Neary et al., 2005). This range of effects is in part related to the amount of organic matter impacted by fire, and the temperature and depth of soil heating. If both of these can be minimized, so will impacts to the microbial population in the soil. Effects of fire to meso- and macrofauna, such as mites, insects, and earthworms, is also highly variable, depending in part on species, habitat and adaptations.

Whether or not plant roots and seed banks are destroyed by fire depends on how deep in the soil they reside, the fire severity and amount of soil heating, and the moisture content of the plant tissues and the soil. Higher moisture content tends to lower the temperature at which living biomass can be killed. Plant tissue can be killed at as low as 104°F, and seeds can be killed at as low as 122°F.

Moist soil is a better conductor of heat into the soil so lethal temperatures may extend deeper into the soil surface. However, high moisture content in the litter and duff aids in facilitating a low severity underburn, which results in very little impact to roots and seeds except at the very surface of the litter layer.

Pile/concentrated slash burning increases the residence time of the fire due to concentrated fuels, which can lead to more consumption of organic matter, higher soil heating temperatures, heating deeper into the soil profile, and thus resulting in isolated patches of severely burned soils directly under the slash pile. Mitigations minimizing to the extent possible the size of the piles and burning during moist soil moisture conditions can reduce these impacts by keeping burn temperatures and soil heating as low as possible. Smaller burn scars tend to recover quicker as well due to the high amount of un-impacted soil around them that contribute to recolonization of soil microorganisms and other soil biota.

The *1998 Regional Supplement to the Forest Service Manual (FSM 2520 R-6 Supplement 2500-98-1, Effective August 24, 1998)* defines detrimentally burned soil as:

> "The condition where the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer. The detrimentally burned soil standard applies to a contiguous area greater than 100 square feet, which is at least 5 feet in width".

Burning of slash piles should not exceed the detrimentally burned soil standard since individual burn piles are designed to be discontinuous and not greater than 10 feet in diameter. Even if these burn scars are taken into account, it is expected that less than 2 percent of the area would be left in a severely burned condition.

Detrimental burning occurs when high intensity fire consumes organic matter above and within the soil, heating the soil to the point where the mineral soil surface changes color and the next one-half-inch deeper of soil organic matter is charred. This can happen under natural high-intensity wildfire conditions or by management actions beneath burn piles or „prescribed burns" when the prescriptions are applied incorrectly or "escape" the parameters of their prescription and become overly intense.

Detrimental burning is most likely under extreme fire weather and dry fuel moisture conditions where fuel accumulations are greatest. Reduction of this fuel through management action decreases the potential of high intensity fire and detrimental burning of the soil. In areas where fuels have been treated (reduced), it is common to have only approximately 20% of the soils in a wildfire-burned area to be in a detrimentally burned condition; this is half of what has been observed in areas where fuels had not been treated.

Large woody material, such as large logs, and standing snags (future large down logs), are critical components in the development and retention of productive soils. Burning has the potential to eliminate these features, particularly those in advanced degrees of decay, from the landscape if care isn't taken to retain them in adequate sizes, numbers, and distribution across the landscape.

V. Environmental Consequences

A. Alternative 1 – No-Action

Under the No-Action Alternative, no project activities would take place. No slopes or soils would be disturbed from road management (construction, reconstruction, maintenance, decommissioning) activities. Slope stability throughout the Planning Area would continue at its natural rates, based on the natural conditions of the forest vegetation and climatic conditions.

Soils would continue to develop along current trajectories and under natural vegetation and climatic conditions. The forest floor would remain intact, maintaining a natural level of effective ground cover. The current level of large woody material would be unaffected.

B. Direct and Indirect Effects Common to Action Alternatives

1. Slope Stability

Roads
Many of the proposed roads are ridge top routes with no grade. There would be very little to no risk that these segments would fail or otherwise create slope instability. However, other roads would be on slopes with grade and/or would cross riparian areas, and/or reconstruct sections of old railroad grade trestles, where there could be an increased chance of failure at some point in the future. Therefore, only the miles of road with characteristics having increased risk are compared between Action Alternatives (Table D-3). The road characteristics are based upon the tables in EIS Chapter II and field knowledge of the proposed routes.

Table D-3. Miles of New Road with Conditions that Could Increase Risk of Failure

	Alternative 2	Alternative 3	Alternative 4
Miles of new classified and temporary road that crosses riparian/ has some grade/ reconstruction of railroad trestle	4.74 miles	0.32 miles	0 miles

Silvicultural Treatments
It is not expected that there would be an increased chance of slope instability due to the silvicultural treatments (commercial or non-commercial) being planned with the Eden Ridge Timber Sales Project, under any Action Alternative. It is expected that the thinning treatments planned would not reduce the density of remaining live tree roots enough to cause a weakening of the soil-root reinforcement. The remaining trees‟ root systems would respond to the reduction in competition and expand in the soil profile before the root systems of the cut trees had significantly decayed.

2. Soil Productivity

Roads
Under all Action Alternatives, the proposed road system would have an effect on soil productivity through increased likelihood of surface erosion, as well as a commitment of the soil resource to something other than supporting a forest ecosystem. The potential extent of the effects between each alternative is shown in Table D-4. For the acreage of land taken out of productivity, the range is based on a minimum road width of 12 feet, and a maximum road width of 16 feet. Level of erosion from road surfaces compares the overall miles of road surface that would exist and have the potential to shed sediment, between alternatives.

Table D-4. Estimated Acres of Total Commitment of Soil Resource/Loss of Soil Productivity

	Alternative 2	Alternative 3	Alternative 4
Acres taken out of Productivity (range based on est. road widths)	78 acres -104 acres	63 acres – 84 acres	60 acres – 80 acres
Long-term opportunity for Erosion: Miles of System Road (existing & new construct/reconstruct)	53.4 mi.	43.1 mi.	40.5 mi.
Short-term opportunity for Erosion: Miles of Temporary Road	0.3 mi.	0.03 mi.	0 mi.

Silvicultural Treatments
As discussed earlier, since all of the silvicultural treatments (commercial and pre-commercial) maintain a component of the original forest system, including some overstory vegetation and the forest floor organic litter layer (i.e., they are not harvest systems such as clear-cuts that drastically change the vegetation component), it is not expected that direct or indirect effects of proposed silvicultural treatments to soil productivity would be measurable.

Harvest (Logging) Systems and Pile Burning
Table D-5, below, provides an estimate of the maximum amount of detrimental disturbance that could potentially occur with each harvest system, per alternative. However, implementation of mitigation measures is expected to result in less than the estimated acreages actually resulting in *detrimental* disturbance (in particular displacement and compaction).

In addition, review of recently commercially thinned stands in the Eden Ridge Planning Area also showed very little to no evidence of residual detrimental disturbance, which is another indication that this is a worse-case scenario estimate of disturbance.

Table D-5. Estimated Acres of Detrimental Disturbance per Action Alternative

	Alternative 2	Alternative 3	Alternative 4
Ground-based harvest system (est. 15%)	313 acres	268 acres	216 acres
Skyline harvest system (est. 5%)	61 acres	47 acres	23 acres
Aerial harvest system (est. 2%)	0 acres	10 acres	23 acres
Pile & Burn (est. 2%)	21 acres	16	12
Totals	**399 acres**	**341 acres**	**274 acres**

C. Cumulative Effects

The cumulative effects area for the soil resource is the proposed treatment units and road systems in the Planning Area, and areas downslope of proposed treatments and road systems that could be impacted by soil movement/slope instability.

Past actions in these areas include the historical railroad logging and related burning/wildfires from the 1920s and 30s. As discussed earlier in this report, the soils and slopes in the Planning Area are in a state of near to total recovery from those past actions, based on growth of vegetation, lack of erosion or other active mass wasting, and build-up of organic matter in the surface soils. Therefore proposed actions under the Action Alternatives would have no measureable adverse cumulative effect with these past activities within the stands. There are no other current or proposed activities in the Planning Area that would occur at the same location; therefore there are no other potential cumulative effects with any of the Action Alternatives.

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APPENDIX E

FIRE/FUELS AND AIR QUALITY REPORT

FIRE/FUELS and AIR QUALITY REPORT

EDEN RIDGE TIMBER SALES

APPENDIX E

Rogue River-Siskiyou National Forest
Powers Ranger District
Coos County, Oregon

Prepared by:
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Date: August 5, 2011

I. Introduction

This report documents analysis of potential effects to the fire and fuels resources associated with the Eden Ridge Timber Sales Project. This report will describe the existing conditions or affected environment in relation to the area‟s potential for wildfire, fuels and air quality; discuss applicable management direction; identify the issues or concerns relative to potential effects to these resources; and describe the potential resource impacts.

II. Alternatives Considered in Detail

Alternative 1 - No-Action: Alternative 1 identifies and describes the current conditions of the physical, biological, social and economic environments associated with the treatment units. As required by NEPA, a no-action alternative is included and analyzed as a basis for which the Action Alternatives can be compared. Under this scenario, Alternative 1 - No-Action would not authorize variable density management and other connected actions to obtain the Purpose and Need for the Eden Ridge Timber Sale Project.

The No-Action alternative should not be confused with a baseline, however. Whereas a baseline is essentially a description of the affected environment at a fixed point in time, the No-Action alternative assumes that other things would happen to the affected environment, particularly in a dynamic, changing ecosystem over time. How this ecosystem could change over time without the proposed management actions is discussed more fully in those affected resources that describe potential consequences.

Alternative 2 - Proposed Action: This alternative is the Proposed Action and is designed to meet the Purpose and Need for the project and area. The Proposed Action would commercially thin second growth conifer stands artificially and naturally regenerated following timber harvest in the 1930‟s through the 1940‟s within lands allocated as matrix. Treatments would also include variable density thinning (VDT) within Riparian Reserves that overlap into overstocked drier upland forests. This alternative would reflect the maximum potential effects in regard to the Relevant Issues.

Alternative 2 would commercially thin 75 treatment units totaling approximately 3,314 acres. Harvest activities would use a combination skyline and ground based logging systems.

During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings. In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s) and all landing piles of slash would be burned.

Alternative 3: Alternative 3 would commercially thin 65 treatment units totaling approximately 3,240 acres. Harvest activities would use a combination of helicopter, skyline, and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings. In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s) and all landing piles of slash would be burned. On units where the logging system would be helicopter based, slash would be treated by YTA, piled and burned at landing sites.

Alternative 4: Alternative 4 would commercially thin 53 treatment units totaling approximately 3,058 acres. Harvest activities would use a combination of helicopter, skyline, and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings. In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s) and all landing piles of slash would be burned. On units where the logging system would be helicopter based, slash would be treated by YTA, piled and burned at landing sites.

III. Affected Environment – Fire / Fuels

Eden Ridge Planning Area falls within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds. Watershed Analyses have been conducted within these drainages and contain a synthesis of scientific knowledge about watershed trends and conditions at 5th field watershed scales as well as by smaller 6th field sub-watersheds. Elevations range from approximately 2,500 to 3,500 feet. The Planning Area includes approximately 6,516 acres and is located approximately 4 air miles southeast of the city of Powers, Oregon at the closest point, with a legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon.

The fire occurrence rate in the South Fork Coquille drainage is relatively low for lightening and human-caused fires. The fire occurrence interval for western hemlock series in the Klamath region is about 65 years (USDA 1995). Previous reported fires mostly occur in the west half of the ER Planning Area (see Map B-11 in Silvicultural Diagnosis Appendix B). There have been no substantial fires recorded in the Planning Area during the twentieth century. Most of the lightning storm events are accompanied by moderate and sometimes heavy rainfall. Under these circumstances, fires have sometimes been started, burned small areas, and then have been put out by the accompanying rainfall shortly thereafter. Most lightning fires have been detected while they are small in size, and have been suppressed before becoming larger than one acre.

The potential for human caused starts could be considered low to moderate. Public and industrial users travel the main road through the area during the dry season, and industrial logging activity on the private lands within the Planning Area during the past decade has been quite active. Hunters frequent the area during the fall, but camping opportunities are limited.

The existing levels of dead and down fuels in the proposed treatment units are considered light, consisting primarily of fine limbwood from the self-pruning occurring in the stands. In the Photo Series for Quantifying Natural Forest Residues in Common Vegetative Types of the Pacific Northwest (PNW-105, 1980), the classification 1-MC-3 closely represents the fuels present in these stands, with 2.5 to 5 tons per acre of 0 to 3-inch material, with a small amount of larger material. These fuels are compact and low to the ground, and are best described as a Fuel Model 8-Closed Timber Litter, of the Fire Behavior Fuel Models (Anderson 1982).

Live ground fuels are also scattered and comprise a very minor amount of the available fuels. Salal and Oregon Grape are the primary ground cover, and are considered a low to no threat component of the overall fuel picture due to its fire resistant nature. Wild Rhododendron and Evergreen Huckleberry make up the shrub layer of vegetation, with burning characteristics similar to Salal. In general, ladder fuels capable of carrying a fire from the ground to the crowns of trees are minimal within these stands. The trees themselves are generally reaching a point where their bark thickness is more likely to tolerate the heat that is generated by the low to moderate intensity surface fire which may pass through the stands.

Fires, burning in this fuel model, are generally characterized by slow burning ground fires; with short flame lengths (less than 4 feet), and present only minimal control problems, under normal dry season weather conditions. High winds and temperatures, steep slopes, and low humidity can cause control difficulties in this fuel model; as well as create a more stand-damaging effect. Fire behavior is influenced by the shading and wind-breaking effects of the closed conifer canopy. This shading effect generally maintains a cooler microclimate, as opposed to an open-grown area where increases in solar radiation and wind tend to decrease fuel moisture and increase fire intensity. The closed canopy creates conditions conducive to cooler fire behavior by reducing fuel bed heating (a function of shading) and by buffering the prevailing wind speeds. While these stands could tolerate a surface fire, they are still vulnerable to an independent crown fire initiated from the outside, and carried into the area by weather (wind) and/or topographic conditions. The closed canopy condition would readily allow fire to move from one crown to another. Steeper slopes would amplify this situation due to pre-heating. Such a fire would likely be lethal to the stand.

A. Management Direction

The activities associated with Eden Ridge Timber Sales are tiered to, and would be designed to comply with direction established in the *1989 Siskiyou National Forest Land and Resource Management Plan* (SNF-LRMP) as amended by the *1994 Record of Decision for Amendments to Forest Service and bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (Northwest Forest Plan, USDA 1994).

Management prescriptions for fire management within General Forest – Matrix (SNF-LRMP; page IV-143) and Riparian (SNF-LRMP; page IV-128) would be applied to this project. A high level of wildfire prevention activities should be maintained and direct treatment methods should be emphasized in the management of natural and activity fuels.

The Biscuit Fire of 2002 provided considerable empirical evidence that many stands of commercial thinning size had poor chances of surviving a wildfire, where no fuels treatments had been employed. A goal of this project is to improve forest resiliency which would help control the possibility of stand replacement disturbances such as those created by severe wildfire. The range of harvest treatments proposed with the Eden Ridge Timber Sales needs to consider stand and fuels treatment which would promote stand survivability, in the event that they are subjected to a wildfire, or perhaps are intentionally burned, in the future.

IV. Relationships of Fuels and Fire Effects on Thinning Aged Stands

Peterson, et al., 2005, Omi and Martinson, 2002, and Agee and Skinner, 2005 present a hierarchy of potential treatments to prevent stand replacement disturbances by fire. The initial step to be taken is to reduce the potential for a surface fire to get into the crowns of the trees in the stand. Research indicates that to keep a surface fire on the surface, breaking the ladder fuel chain, while concurrently raising the crown base height (with emphasis on raising crown base height), must be accomplished. The general recognized practice to accomplish this is to thin from below (Peterson, et al., 2005, Omi and Martinson, 2002, and Agee and Skinner, 2005). The three papers referenced go on to say fuels created by any harvest operations must be reduced to the point where surface fire intensity will be low enough to prevent mortality of residual trees by crown fire initiation (keep the fire on the ground), as well as minimizing any lethal amounts of heat being applied to the base of the bole of the tree. Agee and Skinner (2005) state that timber stand improvement work, without treatment of the fuels created by such activities, were burned more severely than unmodified areas. Omi and Martinson (2002) also reach this same conclusion. Agee and Skinner (2005) said that whole tree harvest, with disposal of tops at the landing; is most effective at preventing surface fuel increases in the residual stand.

The next level of treatment is to prevent the spread of an active crown fire, once it has been initiated. Fire can spread from crown to crown through heat transfer, via two mechanisms. Pre-heating of the crowns by an advancing surface fire will allow a passive crown fire (torching) to escalate to an active crown fire, and propagate in the direction of fire spread, so long as the surface fuels allow this pre-heating to occur (notwithstanding the thorough treatment of surface fuels), and by the continuity of the crowns which allow for the aerial spread of the fire. Combinations of steeper slopes, drier/hotter conditions, and the influence of wind can exacerbate this problem; and could lead to an independent crown fire, spreading through the crowns without the need of pre-heating by burning surface fuels, and regardless of the crown base height. Reducing the crown densities is the common recommendation. Given the proper degree of crown bulk density reduction, this chain can effectively be broken, causing the fire to drop back to the surface. There are general guidelines for addressing crown continuity. An example of a field based rule is that the distance between adjacent tree crowns should be the average diameter of the crown of the codominant trees in the stand (Peterson, et al. 2005). Another rule of thumb taught at S-490 (Advanced Wildland Fire Behavior Calculations) is that thinning to a 75% canopy closure is generally adequate. Thinning to below these levels further reduces the risk of crown-to-crown fire spread.

Reduction of crown density can open up the understory so that mid-flame wind speed may be increased, fine fuel moisture may be reduced due to increased solar radiation (Agee and Skinner, 2005 and Omi and Martinson, 2002), and growth of fine herbaceous fuels may be promoted due to increased exposure to sunlight (Omi and Martinson 2002).

Using the Fire Behavior Field Reference Guide (PMS 436-4), the effects to surface winds and fine fuel moistures, as a result of opening up the canopy can be described. Wind Adjustment Tables indicate that a wind speed of 10 mph at the 20 ft. level would result in a 1-2 mph mid flame wind speed (ground level); in a fully sheltered stand, such as can be found with the existing condition. Implementation of the Proposed Action would leave the stand in a partially sheltered condition, with a resulting mid flame wind speed of 3 mph. The table itself offers only 3 levels of sheltering: Fully Sheltered, Partially Sheltered, and Unsheltered.

Fine Fuel Moisture Adjustment Tables offer two levels of comparison, Shaded (>50% shading) and Exposed (<50% shading) of surface fuels. The differences in fine fuel moisture corrections can range from 1-3%. The existing condition would be considered as shaded, any portion of the proposed action which opens up the canopy more than 50% would be considered exposed.

Both the wind and fine fuel moisture components described above relate more to the probability of ignition and rate of fire spread, than to fire intensity, in the overall picture of fire behavior. The amount, size, and arrangement of the fuel left on site will dictate fire intensity and any resultant mortality.

These variable density treatments are designed to enhance overall forest vigor and resiliency. Density management would release remaining trees from inter-tree competition for sunlight, water and soil nutrients when compared to untreated areas. More fire resistant stands would be created by retaining the largest of the existing trees while developing larger trees at a faster rate. Larger trees are more fire resistant in nature because of their thicker bark and higher crown base height. Post-treatment objectives are to develop a sustainable forest resilient to drought, wind, insects, disease, fire and other natural disturbances.

IV. Affected Environment – Air Quality

The Planning Area for Eden Ridge Timber Sales is approximately twelve miles west of the coastal crest. The combination of good air circulation along the Pacific coast and relatively limited industrial development has resulted in only minor air quality problems west of the coastal crest. Wildland fires that occasionally occur are the primary source of air quality problems in this area.

The nearest Class I Airshed is the Kalmiopsis Wilderness, approximately 30 miles south of the Planning Area. The nearest Smoke Sensitive Receptor Area (SSRA) listed in the Oregon Smoke Management Plan is the city of Coos Bay, about 38 miles to the north/northwest.

National Ambient Air Quality Standards (NAAQS) were established by the Clean Air Act (CAA) of 1963 and subsequently amended (as amended, at 42 USCA 7401 to 7671(q)). Primary air quality standards were established under the act to protect public health; secondary standards were established to protect public welfare from any known or anticipated adverse effects associated with the presence of ambient air pollutants.

Particle pollution, also called particulate matter or PM, is a complex mixture of extremely small particles and liquid droplets in the air (i.e., dust, soot and particles too small to see). When breathed in, these particles can reach the deepest regions of the lungs. Exposure to particle pollution is linked to a variety of significant health problems. Particle pollution also is the main cause of visibility impairment in the nation"s cities and National Parks.

To better protect public health and welfare for millions of Americans across the country, the EPA on September 21, 2006 issued the Agency"s most protective suite of national air quality standards for particle pollution ever. The final standards address two categories of particle pollution: fine particles ($PM_{2.5}$), which are 2.5 micrometers in diameter and smaller; and inhalable coarse particles (PM_{10}) which are smaller than 10 micrometers (a micrometer is $1/1000^{th}$ of a millimeter; there are 25,400 micrometers in an inch).

EPA strengthened the 24-hour fine particle standard from the 1997 level of 65 micrograms per cubic meter (p.g/m3) to 35~ig/m^3, and retained the annual fine particle standard at 15p~g/m^3. The Agency also retained the existing national 24-hour PM_{10} standard of 150p.g/m^3. The Agency revoked the annual PM_{10} standard, because available evidence generally does not suggest a link between long-term exposure to current levels of coarse particles and health problems.

To further comply with this direction, the Forest has several strategies to manage prescribed fire smoke: Curtailment, reduction, avoidance, dilution, and education. Also, since the early 1990s, harvest amounts have dropped dramatically, further reducing the amount of pollutants generated by prescribed burning.

A. Management Direction

The activities associated with Eden Ridge Timber Sales would be designed to comply with direction established in the *1989 Siskiyou National Forest Land and Resource Management Plan* (SNF-LRMP) as amended by the *1994 Record of Decision for Amendments to Forest Service and bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* (Northwest Forest Plan, USDA 1994).

Forest-wide Standards and Guidelines for air quality resources (SNF-LRMP; pages IV-48 through 50) would be applied to this project. Activities shall be planned: to maintain air quality at a level adequate for the protection and use of the National Forest resources, coordinate with the appropriate air quality regulatory agencies, reduce total suspended particulate emissions and minimize the impact of prescribed burning on smoke sensitive areas.

The use of prescribed fire would be limited in the implementation of the Proposed Action, or any of the Action Alternatives. Fire would be applied for the burning of landing slash, and burning of hand piled slash.

V. Environmental Consequences: Fire / Fuels

Following review of the affected environment, alternatives considered and formal scoping with the public, the following concerns were identified for discussion:

FIRE/FUELS – What kind of effect would density management (thinning) treatments and other connected actions have on fuel loading and fire hazard conditions?

Modeling of crown fire initiation, the potential to sustain an active or independent crown fire, and the types of treatments needed to mitigate these problems, generally requires in-depth stand data (stand examinations). FVS-FFE (Forest Veg Simulator-Fire Fuels Extension) is the analytical tool which uses stand exam data to estimate potential mortality and the type of fire burning within a given stand. The modeling uses a simulated silvicultural harvest prescription to remove trees from the stands. A simulated fire is then run through these stands under set weather and fuel moisture parameters, using surface fuel types assigned to most nearly represent the results of either the pre-harvest conditions, or post-harvest conditions representing different levels of fuel treatment.

Analysis for selected examples shows that in their existing condition most stands of the stands proposed for treatment would generally tolerate a wildfire burning under the 95th percentile conditions; with less than 25% potential mortality resulting from the fire (see table below). Fire characteristics tend to be surface fires, with low flame lengths, and the modeling shows that crown fires are difficult to initiate in all sizes/ages of stands. While the fuel models in these stands varied between Low to Moderate Load Conifer Litter models, the Moderate Load Conifer Litter model was used to represent a worst case scenario in the analysis.

FFE modeling results, % mortality based on Basal Area and type of fire:

Unit	Existing Condition	Post-Harvest, Leave Tops	Post-Harvest, Yard Tops
201	12%, Surface Fire	17%, Surface Fire	9%, Surface Fire
303	20%, Surface Fire	26%, Surface Fire	18%, Surface Fire
334	9%, Surface Fire	12%, Surface Fire	7%, Surface Fire
102	14%, Surface Fire	34%, Surface Fire	8%, Surface Fire

Alternative 1 – No-Action

Under the No-Action Alternative, no management activities within the Planning Area would occur. It would be expected that current stand conditions would continue to develop in a natural and undisturbed manner into the foreseeable future.

Deep shading, tight canopy cover inhibiting air flow, low crown ratios, and advanced decomposition of the more volatile surface fuels aid in reducing fire severity in forested stands. The stands in the Eden Ridge Planning Area are reasonably resilient to the effects of wildfire in their current condition. These stands have survived through many years of vulnerability to the potential adverse effects of fire, and have evolved into a condition of becoming more resistant and resilient to these effects. Crown base heights are generally raised and the fuel ladder would continue to be eliminated (both positive fire resistive attributes). They could tolerate most surface fires, with the only true threat to mass mortality being an independent crown fire situation.

This condition would not remain static over time however. While fuels in the majority of the areas proposed for commercial thinning presently constitute a low to moderate hazard, stand dynamics would slowly alter this situation over time. Natural foliage loss and self-pruning are presently contributing fine fuels to the litter layer. Suppressed and intermediate trees would slowly begin to die out and contribute larger fuels to the forest floor. This process is being somewhat offset by the meltdown (slow decomposition) of these same fuels, with the smaller more flammable fuels decomposing at a much faster rate than the larger fuels. The process of fuels build up and the inevitable changes in stand dynamics is a very slow cycle, possibly taking numerous decades to actually develop a noticeable hazard. The results of these processes would more readily facilitate fire spread and contribute to potentially higher severity fire, which can put the stand at an increasingly higher risk of mortality than currently exists. During this same time period, the trees themselves would be developing a thicker bark layer, making them more resistant to the effects of fire, countering (to a degree) the potentially higher fire severity created by fuels being contributed from the stand itself.

Alternative 2 - Proposed Action

Alternative 2 would commercially thin 75 treatment units totaling approximately 3,314 acres. Harvest activities would use a combination skyline and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings.

In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s), essentially creating a „cleaner", more defensible space along the aforementioned roads. All landing piles of slash would be burned.

Prescriptions and treatments would be designed, whereby in the event of an unwanted wildfire, the treated stands would be left in such a condition that wildfire would pass though without generating unacceptable levels of mortality, and provide an area where the fire can be managed by ground based initial attack resources.

Direct Effects - The direct effects of this project from a fire and fuels perspective would be a short-term increase in fuels loading and the associated fire hazard within the units as generated from activity-generated slash. Such an increase would be ameliorated by implementing activity fuels treatments. Other untreated slash would be expected to reach a near natural condition within approximately 5 years.

The Variable Density Thinning (VDT) proposed for this project calls for modifying the existing canopy cover to a condition of 35 to 50 percent. This action, in itself, generally reduces the potential for a running crown fire by opening up the spacing between tree crowns.

The primary concern to fire managers, related to fuels remaining after harvest, is the amount of the smaller diameter (0 to 3 inch) fuels that are left on site. These smaller fuels constitute a hazard from two points. The finer fuels are the most receptive to an ignition source (spark, match, lightning), and are the elements that promote rapid fire-spread and increased flame lengths. While the larger fuels (3 inches and greater) contribute to the duration and intensity of a fire (once one has started), the reduction of these fuels is of lesser importance than the reduction of the finer fuels, in the scheme of hazard reduction to reduce the potential for adverse affects of wildfire. Besides being of lesser importance in hazard reduction, the retention of this larger material would provide a multitude of other benefits, which enhance site productivity and complement other ecosystem values.

The stands are most vulnerable to the potential adverse effects of fire from the time the fine fuels (needles and small twigs) become cured, until these fuels drop to ground level and become part of the litter layer. Curing usually occurs within the first month of exposure to late spring/early summer like weather conditions. The needles would generally fall off the twigs by the second or third year following harvest. The twigs decompose at a slower rate, taking four to six years to fall from the main branches. Larger branch wood follows suit, taking upwards of eight to twelve years to decompose to ground level. Once these smaller diameter fuels (<1") have all reached ground level, decomposition is rapidly accelerated, and the risks associated with a wildfire have substantially diminished. Without treatment, the first 0 to 5 years present the window of highest risk.

Harvest activities (i.e., tractor and skyline yarding systems) associated with the Proposed Action would add needles, limbwood, and tops to the existing fuel bed in varying degrees throughout each treatment area. Disturbed ground vegetation and larger woody material would contribute to the dead fuel loading. In comparison with the natural long-term accumulation of ground fuels, harvest would contribute fuels to the site at an accelerated rate. The fuels remaining after harvest would be mostly of the smaller size classes, as most of the larger fuels would be removed for utilization, unless contractual requirements specify that they be left on site. The estimated fuel bed remaining after harvest is best described as a Fuel Model 11- Light Logging Slash, of the Fire Behavior Fuel Models. The Photo Series For Quantifying Forest Residues (GTR PNW-51), 3-DF-3-PC; with a substantial reduction 3.1-9.0 inch size class due to increased utilization also is representative of this fuel type. This fuel bed typically has 5 to10 tons per acres of 0 to 3 inch size class fuels. In the event of an un-planned fire start, the potential for rapid-fire spread would be higher than a stand in a natural condition (2 to 7 chains per hour in a natural state, compared to 6 to 9 chains per hour after harvest).

Effects to the activity-generated fuel bed as a result from implementation of mechanical pre-bunching has shown that fuels are concentrated under the tracks of the machine as it travels over the area. Needles and small diameter limbs (fuels) are crushed / compressed. This condition actually accelerates the results of natural decomposition and subsequent faster response to a reduction of potential fire intensities.

Below, are fuels treatment options considered for the proposed units. Implementation of these fuels treatment methods would likely be one or a combination of several treatments.

No treatment: This method would be appropriate for sites where fuel loadings fall well below LRMP Standard and Guideline recommendations by photo series (S&G 12-2, page IV-59). When residual fuels exceed the guidelines, not treating the fuels may be appropriate in areas of low risk where risks may be assumed for a period, until the hazard has been reduced by natural processes.

Hand piling fuels concentrations: This method would be effective in breaking up fuel continuity thereby reducing fire spread rates. Hand piling, followed by burning of the piles, can remove most fuels from a site. Hand piling is most effective in continuous moderate fuel loadings (25 to 50 tons per acre), and is less effective in scattered light fuels. This method may also be employed in areas where no other disposal methods are prescribed, or in conjunction with non-burning types of treatments, but where the risks may warrant some sort of hazard reduction; such as the piling proposed along Roads 2000, 5000, 290, 440, and 448. On the commercially thinned units that are adjacent to the aforementioned roads, logging slash within 100 feet of these roads would be hand piled and burned.

Yarding of tops: This method would be effective in removing concentrations of the 0 to 3-inch size class fuels. In all treatment areas using ground-based or skyline yarding, tops of commercial trees would be left attached to a commercial log while yarding (Yard Tops Attached – YTA). The tops would be piled and disposed at the landing location.

Piling and Burning Landing Slash: This method would be effective in disposing of all remaining un-merchantable vegetation on log landings (piling and burning).

SNF-LRMP Standards & Guidelines (S&G) 7-2 (Detrimental Soil Conditions) directs that the application of prescribed fire be conducted so that thresholds for bare soil exposure are not exceeded. Burning in the winter and spring windows of opportunity would best meet this objective, and would also compliment the objectives of maximizing the retention of Large Woody Material (S&G 7-8).

Forest-wide Standards and Guidelines for fire management (SNF-LRMP; pages IV-59 through 62) would be applied to this project. The fire hazard presented by natural, activity or prior activity fuels should be reduced to appropriate levels; and proposed activities should be designed and coordinated on the ground to help make the fuel treatment and fire protection as practical and economical as possible.

Indirect Effects - The indirect effects of this project from a fire and fuels perspective would be an increase in potential fire intensity due to reduced canopy closures. The reduction of canopy closure would allow for an increase in solar radiation and air movement. Both of which, would potentially decrease fuel moistures and allow an herbaceous and shrub understory to develop. These conditions would continue to develop until the residual canopies grow together. At that time, the treated stands would return to near natural conditions.

Alternative 3

Alternative 3 would commercially thin 65 treatment units totaling approximately 3,240 acres. Harvest activities would use a combination of helicopter, skyline, and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings.

In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s) and all landing piles of slash would be burned. On units where the logging system would be helicopter based, slash would be treated by YTA, piled and burned at landing sites.

Direct and Indirect Effects – The effects of Alternative 3 would be much the same as those described for Alternative 2, as the fuels treatment proposed for this alternative are the same, the only difference being the acres (3,240 as opposed to 3,314) proposed for treatment. Fuels treatments for this alternative would continue to result in conditions that meet LRMP Standards and Guidelines, and contribute to the improvement of vigor and resiliency of the forestlands located in this Planning Area.

Alternative 4

Alternative 4 would commercially thin 53 treatment units totaling approximately 3,058 acres. Harvest activities would use a combination of helicopter, skyline, and ground based logging systems. During tractor and skyline yarding activities, tops of trees removed from all proposed units would be yarded (YTA) and piled on landings. In addition, following timber harvest, concentrations of logging slash from units adjacent to Forest Roads 5000, 290, 440, and 448 would be piled by hand and burned up to 100 feet from the road(s) and all landing piles of slash would be burned. On units where the logging system would be helicopter based, slash would be treated by YTA, piled and burned at landing sites

Direct and Indirect Effects – The effects of Alternative 4 would be much the same as those described for Alternative 2, as the fuels treatment proposed for this alternative are the same, the only difference being the acres (3,314 as opposed to 3,058) proposed for treatment. Fuels treatments for this alternative would continue to result in conditions that meet LRMP Standards and Guidelines, and contribute to the improvement of vigor and resiliency of the forestlands located in this project area.

Cumulative Effects

Analysis for determining cumulative effects is considered to include stand density reduction and activity-generated fuels on fuel loading and fire hazard in the Eden Ridge Planning Area. 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. Any other past, present or future treatment activities such as Four Does, Lookout Partner, Backwoods Thin (past), and Silver Doe (present), would be expected to meet LRMP Standards and guidelines. This cumulative effects area is considered adequate since the concern is relevant to activity-generated fuels.

Under all Action Alternatives, although there may be a short-term increase in fire hazard due to the generation of fine fuels, there would be a long-term benefit by decreasing tree/crown spacing and roadside fuels so that defensive measures could be deployed.

The long-term combined (cumulative) effects of this project and other past, present and future projects from a fire and fuels perspective would be to improve the defensible space along the system roads as described in the Action Alternatives. Stands along these roads would be thinned and slash would be treated with hand piling concentrations and YTA to help establish a defensible space if another wildfire were to start in the area. This along with the removal of the future potential for natural tree mortality would contribute to reducing the potential for high severity, stand replacement wild fire in this portion of the forest.

VI. Environmental Consequences: Air Quality

Alternative 1 – No-Action

Under the No-Action Alternative, no management activities within the Planning Area would occur and there would be no direct, indirect or cumulative effect to air quality or the Class I Federal areas.

All Action Alternatives

All Action Alternatives (including the Proposed Action) would burn landing piles and hand piles which may affect air quality. Though the amount of burning may vary between Action Alternatives, the intent of this discussion of effects is to disclose to what extent burning activities would have on the air quality in the Coos Bay area, or to visibility in the Class I Federal area (Kalmiopsis Wilderness). Direct, indirect and cumulative analysis of all Action Alternatives relates to those activities which may affect the Coos Bay and Kalmiopsis Wilderness Class I Federal areas; therefore, effects analysis is combined below.

The use of prescribed fire would be limited in the implementation of the Proposed Action, or any of the Action Alternatives. Fire would be applied for the burning of landing slash and burning of hand piled slash. The proposed action (Alternative 2), calls for the treatment of 3,314 acres on 75 units. For the purposes of this analysis, the assumption will be made that these treatments would be spread out over a period of 5 years or approximately 1 sale per year with 15 units per sale. Thus, on average, the Proposed Action could generate as much as 7.3 tons of PM, 5.4 tons of PM_{10}, and 4.6 tons of $PM_{2.5}$ per year, which is well below the thresholds defined in the National Ambient Air Quality Standards. Alternative 3 would produce approximately 86 % of the TSP produced by Alternative 2, and Alternative 4 would produce approximately 70 % of the TSP produced by Alternative 2. (Piled Fuels Biomass and Emissions Calculator, PNW Research Station, 04/2011).

SNF-LRMP Standards and Guidelines 8-1 would be followed. This standard states, "Management activities shall be planned to maintain air quality at a level adequate for the protection and use of National Forest resources and meet or exceed applicable Federal and State standards and regulations." (36 CFR 219.27(a)(12).

For the protection of Class I Area visibility values, as well as preventing any air quality degradation in the Coos Bay area, avoidance is the key to preventing any impacts due to man-made pollutants, such as smoke created by slash disposal. Any burning planned to occur would require development of a Burn Plan, to include avoidance measures. Among various factors taken into account; detailing prevailing wind direction, timing, and coordination with regulatory agencies would ensure that any burning would occur during conditions where any smoke would not degrade air quality within the Coos Bay and/or visibility within the Kalmiopsis Wilderness (Class I Airshed).

Further, burning would not take place during the visibility protection period of Class I Airsheds, which is July 1 to September 15. Using the direction and tools described above, slash disposal managers would consult with Smoke Management agencies to determine what proper atmospheric conditions are best to assure that impacts to either are avoided. It the case of the Eden Ridge Timber Sales Action Alternatives, burning under conditions where transport winds and mixing heights are favorable, as well as following the daily Smoke Management forecast, would assure no adverse impacts to the nearest SSRA(Coos Bay), or the nearest Class I Airshed. As the majority of burning that would be done is pile burning, and can be accomplished in a broad window of opportunity, there is little risk of not being able to meet the slash disposal needs as a result of this constraint.

Burning would not take place within 38 miles of the Coos Bay area or within 30 miles of the Kalmiopsis Wilderness (Class I Area). Further, burning would not take place during the visibility protection period of July 1 to September 15. Therefore there are no expected direct adverse effects to air quality in either the Coos Bay area or the Class I Area.

The potential for smoke produced by any of the proposed actions, to indirectly enter either of these areas would be mitigated by the avoidance methods such as implementation of the visibility protection period and not burning during weather conditions when smoke could travel to those areas.

Cumulative Effects

All past, present, and foreseeable future projects; have been, are, or would be conducted under the same air quality restrictions. Therefore, there would be no measurable adverse cumulative effects to air quality expected to occur. Since all burning would be prescribed and controlled, there would be ample opportunity to schedule burning when the atmospheric conditions are optimal for smoke dispersal. Likewise, there would be an opportunity to limit the size of burning events to control emissions.

It is expected that none of the Action Alternatives would result in a violation of National Ambient Air Quality Standards, or an appreciable reduction in air quality related values. There would be no adverse cumulative effects predicted from proposed treatments. Any project generated emissions would be smaller in volume than natural fires, and can be scheduled to take advantage of favorable meteorological conditions.

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APPENDIX F

BOTANICAL RESOURCES REPORT

BOTANICAL RESOURCES REPORT

Eden Ridge Timber Sales

Rogue River-Siskiyou National Forest
Powers Ranger District

Clint Emerson
District Botanist

August 29, 2011

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I. INTRODUCTION

This report will describe and analyze effects to botanical resources within the Eden Ridge Timber Sales (hereto referred to as the project). It will cover Threatened, Endangered and Sensitive (TES) and Survey and Manage (SM) vascular plant, fungi, lichen and bryophyte species, and Invasive Plant species.

Closely associated resources are described and analyzed in the following specialist's reports:

a) Dead and down wood quantities are discussed in the Wildlife and Silviculture reports.
b) Hydrologic and aquatic affects is in the Hydrology and Fisheries report.
c) General vegetation and forest ecology is discussed in the Silviculture Report.

The Environmental Impact Statement (EIS) for this project incorporates and summarizes the information in this report.

II. PROJECT AND EFFECTS SUMMARY

Project Summary: A detailed description of the proposal can be found in the EIS, Chapter I. In brief summary, the Proposed Action for the project proposes to use variable density thinning across 3,314 acres of matrix and Riparian Reserve lands on the Powers Ranger District. Another 385 acres are proposed for non-commercial treatments that include thinning small diameter trees, planting Port-Orford-cedar and removing disease-infected or damaged understory trees. The project lies within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Headwaters of South Fork Coquille River, Coal Creek, Mill Creek, Lower Rock Creek and Myrtle Creek 6th-Field watersheds, none of which are significant botanically. The South Fork Coquille 5th-Field watershed is designated as a Tier 1 Key Watershed, selected for directly contributing to anadomous salmonid and bull trout conservation in the Northwest Forest Plan (USDA 1994).

Effects Summary: No significant botanical issues were raised during internal or public scoping. Effects to botanical resources fall under the category "other issues". Other issues as used in this environmental analysis are those that have been determined to be relevant, are used to disclose consequences, may affect design of component actions, may prescribe Project Design Criteria (**PDC**), or whose disclosure of environmental effects are required by law or policy. Other Issues differ from Significant Issues in that they often describe minor and/or non-variable consequences.

There are no populations, nor is there any habitat for any federally listed Threatened or Endangered plant or fungi species within the project. The project would have **no effect** on any Threatened or Endangered plant or fungi species or their habitat.

Oregon bensonia (*Bensonia oregana*), a Sensitive vascular plant species, was found within the project. The planned project **may impact individuals or habitat of Oregon bensonia, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species within its range**. The project will have **no impact** on any other Sensitive vascular plant, lichen or bryophyte species. PDCs focusing on avoidance of known sites of Oregon bensonia are recommended, the specifics of which are outlined later in this report. Sensitive fungi may be present within the project but surveys were deemed impractical. Based on existing data the regional Interagency Special Status and Sensitive Species Program (ISSSSP) provided literature review and several analysis documents which are all incorporated by reference to this document.

Based on the regional assessment, this project **may impact individuals or habitat of Sensitive fungi, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to any population or species within its range.**

High priority invasive plants are absent from the Planning Area. Several lower priority invasive plant species were documented along roads and landings. The risk of invasive plant species spread in the project area was determined to be **low to moderate with implementation of the PDCs** listed in Chapter II of the EIS.

III. AFFECTED ENVIRONMENT

This section summarizes current botanical resources in the affected area and those components with the potential to be affected by the Proposed Action. Resources with no potential to be affected may be identified, but need not be analyzed. This information provides the baseline needed to understand impacts associated with the project.

The analysis area for botanical resources consists of:

- For vascular plants, lichens, mosses, liverworts and invasive plant species, the Eden Ridge Timber Sales Planning Area boundaries consisting of 6,516 acres of Forest Service land within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Headwaters of South Fork Coquille River, Coal Creek, Mill Creek, Lower Rock Creek and Myrtle Creek 6th-Field watersheds.
- For fungi the scale of analysis is the PNW Region 6 of the Forest Service in Oregon and Washington.

A. BOTANICAL RESOURCES

1. Threatened, Endangered and Sensitive Plants and Fungi

Forest Service Manual (FSM) chapter 2670 outlines the policy and direction for the management of TES vascular plants, bryophytes, lichens and fungi and their habitat on Forest Service lands. FSM chapter 2670 requires a Biological Evaluation (BE) report in order to determine and document effects from proposed actions on TES species. **This Botanical Resources report satisfies the BE requirement as stated in the Forest Service Manual**.

The National Forest Management Act (NFMA) of 1976 also contains language relating to diversity and species viability that guides decision and management of native plant species on Forest Service lands. The language in the currently used planning rule (1982) states "management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the Planning Area." This language led to the following additions to the Siskiyou National Forest Land and Resource Management Plan in1989:

Forest-wide Standards and Guidelines for Special Status Plants (see LRMP IV 26-27, 37)
Standards and guidelines applicable at the project level are:

1. Monitor the effects of management activities on TES plant species. If the results of monitoring show a decline in species viability then, alter the management strategy.

2. Analyze the potential effects of all ground disturbing projects on TES plant species and habitat. Mitigate project effects to avoid a decline in species viability at the Forest level.

3. Map, record, and protect essential habitat for TES plant species. Species management guides should be prepared to address the effects of land management activities on local populations of TES at a broader scale, and to identify opportunities to enhance and develop habitat locally.

2. Strategic Plants and Fungi

Strategic, is a new category of species established in May of 2007 by the Interagency Special Status and Sensitive Species Program (ISSSSP). Strategic Species are **not** considered "sensitive" species under Forest Service Manual (FSM) 2670. These are species listed by the Oregon Biological Inventory Center (ORBIC) as category 3 because of information gaps (i.e., distribution, habitat, threats) resulting in status or taxonomic uncertainties.

These species may be rare or uncommon but the current level of scientific knowledge is not adequate enough to make an accurate determination for listing as TES. ISSSSP staff in the Regional Office (RO) work in coordination with field offices to compile information to remove these uncertainties. The management requirement for this group of species is to record survey and location information in the agency's corporate database: Natural Resource Information System (NRIS). Strategic species are not specifically targeted during surveys and in the event new sites are located active management is not required. However, the rarity of a given species will be taken into account when deciding whether or not a site should be protected.

3. Survey and Manage Plant and Fungi Species

The 1993 Final Environmental Impact Statement (FSEIS) and 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (also known as the Northwest Forest Plan (NWFP)) created the survey and manage standard and guideline for all land allocations on the west side of the Cascades in Oregon, Washington and northern California and east Cascade forests within the range of the northern spotted owl.

The standard and guidelines were created to gain information that could help manage a set of lesser known and possibly rare taxa. Species of fungi, lichens, bryophytes and vascular plants were included to determine the status of their population viability.

The original survey and manage provision of the NWFP was amended in 2001 and 2004, then it was completely removed in 2007. A recent settlement agreement to a lawsuit (*Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.)) reinstated the program to the 2001 species list and level of management.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the *Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007). In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are now subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

The Eden Ridge Timber Sale Project applies a 2006 Exemption from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in *Northwest Ecosystem Alliance v. Rey*, No. 04-844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management.

Also known as the Pechman Exemptions, the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

a. Thinning projects in stands younger than 80 years old;
b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and
d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Per the 2011 Settlement Agreement, the 2006 Pechman Exemptions remain in force:

"The provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash. Oct. 10, 2006), shall remain in force. None of the following terms or conditions in this Settlement Agreement modifies in any way the October 2006 provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04844-MJP (W.D. Wash. Oct. 10, 2006)."

The Eden Ridge Timber Sales Project meets **Exemption a.** because it entails no regeneration harvest and entails thinning in stands less than 80 years old (see Eden Ridge TS Silviculture Report, 2011). Therefore, no specific survey and manage surveys were conducted for any plant or fungi species listed in the standards and guidelines.

B. PRE-FIELD ANALYSIS

Based on the applicable laws, policies and procedures outlined above, a review of potential TES plant and fungi species was conducted in order to determine the extent of botanical analysis needed for the project. The NRIS database was consulted in order to determine the potential likelihood of encountering TES plant and fungi species within this project. The results of the data query showed that Oregon bensonia is the only sensitive plant species previously known to occur within the planning/analysis area.

1. Sensitive Vascular Plant, Lichen, Moss and Liverworts

An analysis of the 99 vascular plants, 17 mosses, 7 liverworts and 11 lichen species listed TES and either suspected or documented on the RRSNF was completed to determine potential habitat that should be surveyed (the complete list and analysis can be seen as Attachment A). The analysis considered the location where the project would occur as well as the type, intensity and duration of disturbance the project would entail in relation to the quality of habitat present. Using GIS, digital aerial imagery and known variables such as elevation, aspect and surrounding vegetation type it was determined that the project is within the geographic distribution and elevation ranges and contains potential suitable habitat for the following Forest Service Sensitive listed vascular plant, moss, liverwort and lichen species.

Table F-1. List of Potential Sensitive Vascular Plant, Lichen, Moss and Liverwort Species with Habitat in the Eden Ridge TS Planning Area

Vascular Species	Habitat/Distribution
Arctostaphylos hispidula Gasquet or Howell's manzanita	Forest edges, brush fields, barren ridgelines. Often on serpentine but not always. Usually found with other manzanita species especially *A. columbiana*. Fire dependent species. Occurs sporadically from Coos Co., OR south into Humboldt Co., CA. Nearest site to this project is about 15 miles to the southwest on the RRSNF.
Bensoniella oregana Oregon bensonia	Seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Range is restricted to the Coast and Siskiyou Mountains In extreme SW Oregon and NW California. Elevations 2,800 to 5,200 feet. Known sites within the Planning Area.
Carex crawfordii Crawford's sedge	Seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Range is restricted to the Coast and Siskiyou Mountains In extreme SW Oregon and NW California. Elevations 2,800 to 5,200 feet. Nearest site to the project is about 27 miles to the west.
Carex gynodynama hairy sedge	Moist meadows, open forests, seeps. Found in the Coast Range and Klamath-Siskiyou Mts. from Coos County, Oregon to Monterrey County California.
Illiamna latibractreata California globe mallow	Moist sites, stream sides in coniferous forests. Often in open or partial shade, disturbed ground, often recently burned. Elevation 300-4000 ft. Coos, Curry, Douglas, Jackson and Josephine Cos., OR; south to Humboldt Co., CA. The closest known site to the project is 5 miles to the southwest on RRSNF lands.
Romanzoffia thompsonii Thompson's mistmaiden	Sunny vernally wet, mossy (esp. *Bryum miniatum*), rocky hillsides at 750-6,000 ft. Douglas, Jackson, Lane, Linn, Marion Cos., in foothills and west Cascades of OR. In relation to this Planning Area, there is a known site on BLM land within 20 miles to the east.
Lichen Species	**Habitat/Distribution**
Chaenotheca subroscida	Usually in shaded moist situations, esp. close to the base of trunks. On old THPL, PIEN trunks, decorticated stumps and dry twigs of Picea under canopy. Occurring throughout SW Oregon. Known site approximately 20 miles east of this project.
Moss Species	**Habitat/Distribution**
Codriophorus depressus	Forming mats on rocks in perennial or intermittent streams, and in the spray zone of waterfalls, between 400 and 11,000 feet elevation. Habitats are subject to scour at high water.
Tayloria serrata	Forming green sods on old dung, rotten wood, or on soil enriched by dung on roadsides, trails, in dry to moist coniferous forest of various age classes including early seral, and in wetlands. Decomposed dung may be scarcely visible or completely humified. Scattered sites throughout SW OR. Nearest site about 40 miles NE of this project.
Liverwort Species	**Habitat/Distribution**
Diplophyllum plicatum	Tends to occur in either Western hemlock/Douglas-fir stands with western cedar present or Sitka Spruce older forests stands. It occurs in areas that sustain year-round cool habitats with high humidity which are fairly common along the immediate coast and in the Coast Range. Many populations known just to the north of the project, the closest being about 5 miles away.
Porella bolanderi	Forming shaded to partly exposed mats on a variety of rock types (siliceous, calcareous, and metamorphic) and trunks of *Quercus*, *Umbellularia*, and *Acer macrophyllum* (Piippo and Norris 1996). In the Pacific Northwest, known elevations range from 500-3,000 feet.

2. Sensitive Fungi

Rare ephemeral fungi, such as mushrooms, coral's and club's , are treated separately from the above listed species because of the difficulty in surveying and detecting them prior to projects being implemented. Surveys for species presence are often difficult, because fungi can be seen only when fruiting bodies are produced. Even with above-ground fruiting bodies present, their correlation with the extent and abundance of the fungal organisms underground is unknown (Straatsma and Krisai-Greilhuber 2003). Because of the logistics and costs involved with completing surveys, which takes two years with several visits to each unit, the Forest Service Region 6 policy has been to manage these species at a broader landscape scale by conducting regional "strategic" surveys. These are surveys for the sake of finding new sites, not for clearance of a project. Therefore the effects analysis for fungi is based on existing knowledge of the distribution of each species and focuses on the likelihood of extirpation of a population.

The following table lists the Sensitive fungi species either documented or suspected on the RRSNF with the potential to be found in the Planning Area:

Table F-2. List of potential sensitive fungi that may occur in Planning Area

Arcangeliella camphorata (16)	*Phaeocollybia psuedofestiva (38)*
Boletus pulcherrimus (22)	*Phaeocollybia scatesiae (18)*
Cudonia monticola (31)	*Phaeocollybia spadicea (68)*
Dermocybe humboldtensis (4)	*Ramaria largentii (21)*
Leucogaster citrinus (45)	*Ramaria spinulosa var. diminutive (1)*
Otidea smithii (12)	*Rhizopogon chamaleontinus (1)*
Phaeocollybia attenuata (152)	*Rhizopogon ellipsosporus (7)*
Phaeocollybia californica (35)	*Rhizopogon exiguous (5)*
Phaeocollybia olivacea (99)	*Sowerbyella rhenana (53)*

***The number in parentheses represents the amount of known sites in the PNW as of 2007.**

In order to determine the likelihood of finding Sensitive fungi species in the Planning Area several documents written by the Region 6 ISSSSP were referred to. These documents include:

> Fungi Effects Analysis Guidelines, 10/2008; Attachment 1- Likelihood of Occurrence Key, 9/2004; Attachment 2- Conservation Assessment for Fungi in Region 5 & 6, 7/2007; Attachment 4 – Potential Impacts to Fungi Table; and Habitat Summary for Sensitive Fungi Species, 2007. (ISSSSP website: http://www.fs.fed.us/r6/sfpnw/issssp/species-index/flora-fungi.shtml)

Most of the species in the table above are associated to some degree with forest floor litter, down woody material, host tree/shrub species, or a combination thereof. While this association is known, details about the requirements for forest floor litter or down woody material for most fungal species are not well understood, and host specificity is not often known beyond the broad categories of conifers hardwoods or plant families within these categories. Down woody material and forest floor litter are direct food sources for fungi that play a role in decomposing organic material. Host trees (or shrubs in some cases) provide necessary carbohydrates to some fungi through transference of carbohydrates from the roots of the host to the fungus via an underground network termed mycelia.

Down woody material requirements for most fungal species are not well understood. Down woody material may function to retain moisture, allowing root tips to support active ectomycorrhizae (Harvey et al. 1976, Harvey et al. 1978, Amaranthus et al. 1989, Harmon and Sexton 1995). These fallen tree "reservoirs", large limbs, and stumps can provide refugia for seedlings and mycorrhizal fungi, especially in drier forest communities. As stands mature, the availability of downed wood may be crucial for establishment of fungi as well as plant seedlings (Kropp 1982).

Down woody material is a direct food source for wood-decaying fungi. Studies in Scandinavia and North America indicate that the presence of large down wood promotes higher diversity of wood-decay fungi species (Kruys, 1999, Crites and Dale 1998, Ohlson et al. 1997, Høiland and Bendiksen 1996, Bader et al. 1995, Wästerlund and Ingelög 1981). Høiland and Bendiksen (1996) found that rare wood-inhabiting fungal species occurred primarily on long (average length = 11 meters) and well decayed (average decay Class III) down wood. When surface area is taken into consideration, fine woody debris appears to be equally important to species diversity (Kruys and Jonsson 1999).

The presence of large, well decayed down wood in managed stands can provide habitat for both ectomycorrhizal and wood-decay fungi, as well as plant seedlings. For some fungi, spore dissemination into disturbed areas is the primary method of re-establishment. Remnant stands of late seral forest neighboring managed areas may serve as refugia (Clarkson and Mills 1994). In addition, resistant fungal propagules may remain in soils or down wood after disturbance (Baar et al. 1999). Regardless of the method of re-establishment, it may take a great deal of time before fungal species can be detected.

The size and scale of down woody material influence the range in size of fungal individuals. Fungal colonies can range in size from microscopic to many acres and can persist for years or decades (Smith et al. 1992, De la Bastide et al. 1994, Bonello 1998). Typically fungi are patchily distributed, in part due to patchy distribution of substrate (living host plants, down wood). Scattered islands of down wood throughout a management unit, including many sizes ranging from twigs to large logs, as well as a variety of decay classes, may provide better fungal habitat than one size or decay class of down wood homogeneously covering the forest floor.

Data on quantities or coverage of down wood necessary to support a diversity of fungi in Pacific Northwest forests do not currently exist. In the dry forests of western Montana, Harvey et al. (1981) estimated that 25-37 tons of down wood per hectare are needed to support ectomycorrhizal activity necessary for forest communities developing after stand removal.

C. FIELD INVENTORY RESULTS

Surveys for the above listed vascular plant, lichen, moss and liverwort species were conducted between June and August of 2010 with revisits to some areas occurring in June of 2011. Surveys were conducted by contract (Siskiyou Biosurvey, LLC) and by agency botanists. High potential habitat areas were delineated prior to commencing surveys. The intuitive controlled survey method was utilized, so that each delineated habitat area was searched with a high degree of likelihood that TES species would be found if present. In accordance with Region 6 Forest Service direction, fungi surveys were not conducted.

Oregon bensonia was the only sensitive species found during surveys. It was relocated at a handful of historically known sites, as well as being located in several new areas, including within some of the proposed units and roads in this project. There were several sites found along the edge of existing road beds where wet conditions have persisted due to the change in hydrology caused by the roads original construction. One site was found within a historical road bed scheduled for rebuilding. Units/roads with sites include 007, 314, 318, 319 and 326 and road 5000-448 (see map in Attachment B for details).

Based on results of downed wood material surveys during stand exams in some units in 2009 (Boyer, Silviculture Diagnosis, 2011) and from field observations during surveys for TES plant species, the Project Area appears to be stocked with coarse down wood probably due to debris remaining from historical railroad logging. There is sufficient substrate and habitat currently available for colonization by Sensitive saprophytic fungi, although there are less large diameter structures than desired. Though the structure and composition of the forest does not qualify it as old-growth, there is likely to be sufficient opportunity for colonization of the existing tree species by Sensitive ectomycorrhizal fungi.

IV. INVASIVE PLANT SPECIES

Definition of an Invasive Plant
Those plant species designated as Invasive Plants by the Secretary of Agriculture or by the responsible State official. Invasive Plants generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of a serious insect or disease, or being non-native or newly introduced and not common to the state. Generally, species that can survive and reproduce in a natural setting away from landscape areas are considered invasive.

Management Direction
Management direction on this subject is given in the Siskiyou NF LRMP under forest-wide standards and guidelines item 12-6: *"Control of Invasive Plants should be accomplished in cooperation with state, county, and private organizations through Weed Control Districts or Coordinated Resource Management Agreements. Preventive management is critical to an effective control program."*

In addition, this document incorporates by reference all the standards and guidelines described in the Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision and Final Environmental Impact Statement Volumes I-III, 2005. That document amends the Siskiyou NF LRMP to include an updated set of information on preventing and managing invasive plant species in Region 6.

Current Management Direction for Invasive Plants as stated in the Forest Service Manual 2080, Amendment No. 2000-95-5, effective November 29, 1995 states the following:

District Rangers are responsible for:

1. *Determining the risk of Invasive Plant introduction or spread as part of the NEPA process for proposed actions, especially for ground disturbing and site altering activities.*

2. *Enforcing closures or prohibition orders issued under 36 CFR parts 261.50 (a) and 261.58 (t) and enforcing contract specifications intended to prevent and control the spread of Invasive Plants.*

3. *Ensuring that the contracts and permits contain appropriate clauses concerning the prevention or spread of Invasive Plants as described in the Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision* (September 2005).

Policy: When any ground disturbing action or activity is proposed, determine the risk of introducing or spreading Invasive Plants associated with a proposed action.

A. CURRENT CONDITIONS WITHIN THE PLANNING AREA

Invasive plant surveys were completed as part of the TES plant surveys previously discussed. The Planning Area was found to be relatively void of invasive plants, especially species that are prioritized for active treatments (see Attachment C, Priority Invasive Plants Documented or Suspected on the RRSNF for a list of priority species).

Tansy ragwort (*Senecio jacobaea*) was found to be common along at least some portion of each road within the Planning Area. The district uses only biological controls when treating Tansy, no manual or spraying treatments are used. Bull Thistle (*Cirsium vulgare)* was also found to be fairly common along roads and within old landings. The district is not actively treating bull thistle, as it is biennial, it comes and goes quickly from locations and does not cause irreparable harm. Canadian thistle (*Cirsium arvense)* was found to be less common than the other two previously listed species but is more of a concern for persistence and harm to the environment. One historical site of Scotch broom (*Cytisus scoparius*) is known from the Planning Area but was not relocated during surveys.

V. ENVIRONMENTAL EFFECTS

This section assesses the potential effects to botanical resources caused by implementation of each alternative. Analysis focuses on the following "other" issues identified in Chapter I of the Environmental Impact Statement:

a) TES Plant and Fungi Species
b) Invasive Plant Spread

A. EFFECTS ON THREATENED, ENDANGERED AND SENSITIVE PLANTS AND FUNGI SPECIES

1. Direct and Indirect Effects

Alternative 1(No-Action)
The current condition would remain the same under this alternative. Natural processes would continue to progress in a random succession with an unknown future outcome. Known and unknown TES plant and fungi species that currently exist within the project boundary would respond and continue to evolve within the natural system. There would be no direct or indirect effects from implementing this alternative.

Action Alternatives
The differences in Alternatives 2, 3 and 4 have no bearing on effects to Oregon bensonia because under all Action Alternatives, the known sites found in Units 007, 314, 318, 319 and 326 would undergo vegetation treatments. Effects to sensitive fungi species would also remain relatively similar because of only subtle changes in alternative proposal acreages in relation to the larger landscape. For these reasons effects for each alternative have been lumped in the discussion below.

a. Oregon bensonia

Direct and Indirect Effects
Direct effects to sensitive plants may include impacts such as trampling by foot or equipment, piling of vegetation or logs on known sites or any other soil disturbing activity that could potentially uproot individuals or a population. Examples of indirect effects are things like edge effect (Chen et al., 1992) which can cause changes in microclimatic conditions that may be necessary for a species to persist. If Project Design Criteria (PDC) were not implemented there is a high likelihood that the populations of Oregon bensonia found within treatment areas of this project would be directly impacted by workers or their equipment. There is also potential for indirect impacts from thinning due to the potential for lower relative humidity and moisture retention levels in the soil from decreased canopy and shade cover causing the sites to dry out.

Avoidance of the populations located within this project is recommended so that direct and indirect effects are minimized to insignificant. The methods for avoidance are discussed in the PDC section below. Acknowledging there may be habitat and populations that were not found during the surveys of the project it is determined that the **Eden Ridge Timber Sale Project may impact individuals or habitat, but will not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species.** The Eden Ridge Timber Sales project will have **no impact** on any of the other Sensitive vascular plant, lichen, moss or liverwort species listed as having potential habitat in the project.

b. Sensitive Fungi

Threats and impacts to fungi may occur at several scales. At a local habitat scale, impacts or threats could include anything that affects (removes, alters) the substrate on which fungi grow. Impacts may also occur on a larger scale as a result of the cumulative effects of many smaller local impacts. Local threats combined on larger scales could alter the distribution of populations across regional landscapes, resulting in the impairment of landscape-wide species persistence. For example, the loss of several populations within one area could truncate population continuity, inhibiting the ability of a species to disperse across distances. Such disjunct distributions can often result in expanding areas of extirpation. As cumulative effects may be difficult to address, perhaps the most useful strategy is to focus on what can be managed locally, assuming that cumulative effects would thus be minimized as well.

Larger-scale, indirect effects (such as climate change or air pollution) are difficult to assess, given limited knowledge of even microhabitat requirements of most fungi. The effect of larger-scale issues on fungi populations remains unknown, and cannot be adequately addressed with the management options discussed in this document.

Management activities may pose direct or indirect threats to fungal individuals or mycelial mats, depending on the timing or intensity of the activity. Types of activities that can result in threats to fungal individuals or alter habitat conditions beyond a given threshold of tolerance include activities that:

- intensively or extensively remove or consume the woody substrate, forest floor litter, or shrub hosts with which the species is associated;
- remove or destroy the fungal organism; or
- remove host tree species or significantly modify the microclimate at the species' site.

The following table from the regional Interagency Special Status Sensitive Species Program (ISSSSP) "Fungi Effects Analysis Guidelines" highlights potential impacts to Sensitive fungi:

Table F-3. Potential habitat impacts to sensitive fungi species

Thinning	Increase in solar radiation up to 60%. Modification of forest floor conditions. Retention of large wood is an important factor in protecting Ectomycorrhizal (EM) and Saprobe/wood decaying species viability	
	Direct Impacts	***Indirect Impacts***
	Removal of host trees necessary to sustain EM Disturbance of mycelial network	Moisture retention capability • overstory shade • forest floor litter and duff • large wood Nutrient source Large woody material or host trees for regeneration of inoculum source Soil compaction (less for helicopter) • root growth and root tip availability for fungi

Alternatives 2 (Proposed Action), 3and 4 all propose thinning, not regeneration harvest and because the forest is early to mid seral in structure and composition, there is less potential for Sensitive fungi to occur. There is low probability of extirpating a population at the watershed or regional scale.

Impacts to sensitive fungi would be minimized by following a harvest prescription that leaves at least 40-60% canopy and follows existing wildlife guidelines for the retention of Large Woody Material (LWM) to be left on the ground. The retention of legacy trees and downed woody material is beneficial for both mycorrhizal and wood/litter saprobe fungi species (Smith et al., 2002; Lemkuhl et al., 2004; Kranabetter et al., 2001). Therefore, in theory, there should be suitable substrate and habitat available for the continued and future colonization of sensitive fungi species within the stands proposed for treatment in this project.

Using the ISSSSP Attachment 1 - Likelihood of Occurrence Key it was determined that Outcome 2 was the likely scenario for this Planning Area. Outcome 2 in the document states the following:

> **Outcome 2: Reasonable likelihood of occurrence; low risk to species viability or trend toward listing**
> **Because:**
> a) The species is likely to occur in the proposed project area, but habitat requirements are too broad or too poorly understood to reasonably mitigate adverse effects through management of habitat at the project specific scale. Broad-scale inventories with management of all known sites may contribute toward species viability, and
> b) Allocated Reserve areas (Northwest Forest Plan allocations, as well as reserve areas designated elsewhere) could provide for viability of the species or could help to ensure that the project would not contribute to the need to list.

With regard to Sensitive fungi species, implementing any of the proposed alternatives for the Eden Ridge timber sale may impact individuals or habitat but would not likely contribute to a trend toward federal listing, or cause a loss of viability to the species or population**.**

2. Cumulative Effects

Cumulative effects are "those effects on the environment that result from the incremental effect of the action when added to past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions.

Oregon bensonia
The scale considered for cumulative effects to Oregon bensonia is the extent of the species distribution (Coast and Siskiyou Mts. of Coos, Douglas, Josephine and Curry County, Oregon disjunct to the south in Humboldt County, California). There are roughly 60 populations of this species known in Oregon. Management of this species dates back to the early 1980s when Forest Service botanists began conducting surveys prior to proposed projects and recommending PDCs to protect populations of Oregon bensonia (Rare Plant Siting Forms, Gold Beach and Powers RD 1978-present).

It is likely that adverse effects occurred to some populations of Oregon bensonia from past logging prior to the early 80s. The Eden Ridge Timber Sales Project would not incrementally increase any significant effects to Oregon bensonia because it would have no direct or indirect effects to the species with the proposed PDCs being implemented.

Sensitive fungi
The scale considered for cumulative effects to Sensitive fungi is the Pacific Northwest Region 6 area in Oregon and Washington because this is the level used by ISSSSP biologists to develop the analysis tools that have allowed for the assessment of Sensitive fungi without doing field surveys to verify species presence or absence within projects. There is a high probability that adverse effects have occurred to several of the listed Sensitive fungi species in the past 100 or so years within the region.

Acknowledging that impacts may occur to Sensitive fungi sites, that are as yet unknown because of a lack of surveys and/or an inadequate protocol, is inevitable. Therefore it is can also be said that with these potential direct and indirect effects there would also be cumulative effects because of the certainty that there have been past impacts. There is also likely to be future impacts because of the lack of information on the distribution of these Sensitive species. Overall these effects are not likely to be significant enough to cause a loss of viability to a population or species, keeping in mind there is a high level of uncertainty.

B. EFFECTS ON THE ECOSYSTEM FROM INVASIVE PLANT SPECIES

1. Direct and Indirect Effects

Alternative 1 (No-Action)
There are no known high priority invasive plant species within the Planning Area. There would be no chance to infest new areas because no actions would occur if this alternative were chosen. This alternative would result in no direct or indirect effects with regard to invasive plant spread.

Action Alternatives
For effects determinations, the alternatives are similar enough to lump together, although Alternative 4 (3,058 ac.) would have slightly less impact than Alternative 3 (3,240 ac.) which in turn would have slightly less impact than Alternative 2 (3,314 ac.). This is due to the amount of acres of disturbance being slightly less for Alternative 4 and Alternative 3, with both proposing less thinning than Alternative 2.

Direct effects with regard to spreading invasive plants are actions such as parking road working equipment on an invasive plant site that has gone to seed then moving the equipment to another area in the Planning Area and potentially spreading the seed to a new site. Several scenarios similar to this example have been considered and PDCs were developed to avoid the introduction and/or spread of invasive species in the project. Direct effects would be minimized to insignificant by following the PDCs.

The removal of canopy in an area adjacent to an existing invasive plant site is an example of an indirect effect that could lead to further spread of that species by opening up bare ground and increasing available sun light. The actions proposed for this project have some potential to increase light and expose bare soil after thinning occurs, which has been shown to increase invasive plant colonization (Nelson et al., 2008).

With the limited amount of current seed source in the project this proposal has **low to moderate risk** of introducing or increasing invasive plants.

2. Cumulative Effects

Based on the limited potential for direct or indirect effects it is anticipated that there would be **low to moderate risk** of increasing cumulative effects on the spread of invasive plant species within the project.

VI. PROJECT DESIGN CRITERIA FOR BOTANICAL RESOURCES

Resource Type	Project Design Criteria	Objective	Where Applicable	Reference
Sensitive Vascular Plants	Layout aggregated retention zones or skips in areas where *Bensoniella oregana* was found. A buffer of 100 foot radius from the edge of each population is recommended.	Protect existing known sites of the sensitive plant *Bensoniella oregana* by avoiding direct trampling, maintaining coarse woody debris for moisture retention and maintaining the current amount of shade to light ratio.	Units 007, 314, 318, 319 and 326. See map in Attachment B for details.	Draft Conservation Assessment for Bensoniella oregana, J. Ferriel, 2005; Management Recommendations for Bensoniella -Version 2.0; R. Holmes and L. Hoover; 1998.
Sensitive Vascular Plants	Populations of *Bensoniella oregana* found within the road prizm will be flagged prior to implementation of the project. No equipment or vehicles should be parked or driven within the flagged areas.	Protect existing known sites of the sensitive plant *Bensoniella oregana* by precluding any direct trampling of individuals or a population.	Road 5000-448. See map in Attachment B for details.	Draft Conservation Assessment for Bensoniella oregana, J. Ferriel, 2005; Management Recommendations for Bensoniella -Version 2.0; R. Holmes and L. Hoover; 1998.
Sensitive Vascular Plants	The site of *Bensoniella oregana* in unit 326 intersects with a proposed new road. The proposed new road should be moved further to the north of the buffer area.	Protect existing known sites of the sensitive plant *Bensoniella oregana* by avoiding direct trampling, maintaining coarse woody debris for moisture retention and maintaining the current amount of shade to light ratio.	Proposed new road intersection with existing road in Unit 326. See map in Appendix B for details.	Draft Conservation Assessment for Bensoniella oregana, J. Ferriel, 2005; Management Recommendations for Bensoniella -Version 2.0; R. Holmes and L. Hoover; 1998.
Sensitive Fungi	Avoid thinning below 40% canopy cover with 60% or above preferred. Use dispersed retention with random aggregate retention or skips as outlined in the Silviculture Report for this project.	Allow for continued and future ectomycorrhizal colonization of remaining trees post-thinning.	Throughout the project areas.	Luoma et. al. 2004: Response of ectomycorrhizal fungus sporocarp production to varying levels and patterns of green-tree retention.
Sensitive Fungi	Maintain down wood in all stages of decay across forested landscapes.. Following the current forest standards should meet this criteria.	Many fungal species are associated with larger down woody material in advanced stages of decay. Allows for future saprophytic fungi colonization by retaining as much downed large wood as possible.	Throughout the project areas.	R. Huff and K. Cushman, 2007; Conservation Assessment for Fungi Included in Forest Service Regions 5 and 6 Sensitive and BLM California, Oregon and Washington Special Status Species Programs.
Sensitive Fungi	Maintain all larger well decayed logs during stand treatments.	In younger stands, following disturbance or harvest, the presence of large, well decayed down wood legacy can provide habitat for both ectomycorrhizal and wood-decay fungi, as well as plant seedlings. For some fungi, spore dissemination into disturbed areas is the primary method of re-establishment. Following forest standards should meet this criteria.	Throughout the project areas.	R. Huff and K. Cushman, 2007; Conservation Assessment for Fungi Included in Forest Service Regions 5 and 6 Sensitive and BLM California, Oregon and Washington Special Status Species Programs.
Invasive Plants	Depending upon funding availability collect KV funds to monitor and treat invasive species within the Planning Area for up to 5 years after completion of the project.	Avoid larger scale infestations by monitoring and treating invasive plants as soon as they are discovered within the Planning Area after work is complete.	Throughout the project areas.	

Resource Type	Project Design Criteria	Objective	Where Applicable	Reference
Invasive Plants	Before entering RRSNF lands the contractor is required to clean the undercarriage, tires, wheels and other parts of off-road equipment to prevent the spread of seed from off forest areas. When leaving RRSNF to work in other areas the contractor should clean vehicles again before returning to work on this project.	Prevent the introduction of invasive plant seed into the Planning Area from other projects that the contractor has worked on in the recent past.	Throughout the project areas.	Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, Record of Decision; 2005.
Invasive Plants	Use locally collected native grass seed for erosion control, wildlife seeding and invasive plant abatement.	Prevent the inadvertent establishment of non-native grass species into the project area.	Throughout the project areas.	Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, Record of Decision; 2005.
Invasive Plants	Use only certified weed free straw/mulch if needed for erosion control or other purposes during road construction.	Prevent the inadvertent establishment of non-native grass species into the project area.	Throughout the project areas.	Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, Record of Decision; 2005.
Invasive Plants	All rock sources for road work/construction must first be inspected by a botanist on the district to ensure they are weed free before being used.	Prevent the inadvertent dispersal of invasive plant seed into the project areas.	Throughout the project areas.	Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, Record of Decision; 2005.

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ATTACHMENT A

Complete Table of Current Threatened, Endangered, Sensitive, Strategic, and Survey and Manage Vascular Plant (118 species), Lichen (47 species), Moss (34 species), Liverwort (13 species) and Fungi (189 species) Species Documented or Suspected (Total=401 species) to Occur on the Rogue River-Siskiyou National Forest (RRSNF). List is from the Region 6 Regional Forester/ Interagency Special Status and Sensitive Species Program, Jan. 2008 and the Survey and Manage Settlement Agreement, July 2011.

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
VASCULAR PLANTS					
Adiantum jordanii (California maidenhair fern)	Sensitive	Documented	Growing under myrtle-wood along intermittent stream banks, moist draws and within moist rocky crevices. Elevations less than 3600 feet. Known from about 22 occurrences along the Lower Rogue and Lower Umpqua river canyons of OR; very common in CA.	No Impact	No suitable habitat within the Planning Area. Outside the necessary plant association.
Allium bolanderi var. bolanderi (Bolander's onion)	Strategic	Documented	Rocky clay soils including serpentine; < 1000 m (3280 ft.).	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Arabis macdonaldiana (Macdonald's rockcress)	Endangered	Documented	On barren to shrub covered rocky serpentine soil and Jeffrey pine woodlands at 500 to 4,000 ft elevation. Range is confined to the heavily serpentinized bands of soil located along the far western portion of the CA/OR border within/near the Kalmiopsis Wilderness S to Red Mtn, CA.	No Effect	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Arabis modesta (Rogue canyon rockcress)	Strategic	Documented	Deep soil on steep slopes, cliffs, shaded canyon ledges; 150–500 m (500-1,600 feet). Restricted range-Rogue Canyon in Josephine Co., near Provolt, Jackson Co.; Siskiyou Co., CA.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Arabis suffrutescens var. horizontalis (Crater Lake rockcress)	Sensitive	Suspected	Peaks in the High Cascades on gravelly or stony slopes and dry pumice at 5500 to 8200 feet.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Arctostaphylos hispidula (Gasquet or Howell's manzanita)	Sensitive	Documented	Dry rocky ridges and gravelly soils, often on serpentine. Shrub communities or sparse forest, often growing with *A. columbiana*. Curry, Douglas and Josephine Cos., OR; south to Sonoma Co., CA.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Arnica viscosa (Shasta arnica)	Sensitive	Suspected	Open, rocky, subalpine to alpine sites in the high Cascades of S. Oregon and N. California; 2000–2500 m (6500 to 8500 feet).	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Asplenium septentrionale (grass-fern)	Sensitive	Documented	On rock outcrops mostly consisting of breccia tuff materials; in the Cascades at mid to high elevations.	No Impact	No suitable habitat within the Planning Area. Necessary geologic formations lacking.
Bensoniella oregana (Oregon bensonia)	Sensitive	Documented	Seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Range is restricted to the Coast and Siskiyou Mountains In extreme SW Oregon and NW California. Elevations 2,800 to 5,200 feet.	MIIH	May impact individuals or habitat, not likely to contribute toward federal listing. Sites found in units 007, 314, 318, 319, 326 and road 5550-448.
Botrychium minganense	Survey and Manage Category A	Suspected	Meadows, open forest along streams or around seeps; 1500–3100 m. Not known from the Siskiyou or Coast Mts., only suspected on High Cascades RD.	N/A	This project is outside the expected range for this species.
Botrychium montanum	Survey and Manage Category A	Suspected	Shady conifer woodland, especially under *Calocedrus* along streams; 1500–2100. Not known from the Siskiyou or Coast Mts, only suspected on High Cascades RD.	N/A	This project is outside the expected range for this species.
Botrychium pumicola (pumice grape-fern)	Sensitive	Suspected	Grows in deep pumice soils created by the eruption of Mt. Mazama. Mostly restricted to within or near Crater Lake in the high Cascades mountains of Oregon.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.

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Calachortus howellii (Howell's mariposa lily)	Sensitive	Documented	Serpentine soil, dry rocky slopes. Low to middle elevations, often on *Ceanothus cuneatus* covered slopes or in open Jeffrey pine stands. Restricted to the Illinois River Valley in Josephine County, Oregon.	No Impact	No suitable habitat within the Planning Area. This species has a narrow range confined to the Illinois Valley.
Calachortus nudus (Shasta star-tulip)	Strategic	Suspected	Moist, grassy areas, lake, bog margins; 1200–2500 m. Restricted to the eastern portion of the Klamath-Siskiyou Mountains in Oregon and California.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Camassia howellii (Howell's camas)	Sensitive	Documented	Dry, open serpentine slopes. Confined to an area east of I-5 between Sexton Mtn. and Merlin with a few outlying populations.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Camissonia graciflora (slender-flowered evening-primrose)	Sensitive	Documented	Open or shrubby slopes, grasslands, oak woodlands, less than 4500 feet. Eastern Siskiyou Mts. In Oregon down through California into Baja.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Carex abrupta (abrupt-beaked sedge)	Sensitive	Suspected	Moist meadows, open forest; fields and roads, above 4,000 feet. West Cascades, Blue Mts., and Northern Basin; not known from Siskiyou or Coast Mts.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Carex capitata (capitate sedge)	Sensitive	Suspected	Wet meadows and bogs at high elevations. High Cascades and Great Basin; not expected in Siskiyou or Coast Mts.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Carex comosa (bristly sedge)	Sensitive	Suspected	Swamps and marshes and other wet places; sea level to 1,200 feet. Patchy distribution throughout N. America.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Carex crawfordii (Crawford's sedge)	Sensitive	Suspected	Seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Range is restricted to the Coast and Siskiyou Mountains In extreme SW Oregon and NW California. Elevations 2,800 to 5,200 feet.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Carex gynodynama (hairy sedge)	Sensitive	Documented	Moist meadows, open forests, seeps. Found in the Coast Range and Klamath-Siskiyou Mts. from Coos County, Oregon to Monterrey County California.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Carex klamathensis (Klamath sedge)	Sensitive	Documented	Serpentine wetlands/Darlingtonia bogs at 1,300 to 1,800 feet. Restricted to Josephine County, Oregon w/isolated disjunct population near Redding, CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Carex nervina (Sierra nerved sedge)	Sensitive	Documented	Moist to wet places, often shaded, 3,600 feet and higher. East Klamath-Siskiyou Mts. and Sierra Nevada Mts.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Carex scabriuscula (Siskiyou sedge)	Sensitive	Documented	Wet serpentine areas above 2,800 feet in the Coast Range and 5,000 feet for inland ranges. Open and sunny sites w/little cover. Northern Klamath-Siskiyou Mts. south to Mt. Eddy California.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Carex serratodens (saw-tooth sedge)	Sensitive	Documented	Moist meadows and rocky places near streams and seepages, frequently on, but not limited to serpentine soils; below 6,000 feet. Douglas, Jackson and Josephine Counties, Oregon; also found in the Sierra Nevada and Coast Ranges of California.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Castilleja schizotricha (split-hair paintbrush)	Sensitive	Documented	On decomposed granite or marble, 5,000-6,000 feet, north aspects, in red-fir forest. Siskiyou crest in Jackson and Josephine Counties and south into the Red Buttes Wilderness.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cheilanthes covillei (Coville's lip-fern)	Sensitive	Documented	Rock crevices, base of rocks, rocky slopes, sun to shade. West Cascades in Jackson Co.; also occurs in CA, NV, UT and AZ.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cheilanthes intertexta (coastal lip-fern)	Sensitive	Suspected	Rock crevices, foothills to mid-montane. Current known sites in Oregon on andesite. Klamath Mtns. In Douglas and Jackson Cos., OR. Also occur in CA and NV.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Chlorogalum angustifolium (narrow-leaved	Sensitive	Suspected	Open dry places, heavy soils in meadows and woodlands below 1,500 ft. 3 sites in Jackson and Josephine Cos., OR, more	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this

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amole)			common in CA.		species.
Cicendia quadrangularis (timwort)	Sensitive	Documented	Open places, vernally wet meadows; oak savannah. Klamath Mts., Columbia Basin, Wiillamette Valley. Also Sierra Nevada foothills and Coast Range CA; western S. America.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cimicifuga elata (tall bugbane)	Sensitive	Documented	In SW OR mostly found in open canopied ABCO and PSME forests at mid to upper elevations (4,300-5,400 ft.) on north facing cool slopes. BC to SW OR in the West Cascades and East Siskiyou Mts.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Clintonia andrewsiana (Andrew's bead-lily)	Strategic	Suspected	Found on alluvial terraces within 2nd growth and old growth redwood forests. Known sites in OR are historical as the species is now considered extirpated.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Collomia mazama (Mt. Mazama collomia)	Sensitive	Documented	Open woods, wet meadows, road cutbanks generally above 9,000 ft. but found between 4,500-6,000 ft. on the Rogue-Umpqua divide. Southern Cascades in Douglas, Jackson and Klamath Cos.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Coptis asplenifolia (fernleaf goldthread)	Survey and Manage Category A	N/A- not suspected on the RRSNF	Moist, coniferous forests, seeps, and bogs; 0-1500m; B.C.; Alaska, Wash.	N/A	No suitable habitat within the Planning Area. Not known in OR.
Coptis trifolia (three leaf goldthread)	Survey and Manage Category A	N/A- not suspected on the RRSNF	Wet to mesic, coniferous and mixed forests, bogs, willow scrub, and tundra, often associated with mosses; 0-1500m	N/A	No suitable habitat within the Planning Area. Only in northern OR.
Corydalis aquae-gelidae (coldwater fumewort)	Survey and Manage Category A	N/A- not suspected on the RRSNF	Seeps, springs or streams with relatively cold water, a substrate of gravely sand, upper level canopy closure of 70 to 90 percent, and little herbaceous competition. Sites are between 370 m (1200 ft) and 1310 m (4260 ft) in elevation. Along the crest of the Cascades as far south as the Willamette NF.	N/A	No suitable habitat within the Planning Area. Only extends south as far as the Willamette NF in the Cascades.
Cryptantha milo-bakeri (Milo-baker's cryptantha)	Sensitive	Documented	Rocky or gravelly slopes, generally coniferous forests below 4,500 feet.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cupressus bakeri (Baker's cypress)	Sensitive	Documented	Dry forested, brushy or open slopes, usually rocky ground or serpentine soils at 3,800 to 6,000. West Cascades and East Siskiyou Mts. south to the Sierra Nevada.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cyperus acuminatus (short-pointed cypress)	Sensitive	Suspected	Edges of ephemeral pools, ponds, streams or ditches, below 1,200 ft. Klamath Mts. and Willamette Valley in OR. Also in WA, MT, CA, TX.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cypripedium fasciculatum (clustered lady's slipper)	Sensitive & Survey and Manage Category C	Documented	Open coniferous forest, sometimes with Pacific dogwood on north facing slopes and elevations 1,000-3,500 ft.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cypripedium montanum (mountain lady's slipper)	Survey and Manage Category C	Documented	Mesic to dry (rarely wet) coniferous, deciduous, and broadleaf evergreen forests, openings, and thickets, around shrubs on open slopes; 0--2400 m; Alta., B.C.; Alaska, Calif., Idaho, Mont., Oreg. (Cascade and Siskiyou Mts.), Wash., Wyo.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Delphinium nudicaule (red larkspur)	Sensitive	Documented	Talus and well drained gravelly soils or rocky slopes. Jackson and Josephine Cos., OR; common in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Dicentra pauciflora (few-flowered bleedingheart)	Sensitive	Documented	High elevation on rocky to gravelly soils. Josephine Co., OR south to the Sierra Nevada in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Draba howellii (Howell's whitlow-grass)	Sensitive	Documented	Granitic north facing rock crevices, above 4,000 feet. Restricted to the Klamath-Siskiyou Mts. in SW OR and NW CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Epilobium oreganum (Oregon willow-herb)	Sensitive	Documented	Darlingtonia fens and other wet serpentine areas at low elevations. Josephine Co., OR; CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Epilobium siskiyouense (Siskiyou willow-	Sensitive	Documented	Boulder fields, rock crevices and rocky slopes on serpentine soils at 5,500 to 8,200 feet. Jackson and Josephine Cos., OR;	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this

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herb)			Siskiyou and Trinity Cos., CA.		species.
Ericameria arborescens (goldenfleece)	Sensitive	Documented	In OR occurring in openings of PSME/LIDE forest; disturbance and fire are necessary for germ. 1,200-2,700 ft. Known from 6 sites in Curry Co., OR; abundant in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Erigeron cervinus (Siskiyou daisy)	Sensitive	Documented	In rocky places or crevices on solid rock. Also in open areas, medium to high elevations and sometimes glaciated areas. River and stream banks at lower elevations, usually near seeps or vernally wet areas. Siskiyou Mts. of Curry and Josephine Cos., OR and Trinity, Del Norte and Siskiyou Cos., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Erigeron petrophilus (cliff daisy)	Sensitive	Documented	High elevation serpentine slopes and cliffs. Jackson and Josephine Cos., OR; CA Klamath and Coast Range.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Eriogonum lobbii (Lobb's buckwheat)	Sensitive	Documented	Gravelly ridges and talus slopes at moderate to high elevations. Not generally found on serpentine soils. Curry and Josephine Cos., OR; more common in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Erythronium howellii (Howell's adder's-tongue)	Sensitive	Documented	Open woods, often on serpentine or in ecotonal areas. Illinois Valley OR south to Trinity Mts. in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Eschscholzia caespitosa (gold poppy)	Sensitive	Suspected	Dry flats and brushy slopes below 3,500 feet. Josephine and Douglas Cos., OR. Throughout CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Eucephalis vialis (wayside aster)	Sensitive & Survey and Manage Category A	Documented	Coniferous forest at elevations of 152 to 457 m (500 to 1,500 ft). Typically the species occurs on dry, upland sites dominated by P. menziesii. Interior valley species ranging from Linn Co., OR to Del Norte Co., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Frasera umpquaensis (Umpqua swertia)	Strategic	Documented	Open woods or at edges of meadows. In mid to upper elevation true fir dominated forests or mixed conifer forests (4,000 to 6,000 feet). Rogue-Umpqua divide with small disjunct pops. Into Trinity Co., CA.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Fritillaria gentneri (Gentner's fritillary)	Endangered	Documented	Open, dry low elevation sites in mixed oak-madrone woodlands, ponderosa pine woodlands, chaparral, and grasslands 1,000 to 5,000 ft. Often found on ecotones. Jackson and Josephine Cos., OR; Siskiyou Co., CA.	No Effect	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Galium kamtschaticum (boreal bedstraw)	Survey and Manage Category A	N/A- not suspected on the RRSNF	Moist, cold, coniferous forests in the silver fir or mountain hemlock plant associations, in wet canopy gaps. Northerly aspects, from 643-967 m (1930-2900 feet) in elevation. Circumboreal; in PNW AK to WA Cascade Range, does not extend south of Snoqualmie Pass	N/A	No suitable habitat within the Planning Area. Not known or suspected in Oregon.
Gentiana newberryi (Newberry's gentian)	Sensitive	Suspected	Sub-alpine wet meadows between 3,500 and 6,500 ft. Central Cascade's OR south through the Sierra Nevada in CA and NV.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Gentiana plurisetosa (elegant gentian)	Sensitive	Documented	Wet mountain meadows on granitic soils, 3,900 to 6,200 feet. Josephine Co., OR; Siskiyou, Trinity and Del Norte Cos., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Gentiana setigera (Waldo gentian)	Sensitive	Documented	Serpentine wet meadows and Darlingtonia bogs, seeps on slopes at elevations below 3,800 feet.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hackelia bella (beautiful stickseed)	Sensitive	Suspected	Stream banks, roadsides, open slopes, forest openings 3,000 to 6,000 feet. Klamath Mts. and w Cascades Jackson Co., OR; NCA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hastingsia bracteosa var. atropurpurea (purple flowered rush-lily)	Sensitive	Documented	Wet meadows, rocky seeps, serpentine Darlingtonia fens at lower elevations. Illinois Valley Josephine Co., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hastingsia	Sensitive	Documented	Wet meadows, rocky seeps, serpentine	No Impact	No suitable habitat within the Planning Area. The

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bracteosa var. bracteosa (large flowered rush-lily)			Darlingtonia fens at lower elevations. Illinois Valley Josephine Co., OR.		project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hieracium horridum (shaggy hawkweed)	Sensitive	Suspected	Rocky places, crevices; 1350–3300 m; OR, CA & NV. High Cascades, Sierra Nevada.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Horkelia hendersonii (Henderson's horkelia)	Sensitive	Documented	Dry granitic flats and rubbly talus slopes 6,000 to 7,000 feet. Known from Mt. Ashland in OR; and from one location in Siskiyou Co., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Horkelia tridentata ssp. tridentata (three-toothed horkelia)	Sensitive	Documented	Dry, open coniferous forest on granitic or igneous soils, 1,000 to 8,000 feet. Ashland area only in OR; Sierra Nevada, Cascade Range and Modoc Plateau in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Iliamna latibracteata (California globe-mallow)	Sensitive	Documented	Moist sites, stream sides in coniferous forests. Often in open or partial shade, disturbed ground, often recently burned. Elevation 300-4000 ft. Coos, Curry, Douglas, Jackson and Josephine Cos., OR; south to Humboldt Co., CA.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Keckiella lemonii (bush beardtongue)	Sensitive	Documented	Rocky slopes, coniferous and mixed forests, chaparral, 600-6000 feet. Klamath Mts. in Jackson and Josephine Cos., OR; CA, NV more common.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lewisia leana (Lee's lewisia)	Sensitive	Documented	Rocky or gravelly ridges or benches at higher elevations, often on serpentine soils. Klamath Mts. in Curry, Josephine, Douglas and Jackson Cos., OR; south to Fresno Co., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lillium kelloggii (Kellogg's lily)	Strategic	Suspected (previously extant at historical populations that cannot be relocated)	Gaps and openings usually created by disturbance events; redwood forests, brushfields and roadsides. <3,500ft. Currently thought to be extirpated in OR; more common in N CA, Del Norte and Humboldt Cos.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Limnanthes floccosa spp. bellingeriana (bellinger's meadow foam)	Sensitive	Documented	Vernal meadows/pools in full sun, basalt scablands 1,000-4,000ft. Jackson and Klamath Cos., OR; Shasta Co., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Limnanthes gracilis var. gracilis (slender meadow foam)	Sensitive	Suspected	Vernally wet meadows and stream edges, valleys and foothills, sometimes serpentine soils, <2,500 ft. Douglas and Josephine Cos., OR, particularly the Illinois Valley.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lomatium cookii (Cook's lomatium)	Endangered	Suspected	Alluvial silt or clay deposits over serpentine bedrock, alluvial meadows, moist grasslands and along seasonal streams restricted to the Rogue and Illinois Valleys of Jackson and Josephine Cos., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lomatium engelmanii (Englemann's desert parsley)	Sensitive	Documented	Gravelly serpentine slopes in coniferous forest and open areas at mid to high elevations (3,000-6,000). Siskiyou Mts. Josephine Co., OR; Siskiyou & Trinity Cos., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lotus stipularis (stipuled trefoil)	Sensitive	Documented	Open forest, stream beds, ditches, chaparral and logged areas below 4,000 ft. Josephine Co., OR; throughout CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lupinus lepidus var. ashlandensis (Mt. Ashland lupine)	Sensitive	Documented	Sub-alpine, dry, gravelly openings on granitic soils in full sun at or near ridges (>7,000ft.). Known from one pop. on Mt. Ashland, Jackson Co., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lupinus tracyi (Tracy's lupine)	Sensitive	Documented	Dry openings, edges of forest, open woods, on granitic and metavolcanic soils at mid to high elevations. Known from a few sites in the Siskiyou Mts of Curry and Josephine Cos., OR; Siskiyous in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Meconella oregana (white fairy poppy)	Sensitive	Suspected	Vernally moist meadows and seeps on serpentine and/or gravelly/sandy soils. BC continuing south to the east Cascades to central California w/spotty populations occurring.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.

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Mimulus bolanderi (Bolander's monkeyflower)	Sensitive	Documented	Burns, openings in chaparral (especially *Ceanothus cuneatus* brush fields) & disturbed areas 1,000-2,500ft.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Mimulus congdonii (Congdon's monkeyflower)	Sensitive	Suspected	Oregon white-oak, wedgeleaf ceanothus and whiteleaf Manzanita chaparral 1,000-3,000ft. Applegate Valley in OR; Sierra foothills and Coast Range in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Monardella purpurea (Siskiyou monardella)	Strategic	Documented	Rocky, open serpentine scrub forest, chaparral, woodlands and montane forest, 1,400-4,000ft. Curry, Jackson and Josephine Cos., OR; to central CA in Coast Range and Klamath Mts.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Navarretia leucocephala ssp. leucocephala (white flowered navarettia)	Sensitive	Suspected	Vernal pools; < 2100 m. OR and CA interior valleys.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Nemacladus capillaris (slender nemacladus)	Sensitive	Suspected	Dry slopes, burned areas, volcanic outcrops; 400–2100 m. Jackson Co. OR; more common throughout CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Ophioglossum pusilum (Adder's tongue)	Sensitive	Suspected	Open fens, wet meadows, marsh edges, grassy shores, pastures and roadside ditches. Occurs sporadically throughout the PNW spread across to the East Coast.	No Impact	No suitable habitat within the Planning Area.
Pellaea andromedifolia (coffee fern)	Sensitive	Suspected	Rocky dry areas, rock crevices and under boulders often on steep slopes. S OR to Baja CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Pellaea mucronata ssp. mucronata (bird's foot fern)	Sensitive	Suspected	Rocky dry areas, all elevations. Josephine and Jackson Cos., OR; CA, NV and Mexico.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Perideridia erythrorhiza (red rooted yampah)	Sensitive	Documented	Vernally moist depressions in heavy, poorly drained soils. Oak and Pine woodlands at low to mid elevations in the Cascades, serpentine habitats in the Siskiyous. Douglas, Klamath, Josephine & Jackson Cos., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Phacelia leonis (Siskiyou phacelia)	Sensitive	Documented	Rocky to sandy openings in coniferous forests. Ultramafic soils 3,900 to 6,500ft. Josephine Co., OR; Klamath Mts. CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Pinus sabiniana (gray pine)	Strategic	Documented	Dry foothills on the west slope of the Sierra Nevada, and in the coast ranges, nearly ringing the Central Valley of California; 30--1900m. Handful of populations in OR that may be from cultivation.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Pilularia americana (American pillwort)	Sensitive	Suspected	Vernal pools, mud flats, lake margins, reservoirs. Rare throughout OR, CA and central and SE USA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Plagiobothrys figuratus ssp. corallicarpus (coral seeded allocarya)	Sensitive	Suspected	Vernally moist, rocky, open areas in grassland meadows. Jackson and Josephine Cos., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Plagiobothrys greenei (Greene's popcorn flower)	Sensitive	Suspected	Vernally wet areas, and along trails and roads. Jackson and Josephine Cos., OR; CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Platanthera orbiculata var. orbiculata (lesser round-leaved orchid)	Survey and Manage Category A	N/A- not suspected on the RRSNF	Mesic to wet coniferous and deciduous forest, fen forest; 0--1500 m. Not currently known in OR. Mostly in Canada extending down into WA and ID on the west coast.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Poa rhizomata (timber bluegrass)	Sensitive	Suspected	Dry Douglas-fir and Ponderosa pine forest. Known from a handful of sites in Jackson and Lane Cos., OR; Trinity and Siskiyou Cos., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Polystichum californicum (California sword-fern)	Sensitive	Suspected	Creek banks and canyons in redwood and mixed evergreen forests, rocky open slopes to 3000 ft. Known from a few disjunct pops. In Douglas, Linn, Curry and Coos Cos., OR; common in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
Rafinesquia californica (California chicory)	Sensitive	Suspected	Open sites in scrub, woodland; often common after fire; 100–1500 m, rare in OR, common throughout CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Rhamnus illicifolia (redberry)	Sensitive	Documented	Chaparral and oak woodlands below 5,000ft. Jackson Co., OR; common in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Rhynchospora capitellata (brownish beakrush)	Strategic	Suspected	Moist to wet meadows, swales, seeps, stream banks, flatwoods, fens, and bogs; 0–1600 m. Known from 1 site in a Sphagnum bog near Brookings, OR; scattered sites across continental US.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Ribes divaricatum var. pubifloroum (straggly gooseberry)	Sensitive	Suspected	Coastal bluffs, forest edges; 5–1485 m. Known from a handful of sites along the lower Rogue River in OR; more common in CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Romanzoffia thompsonii (Thompson's mistmaiden)	Sensitive	Documented	Sunny vernally wet, mossy (esp. *Bryum miniatum*), rocky hillsides at 750-6,000ft. Douglas, Jackson, Lane, Linn, Marion Cos., in foothills and west Cascades of OR	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Rorippa columbiae (Columbia cress)	Sensitive	Suspected	Wet seasonal inundations in riparian, lakeshore, vernal pool, ditch and playa habitats from near sea level to 5,300 ft. PNW endemic. Only 11 known pops.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Saxifragopsis fragariodes (joint-leaved saxifrage)	Sensitive	Documented	Rocky crevices, often in rock gardens, 4500 to 9000 ft. Curry and Josephine Cos., OR; CA & WA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Scheuzeria palustris var. americana (American scheuzeria)	Sensitive	Documented	Floating mats, bogs, lake margins 1400–2000 m. CA to Alaska, e N. America.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Schoenoplectus subterminalis (water clubrush)	Sensitive	Documented	Quiet relatively shallow water. Lakes, ponds, marshes. Scattered in CA and OR to AK and east NE Canada and many eastern states.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Scirpus pendulus (drooping bulrush)	Sensitive	Documented	Marshes and wet meadows, river terraces, ditches, 2500 to 3000 ft. Clackamas, Curry, Jackson, Josephine, Linn and Marion Cos., OR; one site in CA near Yreka.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Sedum moranii (Rogue River stonecrop)	Sensitive	Documented	Rock outcrops in lower canyons. Found on greenstone outcrops on west or southwest slopes. Rogue River Canyon, Josephine Co., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Sidalcea malachroides (maple-leaved sidalcea)	Strategic	Suspected	Mostly within the range of Redwoods. Occurs in disturbed areas and clearings along the coast below 2,000 ft. Coastal northern CA. Two historic sites in Oregon are no longer extant.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Sidalcea malviflora ssp. patula (coast checker bloom)	Sensitive	Documented	Coastal. Open woodlands, openings within mixed forests, meadows, or grassy places at low elevations. Often serpentine. From Coos Co. OR south to Humboldt Co. CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Silene hookeri ssp. bolanderi (Bolander's catchfly)	Sensitive	Documented	Oak woodland rocky knolls and slopes, often on serpentine, below 5,000 ft. Josephine Co., OR; NW CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Silene serpentinicola (serpentine catchfly)	Strategic	Suspected	Serpentine soils, chaparral, conifer forest; 100–800 m. Klamath Range CA.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Solanum parishii (Parish's horse-nettle)	Sensitive	Documented	Chaparral, oak/pine woodlands, meadows and brush fields in dry PSME or QUGA communities. Jackson, Josephine Cos., OR; south to Baja.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Sophora leachiana (western sophora)	Sensitive	Documented	South or west facing slopes on disturbed open, sunny habitat. Mixed conifer hardwood vegetation. Endemic to small area in Josephine Co., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Streptanthus glandulosus	Sensitive	Suspected	Serpentine or metamorphic (Franciscan formation), rocky, gen barren slopes,	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
(common jewel flower)			chaparral openings, steep woodland; 150–1400 m. OR and CA.		distribution and/or the known elevation range of this species.
Streptanthus howellii (Howell's streptanthus)	Sensitive	Documented	Dry rocky serpentine slopes in open conifer/ hardwood forests from 1000 to 4500 ft. SW OR, NW CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Tauschia howellii (Howell's tauschia)	Sensitive	Documented	Dry exposed ridges in gravelly granitic and serpentine flats, in coniferous forests at high elevations (6,600-7,100 ft). Jackson Co., OR; Siskiyou Co., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Trillium angustipetalum (Siskiyou trillium)	Sensitive	Documented	Coniferous forest, woodland, and chaparral at low to mid elevations. Lower Rogue canyon Curry Co., OR; sporadically through CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Utricularia minor (lesser bladderwort)	Sensitive	Documented	In ponds or bogs in shallow, standing or slow moving water. Circumpolar in distribution. Several counties in OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Viola primulifolia ssp. occidentalis (western bog violet)	Sensitive	Documented	Serpentine Darlingtonia fens at lower elevations. Curry and Josephine Cos., OR; Del Norte Co., CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Wolffia columbiana (Columbia water-meal)	Sensitive	Suspected	Free floating in quiet water. Widely distributed throughout N. America.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Zigadenus fontanus (small-flowered death camas)	Sensitive	Suspected	Dry, open to partial shade, on south-facing slopes and ridgelines.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
MOSSES					
Andreaea schofieldiana	Sensitive	Documented	Forming mats on dry and exposed to moist, shaded igneous rocks, montane to subalpine. Endemic to the Pacific Northwest. Southwestern British Columbia to Siskiyou and Del Norte counties, California.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Anomobryum julaceum	Strategic	Suspected	Earth cliff crevices, on tussock tundra with seeps and late snow melt areas, and on granitic outcrops. Widespread in the temperate regions of the Northern and Southern Hemispheres.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Brotherella roellii	Survey and Manage Category E	N/A- not expected on the RRSNF	Forms small glossy, golden yellow-green mats on rotten logs, stumps and the bases of red alder (Alnus rubra) trees in mixed low elevation deciduous and coniferous forest edges, usually in floodplains. Endemic to the Pacific Northwest, known only from SW BC and WA.	N/A	Not expected in Oregon.
Bruchia bolanderi	Strategic	Documented	Found ephemerally in the subalpine zone in montane wet meadows and along moist stream banks in the Cascade Range between 3500 and 5000 feet.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Bryum calobryoides	Sensitive	Documented	Forming sods or occurring as individuals among other mosses, on both acid and basic rocks and soil in shaded to exposed boulder fields, montane to alpine meadows, cliffs, and outcrops. Elevations range from 3,000 to 7,000 feet.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Buxbaumia aphylla	Strategic	Suspected	A pioneer on dry, mineral-poor soil (sandy, pumice, or clayey) and well-decayed wood, in exposed to shaded sites in forests, cutbanks of trails and roads, and recovering burns. Mostly 4,000 to 6,000 in the high Cascades.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Codriophorus depressus	Sensitive	Suspected	Forming mats on rocks in perennial or intermittent streams, and in the spray zone of waterfalls, between 400 and 11,000 feet elevation. Habitats are subject to scour at high water.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Codriophorus rysyzardii	Strategic	Suspected	Shaded, moist rocks and cliffs along shady streams or in forests, often in the splash zone, but never aquatic 1000-6000 feet; PSME, TSHE, PISI forests. Endemic to northwestern North America, from Alaska to Oregon.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.

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Didymodon norrisii	Strategic	Suspected	Rock outcrops, calcareous and volcanic boulders, fields, and cliffs in runoff areas, in low to moderate elevations (200-1500 m). Endemic to Western North America. Known only from CA, OR (Jackson Co.) and BC.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Encalypta brevicollis	Sensitive	Documented	On soil in shaded crevices in igneous rocks, along ridge tops with frequent fog penetration. Curry Co., OR; historic sites in WA; throughout Canada.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Encalypta brevipes	Sensitive	Documented	Soil on ledges and in crevices on cliffs, reported from both igneous and siliceous substrates (Horton 1983; Hedderson and Brassard 1992). Sites may be subject to frequent fog penetration. Circumboreal. In the Pacific Northwest known from Alberta, British Columbia, Washington, and Oregon.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Entosthodon fasicularis	Sensitive	Suspected	Occurring as individual plants or forming small sods on seasonally wet, exposed soil in seeps or along intermittent streams. It is usually hidden among grasses, other mosses, and litter. Habitats known to the author and described by McIntosh (2005) are grassland, oak savanna, grassy balds, and rock outcrops.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Grimmia anomala	Strategic	Documented	Forming small cushions on igneous or serpentine rocks, shaded or in crevices of exposed rocks, 4000-7000 ft. Circumboreal occurring in several states.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Helodium blandowii	Sensitive	Documented	Forming mats and small hummocks in medium to rich montane fens with calcareous groundwater. Circumboreal, extending south in the Cascade Range and Sierra Nevada to California.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hygrohypnum alpinum	Strategic	Documented	Irrigated emergent, acidic rocks in montane streams; low to moderate elevations, 200--850 m ; B.C.; Alaska, Calif., Oregon, Idaho, Montana, Washington; Europe	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Iwatsukiella leucotricha	Survey and Manage Category B	N/A- not expected on the RRSNF	Trunks and branches of conifers and occasionally on alder trees along exposed, higher elevation coastal ridges in Washington and Oregon. Globally this species occurs in Japan and adjacent eastern Asia. In the Pacific Northwest it is known from the coastal areas of Alaska, British Columbia, and Oregon.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Meesia uliginosa	Sensitive	Documented	Forming turfs in medium to rich montane fens 5000-6000ft. One of several species of so-called "brown mosses" that occur in mineral-rich fens. Circumboreal distribution.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Orthodontium gracile	Sensitive & Survey and Manage Category B	Documented	On boles of redwood trees in moist old growth or mature second growth forest. Within the range of redwoods from sw OR south to central coast CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Orthodontium pellucens	Sensitive	Documented	On boles of redwood trees in moist old growth or mature second growth forest. Within the range of redwoods from SW OR south to central coast CA.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Oxystegus tenuirostris	Strategic	Suspected	Occurs on damp to moist soil, soil over rock, peaty banks, humid cliffs, rarely on tree bases and logs that may be occasionally flooded. Sea level to sub-alpine. Widely distributed in the world but with very few sites in the Columbia Gorge in OR.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Pseudocalliergon trifarium	Sensitive	Suspected		No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Ptychostomum cyclophyllum	Strategic	Documented	Wet soil along the edge of ditches or among tree roots subject to inundation, wet seepage beside gravel runway, on silty-clay wet area of muskeg, on tundra. Widely distributed in world, only a few sites in OR from Jackson Co.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
Racomitrium aquaticum	Survey and Manage Category E		Occurs in Europe and Asia. Not known from N. America. See *Codriphorus rhyzardii* for this species in N. America.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Rhizomnium nudum	Sensitive & Survey and Manage Category B	Suspected	Occurs in coniferous forests in Oregon mostly at mid to high elevations. It is known from low-gradient riparian zones within old-growth stands of silver fir with scattered Shasta red fir (*Abies magnifica* var. *shastensis*). The understory is often very sparse.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Schistostega pennata	Sensitive & Survey and Manage Category A	Suspected	Moist lowland forest and in most crevices and caves. On mineral soil in shaded pockets of overturned tree roots.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Scouleria marginata	Strategic	Suspected	Occurs on bedrock material or very large boulders along the margins of perennial river systems. It is frequently submerged but is usually exposed during periods of low water flow. The rock material may be granitic or volcanic in origin but must be large enough so it would not be moved during turbulent floodwater events.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Splachnum ampulaceum	Sensitive	Suspected	Forming green sods on old dung of herbivores, or on soil enriched by dung, in peatlands or other wetlands. The sodden, decomposed dung would scarcely be visible, or may be completely humified.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Tayloria serrata	Sensitive	Documented	Forming green sods on old dung, rotten wood, or on soil enriched by dung on roadsides, trails, in dry to moist coniferous forest of various age classes including early seral, and in wetlands. Decomposed dung may be scarcely visible or completely humified.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Tetraphis geniculata	Survey and Manage Category A	N/A- not expected on the RRSNF	Inhabits well rotted stumps and logs in shaded, humid locations at low to mid elevations.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Thamnobryum neckeroides	Strategic	Suspected	Growning on rocks and trees, often in shaded, damp locations in mixed Doug-fir/western hemlock forest with *Acer macrophyllum* British Columbia, Idaho, Montana, Oregon, and Washington in PNW; world wide distribution but rare.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Tomentypnum nitens	Sensitive	Documented	Medium to rich montane fens where it favors slightly elevated sites such as logs, stumps, or hummocks formed by *Vacccinium uliginosum* and *Betula glandulosa*. Circumboreal.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Tortella fragilis	Strategic	Suspected	Calcareous cliffs from sea-level to alpine elevations. Widespread world distribution.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Tortula mucronifolia	Sensitive	Documented	On soil, tree roots, and sheltered ledges and crevices of rock outcrops and cliffs at 5,000-7,000ft. ABMAS/ABCO forest. Widely distributed throughout the Northern Hemisphere.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Triquetrella californica	Strategic	Suspected	On exposed to shaded soil, rocks, sand, or gravel in dry or moist situations. Reported from trails, roadsides, picnic areas, playgrounds, and rock outcrops from sea level to about 1,600 feet elevation, within 10 miles of the coast. Endemic to CA and OR, very rare globally.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
LIVERWORTS					
Anastrophyllum minutum	Strategic	Documented	On peaty soil at relatively high elevations (> 5,500' asl) in the *Tsuga mertensiana* zone. Can be found on ledges or at the base of cliffs. Circumboreal distribution.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Calypogeia	Sensitive	Documented	Usually restricted to poor fens containing	No Impact	No suitable habitat within the Planning Area. The

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
sphagnicola			*Sphagnum*. Also found in serpentine influenced Darlingtonia fens growing among other liverworts (Sphagnum not present).		project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cephaloziella spinigera	Strategic	Documented	Sphagnum bogs and fens at mid to high elevations. Widespread in boreal zone; very rare in OR w/only a few sites.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Chilocyphus gemmiparus	Sensitive	Documented	Found emergent to sub-emergent in clear cold montane streams flowing through meadows as well as forest. 5,000-7,000ft. Only 7 localities known, 5 of them are in Oregon.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cryptometrium tenerum	Sensitive	Documented	Forming small to locally extensive mats on bare, usually shaded and humid soil on hillsides, rock outcrops, and streambanks. In Oregon between sea level and 1000 feet elevation.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Diplophyllum plicatum	Sensitive & Survey and Manage Category B	Suspected	Tends to occur in either Western hemlock/Douglas-fir stands with western cedar present or Sitka Spruce older forests stands. It occurs in areas that sustain year-round cool habitats with high humidity which are fairly common along the immediate coast and in the Coast Range.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Herbertus aduncus	Survey and Manage Category E	N/A- not expected on the RRSNF	Found in cool, moist sites in a variety of forest types, often on moist cliffs in OR. More common in AK, BC and WA.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Harpanthus flotovianus	Strategic	Suspected	Sphagnum bog and fens at higher elevations in the montane boreal zone. Widespread around the northern hemisphere in boreal and montane regions.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Kurzia makinoana	Sensitive & Survey and Manage Category B	Suspected	Occurs on well-shaded, rotten wood and humic soil at low elevations, especially on stream terraces, darlingtonia bogs, floodplains, and other cool, moist forest locations.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Marsupella emarginata var. aquatica	Survey and Manage Category B	Suspected	Restricted to streams with relatively fast moving water and rocky bottoms; in subalpine, montane situations. Widespread around the northern hemisphere in boreal and montane regions.	N/A	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Porella bolanderi	Sensitive	Suspected	Forming shaded to partly exposed mats on a variety of rock types (siliceous, calcareous, and metamorphic) and trunks of *Quercus*, *Umbellularia*, and *Acer macrophyllum* (Piippo and Norris 1996). In the Pacific Northwest, known elevations range from 500-3000 feet.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Tritomaria exsectiformis	Sensitive & Survey and Manage Category B	Suspected	Found on rotting wood and moist soil at the edge of very clear and cold springs in the high Cascades of OR. Arctic circumboreal distribution.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Tritomaria quinquedata	Sensitive & Survey and Manage Category B	Suspected	Occurs on wet humus over boulders, shaded cliffs, soil over exposed rock surfaces, decaying branches at the fringes of spray zones, and among heather on slopes.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
LICHENS					
Bryoria pseudocapillaris	Survey and Manage Category A	Suspected	Grows in areas of frequent maritime fog on exposed trees (especially Sitka spruce and shore pine) and shrubs growing on coastal windswept dunes, rocky headlands, and in one case, coastal mountains, up to 500 meters (1,600 feet) above sea level within 15 km (10 miles) of the ocean	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Bryoria spiralifera	Survey and Manage Category A	Suspected	Grows on exposed trees (especially Sitka spruce and shore pine) and shrubs on forested, coastal, windswept dunes and headlands at or near sea level within 3 km (2 miles) of the ocean	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Bryoria subcana	Sensitive	Suspected	On bark and wood of conifers in forests of coastal bays, streams, dune forests, and high precipitation ridges and summits within 50 km (30 mi) of the ocean.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Buellia oidalea	Survey and		On bark or wood of trunks and twigs of	No Impact	No suitable habitat within the Planning Area. The

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
	Manage Category E		coniferous trees and broad-leaved trees and shrubs along the immediate Pacific coast, in open places such as dunes & salt marshes.		project would occur well outside the suspected distribution and/or the known elevation range of this species.
Calicium abietinum	Survey and Manage Category B		On lignum or occasionally bark of conifer trees or lignum of oak logs and stumps, also fenceposts, especially in the open ecotone between forests and meadows. This species is mostly found in sparsely forested regions.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Calicium adspersum	Survey and Manage Category E		Forming small crusts on bark of living *Abies grandis*, *Pseudotsuga menziesii*, *Quercus* sp., *Sequoia sempervirens* and *Thuja plicata* at or below 2,000 feet elevation usually occurs in relatively open stands in drier microhabitats where sheltered from precipitation.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cetrelia cetrariodes	Survey and Manage Category E		Grows primarily on the bark of alder, and occasionally on mossy rock.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Chaenotheca chrysocephala	Survey and Manage Category B		Found on the bark of TSHE, THPL and other conifer species.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Chaenotheca ferruginea	Survey and Manage Category B		Found on the bark of TSHE, THPL and other conifer species.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Chaenotheca furfuracea	Survey and Manage Category F		Found on the bark of TSHE, THPL and other conifer species.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Chaenotheca subroscida	Sensitive & Survey and Manage Category E		Usually in shaded moist situations, esp. close to the base of trunks. On old THPL, PIEN trunks, decorticated stumps and dry twigs of Picea under canopy.	No Impact	Potential suitable habitat is present but the species was not detected during surveys.
Chaenothecopsis pusilla	Survey and Manage Category E		Found on the bark of TSHE, THPL and other conifer species.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Cladonia norvegica	Strategic & Survey and Manage Category C		On decaying bark or wood at the base of conifer trees and on decaying logs in humid forests, from sea level to 1300m elevation	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Collema nigrescens	Survey and Manage Category F		On bark of hardwood trees and shrubs, including Garry oak, canyon live oak, big-leaf maple, cottonwood, and vine maple	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Dermatocarpon luridum	Survey and Manage Category E		This is a species of the east coast. See D. meiophyllizum below for this species.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Dermatocarpon meiophyllizum	Sensitive		Fresh water aquatic. Seepy terraces, slopes and riparian edges with ALRU, PSME, TSHE, and Acer spp. and on granite rocks along stream edges.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Fuscopannaria saubinetii	Survey and Manage Category E			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Heterodermia leucomela	Sensitive		Occurs on large PISI on windswept forested headlands. Also in coastal redwood forests, low coastal scrub. Conifers in hyper-maritime localities.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Heterodermia sitchensis	Survey and Manage Category E		Restricted to the immediate coaston twigs of *Picea sitchensis* on ridgetop exposed to ocean winds in old-growth temperate rainforest with *Tsuga heterophylla*	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hypogymnia duplicata	Survey and Manage Category C		Grows as an epiphyte on mountain hemlock, western hemlock, Pacific silver fir, Douglas-fir and subalpine fir in old-growth forests of the western Cascades, Olympics and Coast Range, primarily between 330 and 1660 m (1,100-5,450 ft) elevation.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hypogymnia vittata	Survey and	N/A- not		No Impact	No suitable habitat within the Planning Area. The

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
	Manage Category E	expected in Oregon			project would occur well outside the suspected distribution and/or the known elevation range of this species.
Hypotrachnya revoluta	Survey and Manage Category E		Within a few kilometers of the ocean and less than 1500 feet in elevation in *Picea sitchensis* forest or open dunes and wetlands supporting scattered trees and shrubs; or exposed rocks.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lecanora caesiorubella ssp. merrillii	Strategic		On bark of trees and shrubs, and on decaying wood (including redwood fenceposts) in dry, open deciduous or coniferous woodland, chaparral, and salt marsh from sea level to about 1500 ft elevation	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lecanora pringlei	Strategic			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lecidea dolodes	Strategic			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Leptogium burnetiae var. hirsutum	Survey and Manage Category E			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Leptogium cyanescens	Sensitive & Survey and Manage Category A		On bark of Alnus, Salix, Picea, rotten logs and rocks in very humid areas either near the coast or in dense riparian areas. In the PNW known from 2 localities in OR, 1 each in WA , BC and AK.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Leptogium teretiusculum	Strategic and Survey and Manage Category E		Shaded and humid bark of hardwood trees in riparian areas. In southern Oregon and northern California the substrate is *Quercus* spp. In Idaho, the substrate is riparian *Populus*.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Lobaria linita var. tenuoir	Survey and Manage Category A			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Microcalicium arenarium	Survey and Manage Category B			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Nephroma bellum	Survey and Manage Category F			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Nephroma isidiosum	Survey and Manage Category E			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Nephroma occultum	Sensitive & Survey and Manage Category A			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Niebla cephalota	Survey and Manage Category A		On exposed coastal trees, shrubs (less often rock), always within sight or sound of the ocean.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Pannaria rubiginosa	Sensitive & Survey and Manage Category E		Moist lowland habitats, largest populations for OR and WA in coastal thickets of old shrubs on wet deflation plains.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Peltigera pacifica	Sensitive & Survey and Manage Category E		Low elevation moist forests on soil, moss, rocks, logs, and tree bases.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Peltula euploca	Strategic		Noncalcareous rock, in exposed, dry, or shaded and damp habitats. In southwestern Oregon it occurs on basalt in dry *Quercus* and *Pinus ponderosa* associations, and at edges of vernal pools.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.

Species	Listing Category	RRSNF Occurrence Info	Habitat/Distribution	Effects Call	Rationale For Determination of Effects
Platismatia lacunosa	Survey and Manage Category E	Oregon Coast Range Excluded From Management	Often on hardwood boles and branches in riparian forest. Also found in conifer forest both in 2nd and old growth.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Pseudocyphellaria perpetua	Survey and Manage Category A			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Pseudocyphellaria rainierensis	Sensitive & Survey and Manage Category A		Mesic to moist old growth forest. Lower to mid canopy on conifer wood and bark. Southern extent is Lane Co., OR.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Ramalina pollinaria	Sensitive		Low elevation swamps, often with Picea on bark and wood.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Sigridea californica	Strategic			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Stenocybe clavata	Survey and Manage Category A			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Teloschistes flavicans	Survey and Manage Category A			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Tholurna dissimilis	Survey and Manage Category B			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Usnea hesperina	Survey and Manage Category E			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Usnea longissima	Survey and Manage Category F		Coast Range on deciduous trees and shrubs as well as PSME. Often in or near riparian settings or on ridge tops above rivers.	No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.
Usnea sphacelata	Strategic			No Impact	No suitable habitat within the Planning Area. The project would occur well outside the suspected distribution and/or the known elevation range of this species.

Fungi Species (work in progress)

Acanthophysium farlowii	Survey and Manage Category B	
Albatrellus avellaneus	Sensitive & Survey and Manage Category B	Suspected
Albatrellus caeruleoporus	Sensitive and Survey and Manage Category B	
Albatrellus ellisii	Survey and Manage Category B	
Alpova alexsmithii	Survey and Manage Category B	
Alpova olivaceotinctus	Survey and Manage Category B	
Arcangeliella camphorata	Survey and Manage Category B	
Arcangeliella crassa	Survey and Manage Category B	
Arcangeliella lactarioides	Survey and Manage Category B	
Asterophora lycoperdoides	Survey and Manage Category B	
Asterophora parasitica	Survey and Manage Category B	
Baeospora myriadophylla	Survey and Manage Category B	
Balsamia nigrens	Survey and Manage Category B	
Boletus haematinus	Survey and Manage Category B	
Boletus pulcherrimus	Sensitive & Survey and Manage Category B	
Bridgeoporus nobilissimus	Sensitive & Survey and Manage Category A	
Catathelasma ventricosa	Survey and Manage Category B	
Chalciporus piperatus	Survey and Manage Category D	
Chamonixia caespitosa	Sensitive & Survey and Manage Category B	
Choiromyces alveolatus	Survey and Manage Category B	
Choiromyces venosus	Survey and Manage Category B	
Chroogomphus loculatus	Survey and Manage Category B	
Chrysomphalina grossula	Survey and Manage Category B	
Clavariadelphus ligula	Survey and Manage Category B	
Clavariadelphus occidentalis	Survey and Manage Category B	
Clavariadelphus sachalinensis	Survey and Manage Category B	
Clavariadelphus subfastigiatus	Survey and Manage Category B	
Clavariadelphus truncatus	Survey and Manage Category B	
Clavulina castanopes var. lignicola	Survey and Manage Category B	
Clitocybe senilis	Survey and Manage Category B	
Clitocybe subditopoda	Survey and Manage Category B	
Collybia bakerensis	Survey and Manage Category B	
Collybia racemosa	Survey and Manage Category B	
Cordyceps ophioglossoides	Survey and Manage Category B	
Cortinarius barlowensis	Survey and Manage Category B	
Cortinarius boulderensis	Survey and Manage Category B	

Cortinarius cyanites	Survey and Manage Category B	
Cortinarius depauperatus	Survey and Manage Category B	
Cortinarius magnivelatus	Survey and Manage Category B	
Cortinarius olympianus	Survey and Manage Category B	
Cortinarius speciosissimus	Survey and Manage Category B	
Cortinarius tabularis	Survey and Manage Category B	
Cortinarius umidicola	Survey and Manage Category B	
Cortinarius valgus	Survey and Manage Category B	
Cortinarius variipes	Survey and Manage Category B	
Cortinarius verrucisporus	Survey and Manage Category B	
Cortinarius wiebeae	Survey and Manage Category B	
Cudonia monticola	Sensitive & Survey and Manage Strategy B	
Cyphellostereum laeve	Survey and Manage Strategy B	
Dermocybe humboldtensis	Sensitive & Survey and Manage Strategy B	
Destunzia fusca	Survey and Manage Strategy B	
Destunzia rubra	Sensitive & Survey and Manage Strategy B	
Dichostereum boreale	Survey and Manage Strategy B	
Elaphomyces anthracinus	Survey and Manage Strategy B	
Elaphomyces subviscidus	Survey and Manage Strategy B	
Endogone acrogena	Survey and Manage Strategy B	
Endogone oregonensis	Survey and Manage Strategy B	
Entoloma nitidum	Survey and Manage Strategy B	
Fayodia bisphaerigera	Survey and Manage Strategy B	
Fevansia aurantiaca	Survey and Manage Strategy B	
Galernia atkinsoniana	Survey and Manage Strategy B	
Galerina cerina	Survey and Manage Strategy B	
Galerina heterocystis	Survey and Manage Strategy E	
Galerina sphagnicola	Survey and Manage Strategy E	
Gastoboletus imbellus	Survey and Manage Strategy B	
Gastroboletus ruber	Survey and Manage Strategy B	
Gastroboletus subalpinus	Survey and Manage Strategy B	
Gastroboletus turbinatus	Survey and Manage Strategy B	
Gastroboletus vividus	Survey and Manage Strategy B	
Gastrosuillus amaranthii	Survey and Manage Strategy E	
Gastrosuillus umbrinus		
Gautieria magnicellaris		
Gautieria otthii		
Gelatinodiscus flavidus		
Glomus radiatum		

Gomphus bonarii		
Gomphus clavatus		
Gomphus kauffmanii		
Gymnomyces abietis		
Gymnomyces fragrans		
Gymnomyces nondistincta		
Hebeloma olympianum		
Helvella crassitunicata		
Helvella elastica		
Hydnotrya inordinata		
Hydnotrya subnix		
Hydropus marginellus		
Hygrophorus caeruleus		
Hygrophorus karstenii		
Hygrophorus vernalis		
Hypomyces luteovirens		
Leucogaster citrinus		
Leucogaster microspores		
Macowanites chlorinosmus		
Macowanites lymanensis		
Macowanites mollis		
Marasmius applanatipes		
Martellia fragrans		
Martellia idahoensis		
Mycena quinaultensis		
Mycena tenax		
Mythicomyces corneipes		
Neolentinus adhaerens		
Neolentinus kauffmanii		
Nivatogastrium nubigenum		
Octavianina cyanescens		
Octavianina macrospora		
Octavianina papyracea		
Otidea leporina		
Otidea smithii		
Phaeocollybia attenuata		
Phaeocollybia californica		
Phaeocollybia dissiliens		
Phaeocollybia fallax		
Phaeocollybia gregaria		
Phaeocollybia kauffmanii		
Phaeocollybia olivacea		
Phaeocollybia oregonensis		
Phaeocollybia piceae		
Phaeocollybia pseudofestiva		
Phaeocollybia scatesiae		
Phaeocollybia sipei		
Phaeocollybia spadicea		
Phellodon atratus		
Pholiota albivelata		
Podostroma alutaceum		
Polyozellus multiplex		
Pseudaleuria quinaultiana		
Psuedorhizina californica = Gyromitra californica		
Ramaria abietina		
Ramaria amyloidea		
Ramaria araiospora		
Ramaria aurantiisiccescens		

Ramaria botrytis var. aurantiiramosa		
Ramaria celerivirescens		
Ramaria claviramulata		
Ramaria concolor f. marrii		
Ramaria concolor f. tsugina		
Ramaria conjunctipes var. sparsiramosa		
Ramaria coulterae		
Ramaria cyaneigranosa		
Ramaria gelatiniaurantia		
Ramaria gracilis		
Ramaria hilaris var. olympiana		
Ramaria largentii		
Ramaria lorithamnus		
Ramaria maculatipes		
Ramaria rainierensis		
Ramaria rubella var. blanda		
Ramaria rubribrunnescens		
Ramaria rubrievanescens		
Ramaria rubripermanens		
Ramaria spinulosa var. diminutiva		
Ramaria stuntzii		
Ramaria suecica		
Ramaria thiersii		
Ramaria verlotensis		
Rhizopogon abietis		
Rhizopogon atroviolaceus		
Rhizopogon brunneiniger		
Rhizopogon chamaleontinus		
Rhizopogon ellipsosporus		
Rhizopogon evadens var. subalpinus		
Rhizopogon exiguus		
Rhizopogon flavofibrillosus		
Rhizopogon inquinatus		
Rhizopogon truncatus		
Rhodocybe speciosa		
Rickenella swartzii		
Russula mustelina		
Sarcodon fuscoindicus		
Sedecula pulvinata		
Sowerbyella rhenana		
Sparassis crispa		
Spathularia flavida		
Stagnicola perplexa		
Thaxterogaster pingue		
Tremiscus helvelloides		
Tricholoma venatum		
Tricholomopsis fulvescens		
Tuber asa		
Tuber pacificum		
Tylopilus porphyrosporus		

ATTACHMENT B

Figure F-1. Oregon bensonia distribution in Eden Ridge TS

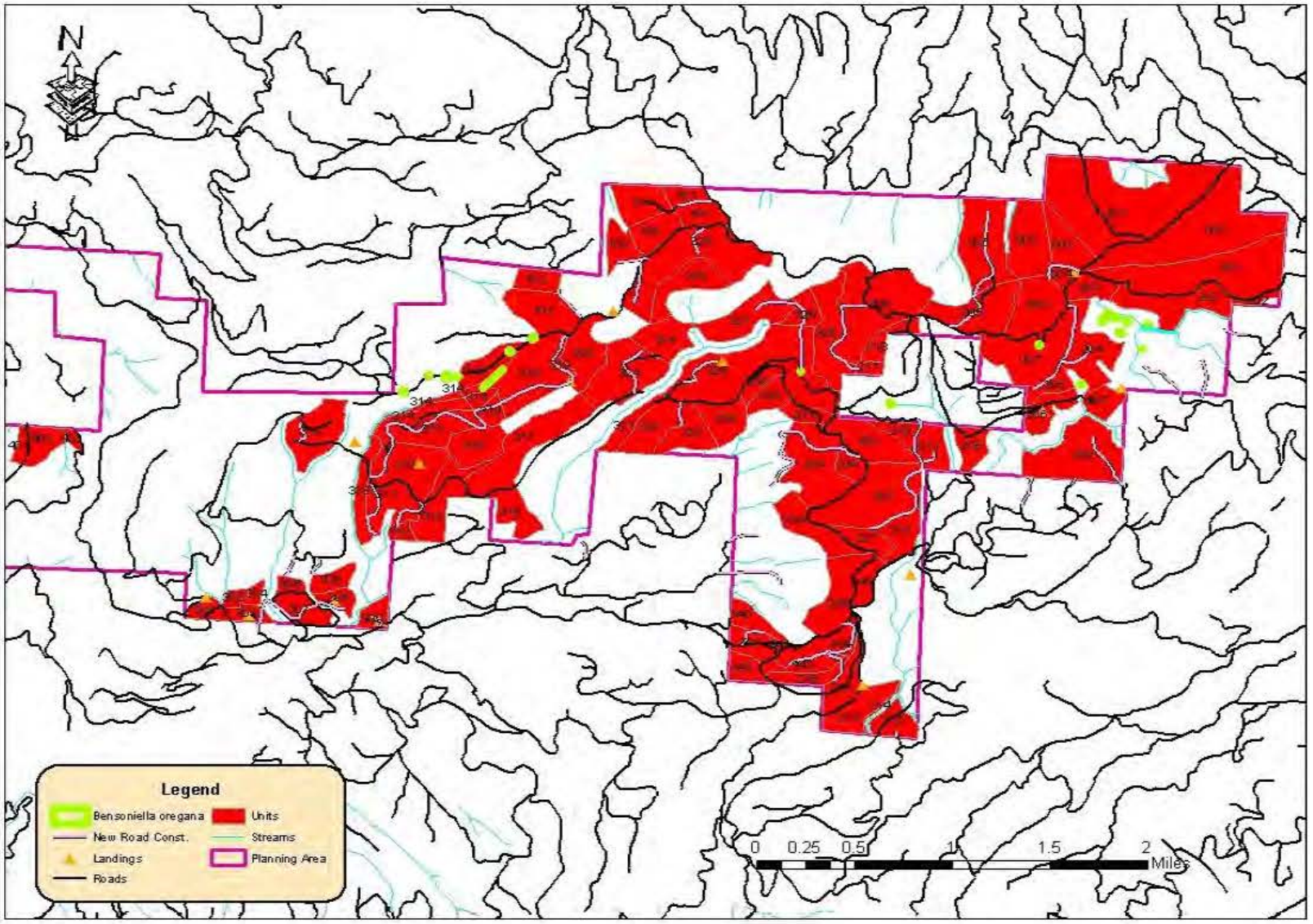


Figure F-2. Oregon bensonia buffered sites in Units 314, 318 and 319

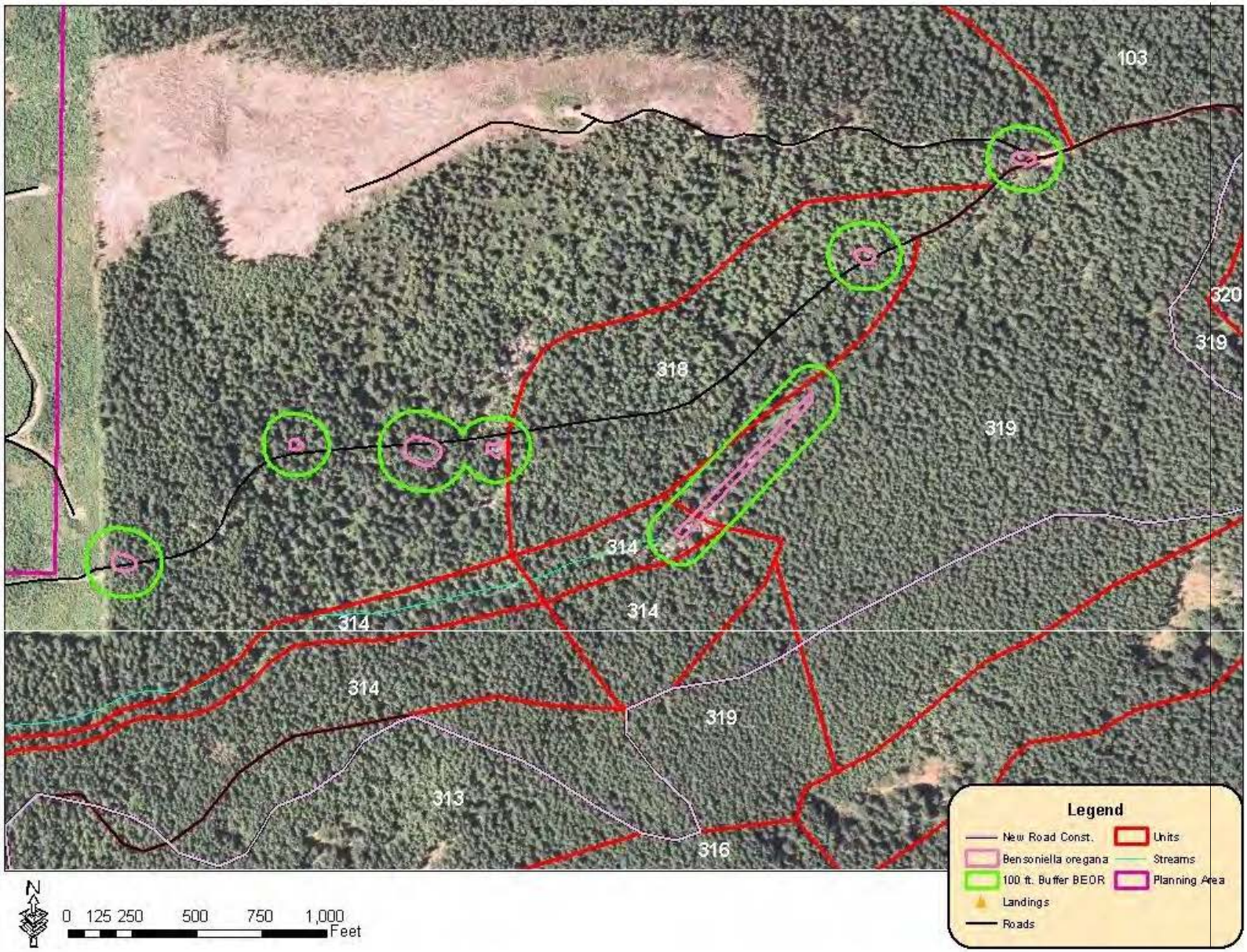


Figure F-3. Oregon bensonia buffer site in Unit 007.

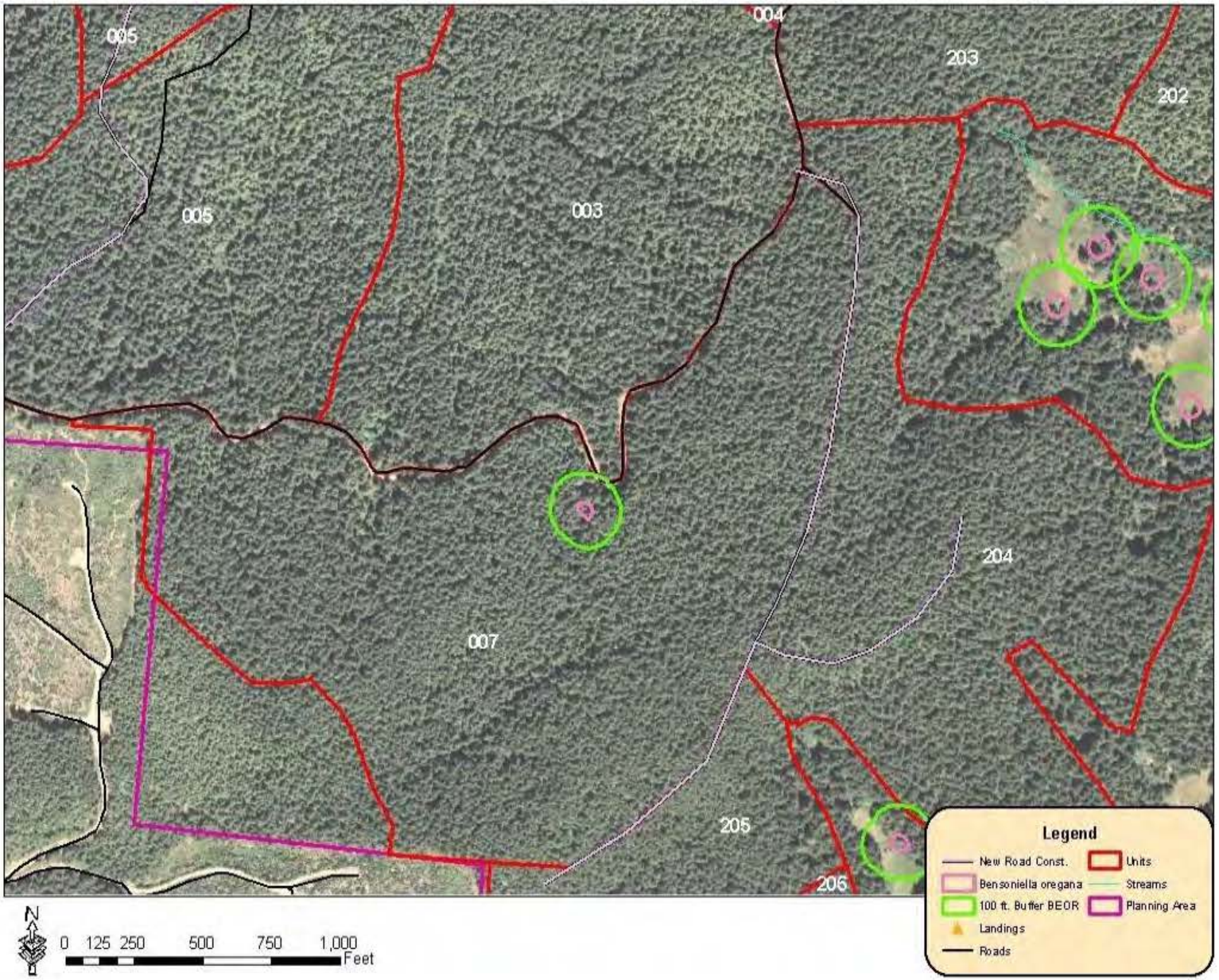
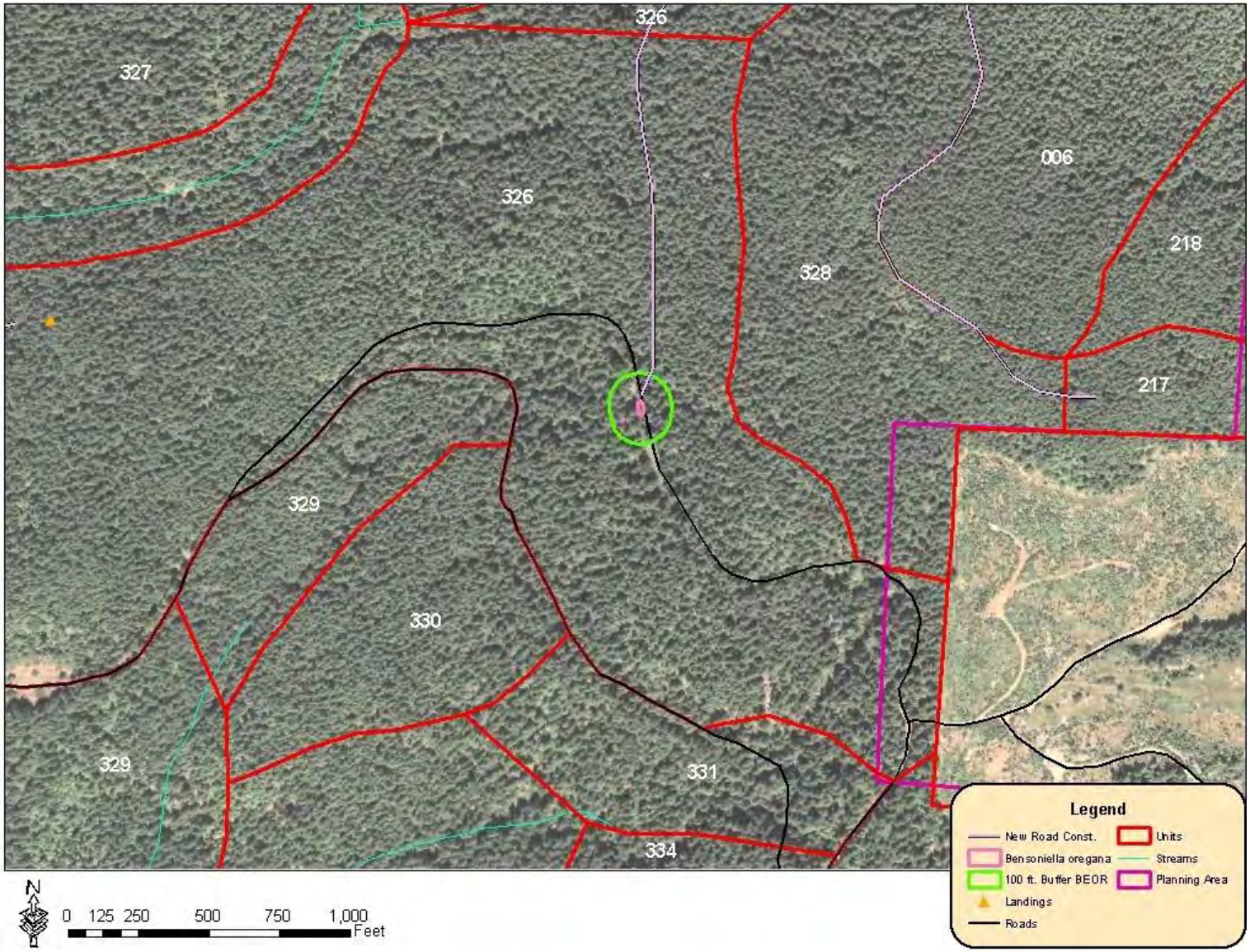


Figure F-4. Oregon bensonia site on proposed road in Unit 326



ATTACHMENT C

Target Invasive Plant Species and Treatment List for the Westside of the Rogue River-Siskiyou National Forest

Species	ODA Category	Treatment	Where in Project
Wooly distaff thistle *(Carthamnus lanatus*)	A & T	Manually pulling	Not known in project.
Biddy-Biddy (*Acaeana nova-zelandiae*)	B	Manually pulling and herbicide.	Not known in project.
Broom – French, Scotch, Portuguese, Spanish	B	Manually pulling and weed wrenching and herbicide of cut stems.	3353-350 road. Probably many other locations.
English ivy (*Hedera helix*)	B	Manually pulling and herbicide.	Not known in project.
False Brome (*Brachypodium sylvaticum*)	B	Manually pulling and herbicide.	Not known in project.
Gorse (*Ulex europaeus*)	B	Manually by cutting, bulldozing, and weed wrenching. Herbicide of cut exposed stems.	Not known in project but along road leading to project.
Himilayan blackberry (*Rubus discolor*)	B	Manually by cutting, bulldozing, and weed wrenching. Herbicide of cut exposed stems.	Not known in project.
Spotted knapweed (*Centaurea maculosa*)	B	Manually by pulling and herbicide treatment.	Not known in project.
Meadow knapweed (Centaurea pratensis)	B	Manually by pulling and herbicide treatments.	Not known in project.
Japanese knotweed (Polygonum cuspidatum)	B	Manually by pulling and injection of herbicide into stem canes.	Not known in project.
Purple loosestrife (Lythrum salicaria)	B	Manually by pulling.	Not known in project.
Tansy ragwort (Senecio jacobaea)	B & T	Manually by pulling.	Not known in project.
Canadian thistle (Cirsium arvense)	B	Manually by pulling and herbicide.	Not known in project.
Italian thistle (Carduus pycnocephalus)	B	Manually by pulling and herbicide.	Not known in project.
Yellow starthistle (Centaurea solstitialis)	B & T	Manually by pulling and herbicide.	Not known in project.

APPENDIX G

WILDLIFE REPORT AND BIOLOGICAL EVALUATION

Wildlife Report
And
Biological Evaluation

EDEN RIDGE TIMBER SALES

APPENDIX G

Rogue River-Siskiyou National Forest
Powers Ranger District
Coos County, Oregon

Prepared by: John Lowe, Wildlife Biologist
Date: August 15, 2011

Reviewed by: David Clayton, Forest Wildlife Biologist
Date: August 22, 2011

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Attachment A - Wildlife Project Design Criteria
Attachment B - Wildlife Analysis Area

I. EXECUTIVE SUMMARY

The Powers Ranger District proposes intermediate commercial harvest treatments using variable density thinning techniques and other connected actions on approximately 3,314 acres of second growth conifer stands artificially and naturally regenerated following timber harvest during the 1920s through the 1930s. Commercial treatments are detailed in Environmental Impact statement (EIS) Tables and displayed on EIS Maps in chapter II. Candidate stands are located on suitable forest land primarily designated as the Matrix land allocation under the Forest Plan as amended by the Northwest Forest Plan. Within the 3,314 acres of treatments, also included are treatments within Riparian Reserves that overlap into overstocked drier upland forests (1,097 total acres).

Commercial treatments would involve harvest of conifers with diameters 7 inches and larger dbh which is a viable product size under current and anticipated market conditions. No old residual trees (old growth) would be cut, except in instances where they are identified as danger trees. Estimated commercial volume could average 8 to 20 thousand board feet (mbf) per acre. Other wood product commodities are anticipated including biomass (chips), and firewood. Harvest treatments from this alternative could yield up to an estimated 53 million board feet and would be implemented utilizing multiple timber sale contracts over an approximate 5-year period.

Treatments would occur within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds. Treatments segregated by watershed were identified to assist with effects analysis and alternative formulation.

There are four alternatives in detail in the Eden Ridge Timber Sales EIS. These include Alternative 1 (No-Action), Alternative 2 (Proposed Action), Alternative 3 and Alternative 4.

Alternative 1 is the No-Action alternative. It represents the current condition and is the basis for comparison of effects from implementation of the three Action Alternatives (Alternatives 2, 3 and 4).

Alternative 2, the Proposed Action, is designed to address and maximize attainment of the Purpose and Need outlined in EIS Chapter I. Alternative 2 also represents the maximum extent of proposed treatments and connected actions (e.g., harvest systems and roads).

Alternative 3 is similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only "high-moderate benefit/low risk" new roads. In relation to Alternative 2, this modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative proposes helicopter logging systems, based on the change in access for conventional systems.

Alternative 4 is also similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only the use (with some reconstruction and maintenance) of existing roads for treatment access. This alternative also excludes some of the higher risk treatments within Riparian Reserves (primarily those associated with perennial streams). In relation to Alternative 2 and Alternative 3, these modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative also proposes helicopter logging systems, based on the change in access for conventional systems.

Table G-1. Comparison of Action Alternatives by Activity

Activity	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Thinning	2,217 acres	2,187 acres	2,093 acres
Riparian Reserves Thinning	1,097 acres.	1,053 acres	965 acres
Est. Volume	53 MMBF	52 MMBF	49 MMBF
Logging System			
Skyline	1,195acres	941 acres	457 acres
Tractor	2,119acres	1,786 acres	1,441 acres
Helicopter	0 acres	513 acres	1,160 acres
Classified Road Construction	10.8 miles	4.5 miles	.25 miles
Temporary Road Construction	0.3 miles	0.3 miles	0
Classified Road Reconstruction	6.1 miles	4.1 miles	1.7 miles

Proposed activities include felling (for thinning), pre-bunching, yarding, piling, burning, temporary road construction, classified road construction, road reconstruction, hazard tree felling, landing construction, road maintenance, tree topping/girdling, down woody material creation, seeding with native grasses, log/rock hauling, helicopter operations.

A summary of effects to species of concern is displayed in Table G-2 below.

Table G-2. Effects Determination for Species of Concern

Species	Action Alternative			
	2	3	4	Comments
Threatened and Endangered Wildlife				
Northern spotted owl	NLAA	NLAA	NLAA	Suitable habitat is not present in any treatment area. Dispersal habitat would be treated and maintained. Any pockets of remnant* trees found within proposed treatment units will be left untreated as Wildlife Areas to Protect. Some remnant trees may be felled as hazards but would be subject to PDC #9 Attachment A.
Northern spotted owl CHU	NE	NE	NE	No CHU in project.
Marbled murrelet	NLAA	NLAA	NLAA	Suitable habitat is not included in any treatment area. Any pockets of remnant trees found within proposed treatment units would be left untreated as Wildlife Areas to Protect. Some remnant trees may be felled as hazards but would be subject to PDC #9 Attachment A.
Marbled murrelet CHU	NE	NE	NE	No CHU in project.
Sensitive Species – Forest Service R6				
American peregrine falcon	MIIH	MIIH	MIIH	Potential disturbance to individuals and potential limited adverse effects to prey species. All activities within disturbance distance of known site would be seasonally restricted.
Bald eagle	NI	NI	NI	No known nests on Powers RD or in the vicinity of the Planning Area.
Harlequin duck	NI	NI	NI	No medium to large stream riparian habitat in project
Lewis's woodpecker	NI	NI	NI	No pine woodlands in Planning Area or along haul route.
Pacific fisher	MIIH	MIIH	MIIH	Thinning (canopy closure reduction) may degrade up to 3,300 acres of foraging habitat, disturbance could occur. Some remnant trees may be felled as hazards but would be subject to PDC #9 Attachment A.
Townsend's big-eared bat	NI	NI	NI	There are no known caves, wooden bridges or abandoned buildings within the project.
Fringed myotis	MIIH	MIIH	MIIH	Minimal, but some impacts to existing snags or trees with cavities could occur.
Northwestern pond turtle	NI	NI	NI	Suitable habitat in the Planning Area, but unlikely any alternative will impact turtles.
Foothill yellow-legged frog	NI	NI	NI	No treatments within suitable riparian buffers
Mardon Skipper	NI	NI	NI	No suitable habitat within treatment areas.
Johnson's hairstreak	MIIH	MIIH	MIIH	Minimal, but some habitat degradation and disturbance could occur.
Coronis fritillary	NI	NI	NI	No suitable habitat within treatment areas.

Species	Action Alternative			
	2	3	4	Comments
White-headed woodpecker	NI	NI	NI	Outside of known range
Northern waterthrush	NI	NI	NI	Outside of known range
California Wolverine	NI	NI	NI	Outside of known range
Pacific Pallid bat	NI	NI	NI	Outside of known range.
Oregon spotted frog	NI	NI	NI	Outside of known range
Siskiyou mountain salamander	NI	NI	NI	Outside of known range.
California slender salamander	NI	NI	NI	Outside of known range.
Black salamander	NI	NI	NI	Outside of known range
Siskiyou short-horned grasshopper	NI	NI	NI	Outside of known range
Insular blue butterfly	NI	NI	NI	Outside of known range
Hoary elfin	NI	NI	NI	Outside of known range
Franklin's bumblebee	NI	NI	NI	Outside of known range
Siskiyou Hesperian	NI	NI	NI	Outside of known range
Crater Lake tightcoil	NI	NI	NI	Outside of known range
Green sideband	NI	NI	NI	Outside of known range. Range limited to western slope of Coast Range and immediate adjacent Coast itself.
Traveling sideband	NI	NI	NI	Outside of known range
Chace sideband	NI	NI	NI	Outside of known range
Oregon shoulderband	NI	NI	NI	Outside of known range
Evening fieldslug	NI	NI	NI	Outside of known range
Management Indicator Species				
Bald eagle	Covered above			
Northern spotted owl	Covered above			
Osprey	NI	NI	NI	No suitable habitat within treatment areas.
Pileated woodpecker	M	M	M	Minimal impacts to these species, but some impacts to existing snags or trees with cavities. Some remnant trees may be felled as hazards but would be subject to PDC #9 Attachment A.
Woodpeckers (Acorn, Downy, Hairy, Northern flicker, Red-breasted sapsucker, white-headed woodpecker,& Lewis)	M	M	M	
American marten	M	M	M	Minimal impacts, but canopy reduction could reduce habitat suitability until forest under-story shrubs grow and restore canopy cover. Some remnant trees may be felled as hazards but would be subject to PDC #9 Attachment A.
Columbian black-tailed deer	M	M	M	Beneficial impacts from improvement of forage; i.e., more grasses, forbs, and shrubs. Some minimal impacts from increased road miles and reduced thermal/hiding cover.
Roosevelt elk	M	M	M	
Other Rare or Uncommon Species				
Bats (fringed, long-eared, and long-legged myotis; silver-haired, pallid, and Townsend's big-eared bats)	M	M	M	Minimal impacts to these species, but some impacts to existing snags or trees with cavities.
Great gray owl	NI	NI	NI	No Habitat
Red tree vole (Mesic Zone)	M	M	M	Canopy connectivity reduced and undiscovered nest trees may be felled.
Del Norte salamander	M	M	M	Some talus habitat may be impacted. Known sites will be protected.
Neo-tropical Migratory Birds				
All birds in this category	Variable impacts, but no more than M for any species, because the scale of impacts is small, compared to the availability of habitats within the watersheds and forest.			

Threatened & Endangered Species: NE = No Effect BE = Beneficial Effect	NLAA = May Affect, Not Likely to Adversely Affect LAA = May Affect, Likely to Adversely Affect CHU = Critical Habitat Unit
All other species NI = No Impact BI = Beneficial Impact	MIIH = May Impact Individuals or Habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species WIFV = Will Impact Individuals or Habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species
M –may affect some individuals or some habitat but effect is minimal Ng – negative effect to habitat and species B – Beneficial	
Note: some species are on more than one list	

***Remnant trees** = Generally large old trees that were not removed during earlier regeneration harvest activities or that survived stand replacement fires. In some cases they are single trees, while other areas have groups of older trees up to a half acre in size. These trees generally range from 34" dbh to in excess of 60" dbh and are often at least twice the diameter of the average tree in the stand they are located in. They often have a "wolfy" structure consisting of moss covered limbs/platforms > 4-6" diameter, and fire scars or charred bark. Generally, bark is thicker and more furrowed and crowns tend to be more flat topped, less "pointed" than younger trees.

Effects to Species of Concern

Species of concern are those species listed by the Endangered Species Act as Threatened or Endangered, the Regional Forester as Sensitive, Other Rare or Uncommon Species, Management Indicator Species by the Siskiyou Land and Resource Management Plan, or Birds of Conservation Concern including focal Neo-tropical Migratory Bird Species by Oregon-Washington Chapter of Partners in Flight in their published Landbird Conservation Plan (PIF 1999, 2000). Effects to species are generally based on the effects to their habitat or potential effects from disturbance during nesting season.

The Forest consults with the USDI Fish and Wildlife Service (per Section 7 of the Endangered Species Act) about any management activities which "may affect" individuals of listed species or their habitat. For detailed information on the natural history and management of the Forest's Endangered and Threatened species, see the most recent programmatic "Formal Consultation on Timber Harvest, Meadow Restoration and Quarry Activities Proposed by the Rogue River-Siskiyou National Forest (Tails # 13420-2009-F-0146)(USDA, USDI 2009). Information in the referenced document was used in the subsequent determination of effects to Threatened and Endangered species for this project.

Threatened and Endangered Species

The effects determination for thinning and associated treatments for all Action Alternatives is **May Affect, Not Likely to Adversely Affect (NLAA**) for the northern spotted owl. Project Design Criteria would assure that no suitable habitat would be removed; however up to 3,314 acres of dispersal habitat may be treated and maintained. The project area and proposed haul route are located outside 1992 and 2008 Critical Habitat Units (CHUs), therefore there would be **No Effect (NE)** to spotted owl critical habitat.

For the marbled murrelet, the effects determination for thinning and associated treatments is **May Affect, Not Likely to Adversely Affect (NLAA)** for all Action Alternatives. Project Design Criteria would assure that no habitat would be removed. The project area is located outside Critical Habitat Units (CHUs). The proposed haul route travels through marbled murrelet CHU; however, hauling is not expected to have any impact due to high use from private timber operations and public use accessing the national forest. Therefore, the effects determination for marbled murrelet Critical Habitat is **No Effect (NE)**.

Sensitive Species
The determinations for Sensitive species that are NOT likely to occur in the project area is **No Impact**. For all Action Alternatives, the determinations for Sensitive species that are likely to occur in the project area is no more than **May Impact Individuals or Habitat (MIIH)**, but would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species, because of potential disturbance to individuals and limited adverse effects to habitat from treatments. Adverse effects are limited because the scale of impacts is very small compared to the scale of the distribution of these species and their habitat across the watersheds and forest.

Management Indicator Species
Effects to Management Indicator Species (MIS), is based upon effects to their habitat. The determination for the **bald eagle** and **osprey** is **No Impact** because riverine habitat along major creeks and streams would not be impacted with this project under all Alternatives. **Northern spotted owl** is addressed as Threatened or Sensitive species. The determinations for **woodpeckers** (pileated, downy, hairy, acorn, white-headed, northern flicker, red-breasted sapsucker, Lewis' woodpecker) would be **M** (**may affect some individuals or some habitat but effect is minimal** under all Action Alternatives), because some snags would likely be felled. The determination for **American marten** would be **M**, because mature habitat would be thinned reducing canopy cover from near 100% to 40-50% and some snags and remnant trees may be felled for safety. Late-successional habitat would not be removed however. The determinations for **Columbian black-tailed deer** and **Roosevelt elk** are **M** for all Action Alternatives because forage would be created by thinning while thermal cover would be reduced. Disturbance from humans may increase due to increased access to new areas from road construction/maintenance activities.

Other Rare and Uncommon Species
The determination for **bats** (fringed, Townsend's big-eared, long-eared, and long-legged myotis; silver-haired and pallid) and **black-backed woodpecker** is **M – may affect some individuals or some habitat but effect is minimal** because some potential habitat will be removed. Some large snags, which are habitat for these birds and bats, will likely be felled during treatments associated with operations. The determination for **white-headed woodpecker and flammulated owl** is **No Impact**, because the project area is outside the known range of the species. The determination for **great gray owl** is **NI – no impact** because there are no meadows of 10 acres or greater within the Planning Area. The FAUNA database contains only one incidental sighting of a great gray owl within the Siskiyou portion of the Rogue River-Siskiyou National Forest. This location is over 4 miles from the largest meadow (7 acres) in the project area.

The determination for **red tree vole** is **M - may affect some individuals or some habitat but effect is minimal**. Surveys for the proposed treatment units are not required because they fall under the 2006 Pechman Exemptions, thinning in forest stands younger than 80 years of age. However, past surveys have located nest trees in proposed treatment units. Those nest trees have been identified and marked as wildlife trees to protect. Some undiscovered red tree vole nest trees may be felled or blow down. Thinning may isolate individual tree canopies reducing inter-connected tree canopies which may be used by foraging and dispersing red tree voles. The determination for the **Del Norte salamander** is **M – may affect some individuals or some habitat but effect is minimal** because some talus habitat may be impacted. Past surveys have located occupied sites. These sites would be protected from ground compaction activities with a buffer of 100' or one site tree length, whichever is greater.

Neotropical Migratory Birds/Landbirds (NTMB)
The effects to migratory birds/landbirds are variable depending on the habitat associations of the individual species, but no more than minimal (**M**) for any species. It is expected that project activities would fall some snags and thus have a potential adverse effect on cavity nesting birds in certain areas. However, all Action Alternatives would leave existing dead wood used by cavity-dependent species, and where needed, snags and down wood may be created. Disturbance to individuals and limited adverse effects to habitat from treatments are limited in scale when compared to the distribution of the species and habitats within the watersheds and Forest.

II. INTRODUCTION

The Eden Ridge Timber Sales Project for the Powers Ranger District of the Rogue River-Siskiyou National Forest requires a Biological Evaluation to be completed (FSM 2672.4). It is Forest Service policy to protect the habitat of listed Threatened or Endangered species from adverse modification or destruction, as well as to protect individual organisms from harm or harassment as appropriate (Forest Service Manual (FSM) 2670.3). This Biological Evaluation was prepared for the proposed Eden Ridge Timber Sales Project, which would be authorized, funded, and conducted on the Rogue River-Siskiyou National Forest (RRSNF).

The purpose of this evaluation is to determine and document the possible effects that the proposed activity and alternatives would have on any Endangered, Threatened, Proposed, or Sensitive wildlife species (FSM 2672.4). A second objective of this evaluation is to ensure these species receive full consideration in the decision-making process, to maintain species viability and meet defined recovery goals. The Biological Evaluation process (FSM 2672.43) provides a description of office analysis, and mitigation activities necessary to ensure proposed management actions will not likely jeopardize the continued viability of:

> Species listed or proposed to be listed as Endangered (E) or Threatened (T) by the USDI Fish and Wildlife Service. Species listed as Sensitive (S) by the USDA Forest Service Region 6 (USDA FS 2008, FSM 2670.44).

The Biological Evaluation is a 5-step process. Each Proposed, Endangered, Threatened, and Sensitive species (PETS) potentially occurring in the proposed Eden Ridge Timber Sales Project area was evaluated based on these steps, (evaluation of impacts on a given species may be complete at the end of step #1 or may extend through step #5).

Section 7 of the Endangered Species Act (ESA) also directs each Federal agency to insure that any action authorized, funded or carried out by such agency is not likely to jeopardize the continued existence of any Threatened or Endangered species or result in the destruction or adverse modification of their critical habitat. The ESA also directs each Federal agency to confer or consult with the appropriate Secretary on any action, which is likely to jeopardize or affect the continued existence of any species or its critical habitat.

A. ALTERNATIVES CONSIDERED IN DETAIL

No-Action Alternative
Alternative 1 is the No-Action Alternative. It represents the current condition and is the basis for comparison of effects from implementation of the three action alternatives. Under No-Action, stands proposed for thinning treatment would continue to be overstocked, with intense competition for growing resources, e.g. sunlight, water, nutrients, space. This process maintains a relatively high canopy closure, preventing the establishment or growth of a grass/forb/shrub ground cover. Stands would continue to self-thin the intermediate and overtopped trees, while the co-dominate trees would continue to have poor crown development and slow diameter growth. Snag development, especially in the smaller tree classes, is promoted as trees in dominant position continue their advantage.

Stand structure elements such as horizontal and vertical structural diversity, large down wood, snags and multiple canopy layers would likely develop in these stands if no thinning occurs. These characteristics would develop over a longer time period as the stand naturally progresses through the different stages of stand development. The No-Action Alternative promotes the availability of smaller snags and down wood while the Action Alternatives promote the availability of larger snags and down wood.

Alternative 2 (Proposed Action)
The Powers Ranger District proposes variable density thinning treatments, Port Orford cedar sanitation and planting treatments, and other connected activities on approximately 3,314acres of candidate stands. These stands are located on suitable forest land designated as Matrix and Riparian Reserve land allocations under the Siskiyou National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan.

Alternative 2 proposes intermediate commercial harvest treatments using variable density thinning techniques and other connected actions on second growth conifer stands artificially and naturally regenerated following timber harvest during the 1920s through the 1930s. Commercial treatments are detailed in Tables and Maps in EIS Chapter II. Candidate stands are located on suitable forest land primarily designated as the Matrix land allocation under the Forest Plan as amended by the Northwest Forest Plan. Within the 3,314 acres of treatments, also included are treatments within Riparian Reserves that overlap into overstocked drier upland forests (1,097 total acres).

Approximately seventy-five (75) treatment units would be designed for timber harvest with associated harvest systems that would use a combination of ground-based, skyline and helicopter operations depending on soil, slope and hydrological concerns. Also included is an additional 363 acres of non-commercial silvicultural treatments.

Commercial treatments would involve harvest of conifers with a minimum of 7 inches dbh, which is a viable product size under current and anticipated market conditions. No old residual trees (remnant) would be cut, except in instances where they are identified as danger trees. Estimated commercial volume could average 8 to 20 thousand board feet (mbf) per acre. Other wood product commodities are anticipated including biomass (chips), and firewood. Harvest treatments from this alternative could yield up to an estimated 53 million board feet and would be implemented utilizing multiple timber sale contracts over an approximate 5-year period.

Treatments would occur within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds.

To access the 75 units for treatment, approximately 31 miles of existing Classified roads would be used for the haul route and approximately 11 miles of new classified system road construction would be built, 6.1 miles of reconstruction of existing classified roads, 5.5 miles of road maintenance and .3 miles of decommissioning and construction of new temporary roads within units are being considered these over a 5-year period.

Alternative 3
This alternative is similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only "high to moderate benefit/low risk" new roads. This theme was derived from comments received during scoping. Road "benefit" relates to the amount of area accessed for a given segment or length or road. A "high benefit" new road would be one that provides current and future access for a large area, as compared to a "low benefit" road which for its length and potential environmental impact, would access fewer acres. A "high risk" new road could be one that would require crossing high risk or a number of Riparian Reserve areas, or is in a position on the terrain that would allow surface runoff into perennial streams, or is a road that would have steeper grades and/or involve a large amount of cut and fill of material during construction. An assessment of the new roads associated with the Proposed Action (Roads Analysis) is contained in EIS Appendix H (Transportation and Logging Systems Report).

In relation to Alternative 2, this modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative includes helicopter logging systems, based on the change in access for conventional systems.

Alternative 3 also responds to the goals and objectives outlined by the Land and Resource Management Plan (1989 Forest Plan) for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan, and helps move the Planning Area toward desired conditions described in that plan. This alternative is also designed to improve overall forest health by stimulating natural processes that encourage more stable and resilient forest vegetative conditions, manage stand densities and species composition, and provide for a sustainable yield of commercial timber and other commodities, with less environmental impact and risk (primarily associated with roads), as compared to the Proposed Action.

Alternative 4
This alternative is also similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only the use (with reconstruction and maintenance) of existing roads for treatment access. This alternative also excludes some of the higher risk treatments within Riparian Reserves (primarily those associated with perennial streams).

In relation to Alternative 2 and Alternative 3, these modification would reduce the treated area on some units, resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative includes helicopter logging systems, based on the change in access for conventional systems.

Alternative 4 also responds to the goals and objectives outlined by the Land and Resource Management Plan (1989 Forest Plan) for the Siskiyou National Forest, as amended by the 1994 Northwest Forest Plan, and helps move the Planning Area toward desired conditions described in that plan. This alternative is designed to improve overall forest health with less environmental impact and risk (primarily associated with roads and treatments in proximity to perennial streams), as compared to the Proposed Action or Alternative 3.

III. PROPOSED, ENDANGERED, THREATENED & SENSITIVE SPECIES

In compliance with Section 7 of the Endangered Species Act (ESA)(1973 et seq.) and the Forest Service Biological Evaluation process for Proposed, Threatened, Endangered, and Sensitive (PETS) wildlife species, the list of species potentially occurring within the RRSNF was reviewed. The January 31, 2008 Pacific Northwest Region (R6) listing of species applicable to the RRSNF was reviewed in regard to potential effects on any of these species by actions associated with the Eden Ridge Timber Sales Project.

The Eden Ridge Timber Sales Planning Area was buffered by 2 miles (see Map Attachment B), which is a northern spotted owl home range plus one half mile. This effects Analysis Area distance will encompass the home range of most of the species analyzed in this document. The term project area, is used to describe where action would occur, such as units where forest thinning is proposed and where road construction or road improvements are proposed.

The Plum Creek Timber Company owns approximately 30,000 of the 39,731 acres within the Analysis Area. Timber harvest activities on the surrounding private lands are typically on a 40-50 year regeneration rotation. These harvest activities keep the surrounding lands in a fairly consistent early successional vegetation stage. Additionally, 8,634 acres within the Analysis Area are managed by the USFS and the remaining 444 acres are managed by the Bureau of Land Management (BLM).

A. LATE-SUCCESSIONAL FOREST

—Late-successional forests are those forest seral stages that include mature [21-32" DBH or 80-200 years of age] and old-growth [>32" DBH or >180-200 years old] age classes." (NWFP FSEIS Vol. 1, Glossary, p. 9 and ROD, p. B-1) (NWFP FSEIS Vol. 1, p. 3&4 – 13 and 3&4 - 26). —Although the processes that created the current late-successional and old-growth ecosystems are not completely understood, they include: (1) tree growth and maturation, (2) death and decay of large trees, (3) low-to-moderate intensity disturbances (e.g., fire, wind, insects, and diseases) that create canopy openings or gaps in the various strata of vegetation, (4) establishment of trees beneath the maturing overstory trees either in gaps or under the canopy, and (5) closing of canopy gaps by lateral canopy growth or growth of understory trees." (NWFP ROD, p. B-2).

Two Threatened species that occur within the fifth-field watersheds associated with the project areas use late-successional forest habitat for their survival needs. These Threatened species are the northern spotted owl and the marbled murrelet. The most important habitat component these species need in late-successional forest is very large trees with large cavities or platforms, which are needed for nesting. The majority of trees used for nesting by the marbled murrelet and the northern spotted owl are conifers greater than 50" dbh with unique structure, such as large limbs or cavities (Nelson and Wilson, 2002; LaHaye and Gutierrez, 1999; Forsman and Giese, 1997). In addition, some species, such as the Pacific fisher, use large deciduous hardwoods with cavities and large limbs (Yaeger, 2005).

Although there are a number of characteristics in late-successional forest, quantification of old-growth forest generally uses a combination of diameters (described above) and canopy closure (generally greater than 50%), because diameter and canopy closure are easily measured and because these are the types of stands where the characteristics of late-successional forest are likely to begin developing or may already occur. For example, a stand, which is sixty years of age, could be dominated by 21-32" dbh trees with high canopy cover, but is not likely to contain giant trees, large cavities, or large limbs. This stand could contain a few large snags or large down wood; therefore, this stand is only beginning to develop late-successional forest characteristics.

Patch sizes have been fragmented by past timber harvest and wildfire reducing the overall sizes and number of patches. There is a need to grow larger patches of older forest (LSRA, 1995). Additionally, the diversity within existing late-successional forest habitat is probably less than it was historically, when low to moderate intensity fires were historically more common than they have been over the past 100 years. Low to moderate intensity fires increase diversity by creating gaps and scattered dead wood where small groups or individual large trees are killed by burning.

Within the Eden Ridge Planning Area, there is an estimated 3,314 acres of proposed treatment acres that are best represented by the mature (21-32" dbh) forest habitat type, **however these "mature" stands do not contain giant trees, large cavities, or large limbs, and are not considered late-successional forest.** Further, based on historical records and stand examination, these stands are currently less than 80 years old.

1. Northwest Forest Plan Standard and Guideline C-44

The Northwest Forest Plan ROD has Standards and Guidelines designed to limit harvest of older forest in watersheds/analysis areas where little late-successional forest remains (Northwest Forest Plan ROD, page C-44). Standard and Guideline C-44 of the Northwest Forest Plan ROD establishes the need to provide for retention of old-growth fragments in watersheds where 15% or less is late-successional forest within 5th field watersheds.

NWFP S&G (C-44) discusses that,"…Within such an area, all remaining late-successional stands should be protected". NWFP ROD B1-4 discusses structure and composition of late-successional and old growth forest ecosystems and does not limit the determination of such stands to diameter and canopy closure.

The entire area associated with proposed treatments (the Project Area) is within the land allocation designation of Matrix. Two 5th field watersheds are affected by the project. Existing late-successional and old-growth forest habitat by 5th field watershed is summarized in Table G-3.

Table G-3. Posthabitat[1] Conditions Within 5th field Watersheds Affected by the Proposed Action

5th Field Watershed	Watershed - USFS acres	% Late-successional	% Old-growth
Middle Fork Coquille River	1,534	43% (653 ac)	1% (14 ac)
South Fork Coquille River	65,370	21% (14,001 ac)	14% (8,967 ac)

As part of implementation for the Eden Ridge Timber Sales Project, an analysis exercise would be done to determine whether or not any 5-acre portion of a candidate stand contains 6 or more trees with potential late-successional structure. If an area contains 6 or more trees with potential structure, it constitutes potential suitable habitat. Any stand with a potential suitable habitat (remnant late-successional tree) component would be further assessed with a walk-through of the area that would be impacted (USDI, 2006). If a late successional component is confirmed, that portion of the stand (or the entire stand) would be excluded from treatments (including ½ site tree un-thinned buffer) (see PDC#6).

Therefore, **the Eden Ridge Timber Sales Project would not affect (change or reduce) the current condition regarding late-successional or old-growth forest**, in conformance with Standard and Guideline at Northwest Forest Plan C-44.

B. DESCRIPTION OF SPECIES AND CRITICAL HABITAT LISTED UNDER ESA

1. Northern Spotted Owl (Strix occidentalis *caurina)*

The northern spotted owl was listed as threatened throughout its range ~~–d~~due to loss and adverse modification of spotted owl habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USDI FWS 1990:26114).

More specifically, threats to the spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of populations within physiographic provinces, predation and competition, lack of coordinated conservation measures, inadequacy of regulatory mechanisms and vulnerability to natural disturbance (USDI FWS 1992b). A primary spotted owl recovery goal of the Revised Recovery Plan is to conserve older stands that are either occupied or contain high-value spotted owl habitat. Long-term spotted owl recovery could benefit from forest management where the basic goals are to restore or maintain ecological processes and resilience.

In general, to advance long-term spotted owl recovery and ecosystem restoration in moist forests in the face of climate change and past management practices; the principles recommended to be applied by land managers include:

1) Conserve older stands that have occupied or high-value spotted owl habitat as described in Recovery Actions 10 and 32. On Federal lands this recommendation applies to all land-use allocations outside of Congressionally Reserved Areas.
2) Management emphasis needs to be placed on meeting spotted owl recovery goals and long-term ecosystem restoration and conservation.
3) Continue to manage for large, continuous blocks of late-successional forest.

[1] Posthabitat is defined as late-successional forest habitat (mature and old growth), which is synonymous with nesting-roosting habitat for northern spotted owls.

Recovery Action 10 – Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.

Recovery Action 32 – Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees (USFWS 2011).

Critical habitat for the northern spotted owl was designated on 1 January 1992 (USDI FWS 1992a). A revised designation of critical habitat was published in the Federal Register in August 2008 (USDI FWS 2008b). Critical habitat for the northern spotted owl corresponds closely with those areas designated as Late-Successional Reserve in the Northwest Forest Plan (USDA and USDI BLM 1994). The spotted owl's listing reflected primarily the loss of suitable habitat for spotted owls. **There is no Northern Spotted Owl Critical Habitat designated within the Eden Ridge Planning/Analysis Area.**

In their 2004 evaluation of the status of the northern spotted owl, Courtney et al. (2004) state that present major threats to the species include the effects of past and current timber harvest; loss of habitat to fire; and barred owls. The 2004 authors go on to state that other threats are also present but of threats identified at the time of listing, only one (predation linked to fragmentation) is not well supported.

In their five year status review of the spotted owl, Courtney et al. (2004) report that predation on spotted owls has not been directly observed though great horned owls (*Bubo virginianus*) are presumed to be a major spotted owl predator. Furthermore, an evaluation of numerous corpses strongly indicates predation as the cause of death (Courtney 2004). Miller (1989) does report predation of juvenile spotted owls by great horned owls and starvation as the two main causes of mortality. Johnson (1992) implicates northern goshawks (*Accipiter gentiles*), Cooper's hawks (*Accipiter cooperi*), red-tailed hawks, and great horned owls as potential avian predators.

In their work in western Oregon, Forsman et al. (1984) identify great horned owls as a spotted owl predator. The five year status review includes a report by Leskiw and Gutiérrez (1998) of perhaps having recorded the predation of a spotted owl by a barred owl (*Strix varia*); Gutiérrez et al. (1995) share that fisher (*Martes pennanti*) have been seen climbing in spotted owl nest trees and may eat spotted owl eggs and young. It appears then that predation of adult spotted owls, their young, and or eggs could be preyed upon by wildlife species associated with late seral conifer forest as well as those associated with edge habitat.

Management direction for the northern spotted owl has its basis in *A Conservation Strategy for the Northern Spotted Owl* (Thomas et al. 1990). Direction stems from the Northwest Forest Plan, which amended current forest planning documents and established a system of Late-Successional Reserves (LSR) across the landscape to provide habitat for the recovery of spotted owl populations. Thomas et al. (1990) disclosed northern spotted owls' use of old-growth forests almost exclusively and rarely use clearcuts or young forest plantations. When young stands are used, they typically contain remnant large trees (Thomas et al. 1990). Where timber harvest has occurred, spotted owls are usually found in the remaining patches of old-growth and mature forest (Forsman 1982).

Habitat features associated with forests used by spotted owls include multi-layered canopies, relatively high canopy closure, large diameter trees, and numerous snags and logs (Forsman 1982, Thomas et al. 1990). These stand features are related to requirements for feeding, nesting, and roosting (Forsman 1982). Spotted owls most commonly nest in tree cavities or on platforms created by debris or mistletoe infections (Thomas et al. 1990).

Northern spotted owls generally inhabit older forested habitats because they contain the structures and characteristics required for nesting, roosting, foraging (NRF), and dispersal. A definition of NRF habitat in the Klamath Province is difficult to identify because of the variety of ecological types and frequent fire history (USDA Forest Service 1996). The Mt. Ashland LSR Assessment (USDA Forest Service 1996) identified stands which supported northern spotted owl as >17" average diameter and >60% canopy closure (CC). The Rogue River/South Coast Biological Assessment defines Nesting/Roosting/Foraging (NRF) habitat as >21" average diameter and >60% CC (USDA Forest Service, USDI Fish and Wildlife Service 2009c).

Zabel et al. (2003) identified habitat models for northern spotted owls in the Klamath Province of northern California which correctly classified owl-occupied sites with >85% accuracy. Within Douglas-fir habitats below 6,000 ft. elevation in the Eastern Klamath Ecological zone, these sites were classified as >17" average diameter and >60% CC. Zabel et al. (2003) concluded that their model performed best at the 200 hectare radius (0.5 mi).

The primary prey of northern spotted owls in the Analysis Area are dusky-footed woodrats (*Neotoma fuscipes*) and northern flying squirrels (*Glaucomy sabrinus*) (USDA Forest Service 1996). Dusky-footed woodrats are occasionally abundant in early mixed-conifer forests and present in late stages of forest development (Carey et al. 1999). Northern flying squirrels are generally associated with older forests. Zabel et al. (1995) verified a trend of negative, linear relationship between home range size during the breeding season and the proportion of woodrats in the diet of northern spotted owls. The proportion of northern flying squirrels in the diet was positively correlated with home range size.

Spotted Owl Environmental Baseline

Habitat data for northern spotted owl analyses was derived from Geographic Information System (GIS) coverages. The analysis is based on satellite imagery. The use of satellite imagery allows large areas to be assessed on a consistent basis and is considered the —best available" data that maps and provides consistent vegetation characteristics throughout the Analysis Area regardless of ownership. It is important to note some limitations in terms of the satellite imagery used for analysis as such, individual pixels of data may not exactly match on the ground.

Information on general forest cover types on Forest Service and National Park Service lands in Oregon and Washington was obtained through a contract with Pacific Meridian Resources Company. The cover type data (Prehabitat) were produced using a combination of 1988 and 1991 Landsat imagery and were classified into vegetation categories based on tree size and stand structure. This cover type data was classified into vegetation categories based on size, structure and canopy closure date. Data is updated when vegetation conditions changed (such as timber harvest). Prehabitat was updated and called Posthabitat after the Biscuit Fire.

Data available for habitat analysis in the Biscuit Fire Recovery Project could not be classified the same as Zabel et al. (2003) classified habitat in their best model for northern spotted owl habitat. The available data had the following tree size classifications: 1-9, 9-21, 21-32, and greater than 45 inches and canopy cover classifications at 10-40, 40-70, and greater than 70. Therefore, analysis for this project defines late successional forest habitat for northern spotted owls as near to Zabel et al. classifications for the Western Klamath area as possible.

USDI Fish and Wildlife Service describe two types of habitats for spotted owls: nesting-roosting foraging (NRF) and dispersal. Survival of individuals and successful reproduction is dependent upon NRF and replacement of deceased spotted owls and colonization of developing NRF habitat is influenced by dispersal habitat. Late successional forest habitat described in the Northwest Forest Plan is synonymous with northern spotted owl NRF habitat as it was understood in 1994.

Posthabitat is defined as late-successional forest habitat (mature and old growth), which is synonymous with nesting-roosting habitat for northern spotted owls (based primarily on Zabel et al. 2003). Included are stands dominated by trees greater than 21" dbh with greater than 40% over-story canopy cover. Stands with 9-21" dbh with greater than 40% canopy closure are defined as dispersal-foraging habitat.

Late-successional forests are "stands dominated by conifer trees that are 21 to 32 inches dbh…" (NWFP FSEIS Vol. 1, p. 3&4- 26). Another definition: "late-successional forests are those forest seral stages that include mature and old-growth age classes." (NWFP FSEIS Vol. 1, Glossary, p. 9 and ROD, p. B-1). Areas with greater than 32" dbh with two or more canopy layers "would generally best fit the definition of old growth." It is important to note that there are some limitations in terms of the satellite imagery used for this analysis. Field verification is necessary to validate the size classifications, because shadows, large crowns and closed canopies can be depicted as LS or OG.

The Revised Recovery Plan for the Northern Spotted Owl, June 2011 includes Recovery Action 32 – Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees (USFWS 2011).

The Rogue River-Siskiyou NF and Medford BLM drafted guidelines identifying forest stands meeting Recovery Action 32. Forest stands meeting the described conditions are a subset of suitable habitat and actual stand conditions vary across the range. (USDA/USDI 2010).

The sub-basin that contains the proposed units, the Analysis Area, and 5th field watersheds contain approximately 36,328 acres of NRF and 22,471 acres of dispersal habitat.

Table G-4. Environmental Baseline of Spotted Owl Habitat (USDI 2009)

Watershed (major sub-basins)	Total Forest Acres	Habitat Capable Acres	Spotted Owl NRF Habitat Baseline	Spotted Owl Dispersal Habitat Baseline
Coquille Sixes	89,149	17,680	36,328	22,471

The Forest manages all or part of LSRs within the Forest as a portion of the network of reserves designed for the conservation of the spotted owl. These reserves theoretically either currently provide sufficient amounts of habitat and numbers of spotted owls to maintain local populations, or, if deficient in habitat or owls, should provide sufficient habitat and owls in the future. The NWFP (USDA FS and USDI BLM 1994a) directs that LSRs be managed to improve late-successional forest conditions, therefore habitat for the spotted owl should improve accordingly over time within these reserves (USDI 2009).

2. Marbled Murrelet (*Brachyramphus marmoratus*)

The marbled murrelet is a small seabird (Alcidae) that nests along the Pacific coast from Alaska to central California, and winters as far south as Baja California, Mexico. Murrelets forage at sea where they consume a diversity of prey species including small fish and invertebrates, but nest on large limbs in old growth coniferous forests. In the Pacific Northwest, murrelets have been found as far inland as 53 miles (USDI FWS 1997). Dillingham et al. (1995), examining murrelet survey data for the Rogue River-Siskiyou N.F., found that no murrelets were detected more than 32 miles from the ocean, although surveys had been conducted up to 47 miles inland. South of the divide between the Rogue and Coquille Rivers, the farthest inland murrelets had been detected was 17 miles (Dillingham et al. 1995). The Eden Ridge Timber Sales Project is approximately 28 miles from the ocean.

The 2009 status review (USFWS 2009d) reconfirmed the murrelet's status as a threatened species and summarized the terrestrial habitat. Throughout the forested portion of their range, marbled murrelet habitat use is positively associated with the presence and abundance of mature and old growth forests, large core areas of old growth, low amounts of edge and fragmentation, proximity to the marine environment, and increasing forest age and height (Hamer and Nelson 1995b). In all cases, marbled murrelets focus on the presence of platforms used for nesting. Platform presence is more important than the size of the nest tree, and tree size alone is not a good indicator of the abundance of platforms (Evans Mack et al. 2003). The presence of platforms is the most important characteristic of marbled murrelet nesting habitat (Burger 2002). Individual tree attributes that provide platforms suitable for nesting include large or forked branches, deformities caused by broken tops or mistletoe infection, or other structures large enough to provide a platform for a nesting adult murrelet (Hamer and Nelson 1995b).

Platforms are defined as limbs 4 inches (10 centimeters) in diameter or more and 33 feet (10 meters) or more above ground (Burger 2002). Tree diameter and height have been positively correlated with platform size and the abundance of platforms, but the relationship may change depending on the variety of tree species and forest types marbled murrelets use for nesting (Huff et al. 2006). Overall, nest trees in Washington, Oregon, and northern California have been greater than 19 inches (48 centimeters) dbh and greater than 98 feet (30 meters) tall (Hamer and Nelson 1995). Other important attributes of the platform are vertical and horizontal cover and substrate. Known nest sites have platforms that are generally protected by branches above (vertical cover) or to the side (horizontal cover) (Huff et al. 2006). Marbled murrelets appear to select limbs and platforms that provide protection from predation (Luginbuhl et al. 2001; Marzluff et al. 2000; Raphael et al. 2002) and inclement weather (Huff et al. 2006). Substrate, such as moss, duff, or needles, on the nest limb is important for protecting the egg and preventing it from falling (Huff et al. 2006). Murrelet habitat is mapped by using spotted owl NRF habitat as a preliminary screen.

Range-wide habitat loss is by far the greatest terrestrial threat to murrelets. Timber harvest has reduced the amount of old growth forest habitat within western Oregon and Washington by more than 80 percent and it is likely disproportionate harvesting has occurred within the range of the murrelet compared with forests further inland (USDI FWS 1992b). The NWFP establishes all murrelet occupied stands on Federal lands as LSRs, which greatly restricts the habitat modification activities that can occur. In 1996, the Service designated murrelet critical habitat, which largely overlaps mapped LSRs within the murrelet range on Federal lands. Predation via corvids and or rodents is also considered a threat to reproductive success.

An account of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet can be found in the 1988 species status review (Marshall 1989), the final rule designating the species as threatened (USDI FWS 1992b), the final rule designating critical habitat for the species (USDI FWS 1996), *Ecology and Conservation of the Marbled Murrelet* (Ralph et al. 1995), *Recovery Plan for the Marbled Murrelet* (USDI FWS 1997), and the Service's BO for Alternative 9 (USDI FWS 1994) of the *Final Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (USDA and USDI 1994a).

In 1995, it was estimated 1,077 occupied murrelet sites occurred within Washington, Oregon, and California. Suitable habitat for the murrelet was estimated at 2,561,500 acres of Federal lands in the listed range of this species (Ralph et al. 1995). Murrelet habitat is protected on Federal land under the NWFP.

The loss of significant amounts of suitable, unoccupied murrelet habitat may hamper efforts to stabilize and recover this species. The Federal listing of the murrelet as Threatened was primarily based on the loss of late-successional forest and the subsequent reduction in the number of nest sites available to murrelets (USDA and USDI 1994; Carter and Erickson 1992). This loss of habitat may also explain gaps in their inland distribution.

Current management direction for the marbled murrelet comes from the Northwest Forest Plan ROD and the Marbled Murrelet Recovery Plan (USDA and USDI BLM 1994, USDI FWS 1997). If surveys determine a stand is occupied, a Late-Successional Reserve is set up to protect all contiguous existing and recruitment habitat (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years) within one-half mile of the occupied site. Suitable habitat is generally 80 years old or more with trees averaging 32 inches dbh or more, with at least one platform > 5.9 inches in diameter containing nesting substrate (e.g., moss, epiphytes, duff) on that platform which has overhead protective cover (tree branch or foliage), and has an access route through the canopy that a murrelet could use to approach and land on the platform (USDI 2009).

Marbled Murrelet Critical Habitat

Critical habitat for marbled murrelets was designated in May 1996 (61 FR 102:26256-26320). The Service has designated approximately 3.9 million acres of land as critical habitat, of which 78 percent (3.0 million acres) is located on Federal lands within the area covered by the NWFP boundary.

The Service considers two components of marbled murrelet habitat to be biologically essential: 1) terrestrial nesting habitat and associated forest stands and 2) marine foraging habitat used during the breeding season. Within areas essential for successful marbled murrelet nesting, the Service has focused on the following primary constituent elements: 1) individual trees with potential nesting platforms and 2) forested areas within 0.5 miles (0.8 kilometers) of individual trees with potential nesting platforms, and with a canopy height of at least one-half the site potential tree height. Within the boundaries of designated critical habitat, only those areas that contain one or more primary constituent element are, by definition, critical habitat.

The Eden Ridge Timber Sales project is within the known range (Area A) of the marbled murrelet; however, **there is no designated marbled murrelet critical habitat within the Planning/Analysis Area**.

C. EFFECTS TO SPECIES LISTED UNDER ESA AND CHU

A summary of presence, habitat and determination of effects with mitigation is shown in Table G-5.

Table G-5. ESA Species & Critical Habitat Unit (CHU) Presence and Effects Determination

Wildlife Species	Sighting/Habitat	Habitat or Species Present	Determination of Effects with mitigation
Federally Endangered, Threatened, or Proposed Species			
Northern spotted owl	Suitable Habitat present/species known for area	Suitable habitat not affected by project/species may be affected	**NLAA**
Northern Spotted Owl Critical Habitat Unit	CHU not within project area	CHU not present	**No Effect**
Marbled Murrelet	Suitable Habitat present /species not known for area	Habitat not affected by project/species may be affected	**NLAA**
Marbled Murrelet Critical Habitat Unit	CHU not within project area	CHU not present	**No Effect**

No Effect
NLAA = May Affect, Not likely to Adversely Affect
LAA = Likely to Adversely Affect

1. Northern Spotted Owl

No-Action Alternative
The No-Action Alternative would not result in any change in levels of disturbance to spotted owl nest sites. No spotted owl pairs would be affected by disturbance in habitat and dispersal opportunities would not be reduced from current conditions. In the absence of large-scale disturbance (wildfire, insects, and disease) the densities of northern spotted owls would likely remain stable, notwithstanding other threats identified by the Sustainable Ecosystems Institute report (Courtney et al. 2004) which include barred owls and West Nile Virus.

All Action Alternatives
The FAUNA database contains 4 spotted owl records within the analysis area. Three of the records are for observations of one historic owl in 1991 and 1992. The forth was an incidental observation from 1992. The project area was surveyed to protocol in 2008 and 2009. No spotted owls were detected within any of the proposed units; however, contract surveyors reported an incidental observation of a spotted owl. Detected owls may be using the project area for forage and would likely continue to do so. Originally some larger trees existed within the units; however, boundaries for the harvest units were re-delineated or portions of units were dropped to avoid areas where large diameter trees were common and there was potential for suitable habitat for spotted owls (PDC #5 Attachment A). The nature of the treatment prescription would retain the largest overstory trees (PDC #15 &16).

In general, noise disturbance has the potential to adversely affect a spotted owl such that their normal behavior is disrupted. The degree to which an individual spotted owl may be affected from noise disturbance varies with the proximity (distance), intensity (sound level) and duration of the disturbance. Activities that generate noise levels that result in the alteration of an individual owl's behavior would constitute a form of harassment as defined by the ESA. Harassment is —a intentional or negligent act or omission which creates the likelihood of injury by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering" (50 CFR 17.3).

The potential effects of elevated stress hormones on spotted owl population dynamics are not well understood. Evidence of recreation effects on spotted owls was reported by Swarthout and Steidl (2001) who found that the closely related Mexican spotted owl (*Strix occidentalis lucida*) was affected by hikers. They reported that juveniles and adults were unlikely to flush at distances ≥24 m from hikers, respectively. Delaney et al. (1999) studied the effects of chainsaw and helicopter noise on Mexican spotted owls. They found that no spotted owls flushed when noise stimuli were >105 m away. This study further shows that spotted owls may be sensitive to some types of noise disturbance.

Required Project Design Criteria (PDCs) have been developed for northern spotted owls on the Rogue River-Siskiyou National Forest. The following table portrays zones of restricted operations and distances from specific activities for known activity centers:

a. Northern Spotted Owl Project Design Criteria - Mitigation Measures

If a new activity center is located, the following mitigation measures would be applied where appropriate:

Table G-6. Northern Spotted Owl Mitigation Measures and Affected Harvest Units

Activity	Zone of Restricted Operation	Harvest Unit
Blast of more than 2 pounds of explosive	1 mile	Rock Quarry
Blast of 2 pounds or less of explosive	120 yards	None
Impact pile driver, jackhammer, or rock drill	60 yards	None
Type III-IV Helicopter or single-engine airplane	120 yards	None
Type I or II Helicopter	0.25 miles	None
Chainsaws, power tools (hazard trees, tree harvest, fuel reduction work, etc.)	65 yards	None
Heavy equipment	35 yards	None

Table G-7. Project Mitigation Measures (PDCs) for the Protection of Northern Spotted Owl

Any of the following Mandatory PDCs may be waived in a particular year if nesting or reproductive success surveys conducted according to the FWS-endorsed survey guidelines reveal that spotted owls are non-nesting or that no young are present that year. Waivers are valid only until March 1 of the following year. Previously known sites/activity centers are assumed occupied unless protocol surveys indicate otherwise.	
Disturbance	1) **Work activities** (such as tree felling, yarding, road construction, hauling on roads not generally used by the public, prescribed fire, muffled blasting) that produce loud noises above ambient levels, or produce thick smoke that would enter the stand, **will not occur within specified distances (see above table) of any nest site or activity center of known pairs and resident singles between 1 March and 30 June (or until two weeks after the fledging period)** – unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt. The restricted zone is 1.0 mile for any un-muffled blasting. This distance may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the blast and nest sites. March 1 – June 30 is considered the critical early nesting period; the action agency biologist has the option to extend the restricted season during the year of harvest, based on site-specific knowledge (such as a late or recycle nesting attempt). The boundary of the prescribed area may be modified by the action agency biologist using topographic features or other site-specific information. The restricted area is calculated as a radius from the assumed nest site (point).
Disturbance	2) **If an active spotted owl nest or activity center is located within or *adjacent* to a project area, delay the project activity until September 30th** or until an action agency biologist determines that young are not present. For a given situation, the ~~a~~djacent" distance is determined by the action agency biologist – if needed, contact Level 1 team for guidance. If any project activity is so close to a known or suspected owl site that the disturbance would flush a nesting spotted owl, curtail the project activity until September 30. The field biologist has the discretion to conduct surveys and determine fledging activity.
Disturbance	3)Broadcast burning will not take place within 0.25 mile of known active northern spotted owl nests between 1 March and 30 June (or until two weeks after the fledging period) unless smoke will not drift into the nest stand.

Quarries	1) For active nest sites or unsurveyed suitable habitat within 0.25 mile of the quarry operation (1.0 mile for blasting), restrict operation of the quarry from March 1 through June 30 (unless protocol surveys demonstrate non-nesting). **Recommended** 2) For active nest sites or unsurveyed suitable habitat within 0.25 mile of the quarry operation, restrict operation of the quarry from March 1 through September 30 (unless protocol surveys demonstrate non-nesting).
Remnant Trees	Remnant trees will be retained. Remnant trees felled for operational needs will be retained on-site. PDC #9 Attachment A.

Above-ambient noises further than these (Table G-6) distances from spotted owls are expected to have ether negligible effects or no effect to spotted owls. The types of reactions that spotted owls could have to noise that the Service considers to have a negligible impact, include flapping of wings, the turning of a head towards the noise, hiding, assuming a defensive stance, etc. (USFWS 2003).

If spotted owls are detected in or adjacent to treatment units, Project Design Criteria from the USDI Fish and Wildlife Service Formal Consultation on timber harvest, meadow restoration and quarry activities proposed by the Rogue River–Siskiyou National Forest (TAILS #: 13420-2009-F-0146) dated August 27, 2009 (USDA/USDI, 2009c) would be applied to proposed activities (PDC# 2&3 Attachment A).

b. Direct and Indirect Effects

The proposed action would commercially treat and maintain up to 3,314 acres of spotted owl dispersal habitat and non-commercially treat up to 363 acres The resultant canopy closure (40-50%) and residual tree structure (the larger tree component) is likely to maintain the dispersal function of the treated stands. The reduced structural complexity, e.g., loss of snags and vertical canopy diversity, is a degradation of habitat quality for late-successional associated species but the effect on wildlife from this degree of change is likely minimal and dispersal habitat is likely to be maintained. Over the long term, the thinning should allow the remaining trees to reach a larger diameter and develop larger branches sooner than would be possible if no thinning were done. Spotted owl dispersal habitat would be maintained by the project.

No snags or down woody material is proposed for removal. No new road construction is proposed within any spotted owl home range (1.3 miles). No northern spotted owl activity center (300 meter) occurs within the project area or along the haul route. One core area (0.5 mile) occurs along the haul route. One home range occurs within the project area and portions of 3 home ranges occur along the haul route. Thirty two acres of dispersal habitat would be maintained within the mean home range of northern spotted owl - activity center #290.

Harvest and vegetation treatments may improve foraging habitat conditions for prey (USDI, 2009). Lemkuhl et al. (2006) confirmed the importance of maintaining snags, down wood and mistletoe. Primary prey species of spotted owls are small mammals that include northern flying squirrels (*Glaucomys sabrinus*) and dusky-footed (*Neotoma fuscipes*) and bushy-tailed (*N. cinerea*) woodrats, followed by tree voles (*Arborimus* and *Clethrionomys*) and mice (*Peromyscus* spp.). While flying squirrels tend to increase in abundance in older forests, they can also be common in younger stands. Dusky-footed wood rats tend to be more abundant in younger and drier forest stands and bushy-tailed woodrats are often associated with cliffs, rocky outcrops, and talus, but they also occupy hollow trees and logs. Tree voles appear to show a positive correlation with stand age and are more abundant in old-growth forests.

Density management can have short term (less than 5 years) adverse impacts on prey species and foraging and dispersal habitat given the removal of vegetative cover for small mammals. However, Gomez et al. (2005) noted that commercial thinning in young stands of Coastal Oregon Douglas-fir (35-45 yr) did not have a measurable short-term effect on density, survival or body mass of northern flying squirrels, an important prey species for spotted owls.

Gomez et al. (2005) also noted the importance of fungal sporocarps, which were positively associated with large down wood. Some disturbance of habitat may improve forage conditions, provided understory structure and cover are retained. Removal of some tree canopy, provided it is not too extreme, would bring more light and resources into the stand, stimulating forbs, shrubs and other prey food. The understory habitat conditions for prey food should increase over the next few years, until shrubs and residual trees respond to again close in the stand.

In addition, residual trees, snags and down wood that are retained in the thinned stands would provide some cover for prey species over time, and would help minimize harvest impacts to some prey species. Some arboreal prey species would venture into harvest units a short distance for food. Northern spotted owls seldom venture far into non-forested stands to hunt. However, edges can be areas of good prey availability and potentially increased vulnerability (i.e., better hunting for owls) (Zabel 1995). The retained trees may respond favorably to more light and resources and gain height and canopy over time (USDI, 2009). Any areas found meeting Recovery Action 32 definitions would be excluded from treatment areas under all Action Alternatives.

There is the potential for disturbance to any dispersing spotted owls that may be moving through the project area searching for suitable habitat, or to any potential foraging spotted owls, within the disturbance limits identified in Table G-6 above. If any spotted owls are discovered in the project area, the above PDCs are required, unless it is determined through protocol surveys that they are not nesting. Because of this potential for disturbance to spotted owls, the Eden Ridge Timber Sales Project is considered "**may affect, not likely to adversely affect**" for the **northern spotted owl**.

The Proposed Action is considered "**No Effect**" (NE) to **northern spotted owl critical habitat**, because the project area and treatment units are not within northern spotted owl Critical Habitat Units (CHU). The nearest treatment unit to spotted owl CHU is over 1.5 miles and the nearest road identified for use during the proposed action is over 0.8 miles from the nearest CHU.

c. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment (CHFT) Project within the Analysis Area.

Approximately 50 acres are currently being treated and treatments on the remaining 625 acres may occur during the life of the CHFT Project. No National Forest projects, which would remove spotted owl habitat, are anticipated in the project area or Analysis Area. Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little habitat on private land for spotted owls in the Analysis Area. The remaining approximately 444 acres are managed by the BLM.

2. Marbled Murrelet

No-Action Alternative
The No-Action Alternative would not result in any change in levels of disturbance to marbled murrelet nest sites. No marbled murrelet would be affected by disturbance in habitat and nesting opportunities would not be reduced from current conditions. In the absence of large-scale disturbance (wildfire, insects, and disease) the densities of marbled murrelet would likely remain stable, notwithstanding other threats.

Action Alternatives
There is potential for disturbance to murrelets from activities in adjacent non-murrelet habitat. The majority of information on disturbance to nesting marbled murrelets has been from anecdotal observations and inferred from studies on other seabird species (Long and Ralph 1998). Professional opinions vary on the subject but it is the Service's and the BLM's positions to approach the issue cautiously until such data exist to support a less restrictive approach to disturbance issues. The sensitivity of an individual to disturbance is likely related to the baseline level of disturbance the bird is accustomed to, the level and proximity of disturbance (Hamer and Nelson 1998), and the timing of the disturbance within the nesting cycle and daily activity periods. Many bird species, including murrelets, can habituate to relatively high levels of disturbance over time (Long and Ralph, 1997; Hamer and Nelson 1998). However, for murrelets, the adverse effects of disturbance may also lead to nest abandonment by adults, reduced nest attentiveness (leading to increased vulnerability of predation), aborted feeding visits, premature fledging, and avoidance of otherwise suitable habitat (Hamer and Nelson 1998).

Scattered throughout the Eden Ridge Timber Sales Planning Area, are small pockets and scattered, individual large trees (remnant structure), some of which could serve as nesting habitat and are considered "potential nesting structure" (Roberts, 2004). Marbled murrelet surveys were conducted on one stand within the Eden Ridge Timber Sales project area adjacent to Alternative 2, Unit 401 in 1996 and 1997. No detections were made during these surveys. Murrelet surveys were also conducted in 16 stands of potential habitat within and adjacent to proposed Eden Ridge Timber Sales treatment areas in 2008 and 2009. Surveys included all or portions of Alternative 2, Units: 001, 003, 004, 005, 006, 007, 101, 102, 203, 204, 218, 322, 323, 324, 325, 326, 327, 328, 329, 330 and 331. No murrelets were detected and no suitable habitat was discovered within the surveyed stands.

a. Marbled Murrelet Project Design Criteria - Mitigation Measures

To protect marbled murrelets from disturbance; the following Project Design Criteria (PDC) from the USDI Fish and Wildlife Service Formal Consultation on timber harvest, meadow restoration and quarry activities proposed by the Rogue River–Siskiyou National Forest (TAILS #: 13420-2009-F-0146) dated August 27, 2009 (USDA/USDI, 2009) would be applied to proposed activities.

Table G-8. Marbled Murrelet Mitigation Measures and Affected Harvest Units

Activity	Zone of Restricted Operation	Harvest Unit
Blast of more than 2 pounds of explosive	1 mile	401, 402 & 403
Blast of 2 pounds or less of explosive	120 yards	401 & 402
Impact pile driver, jackhammer, or rock drill	120 yards	401 & 402
Type III-IV Helicopter or single-engine airplane	120 yards	401 & 402
Type I or II Helicopter	0.25 miles	401, 402 & 403
Quarry operations	0.5 miles	Rock quarry
Chainsaws, power tools (hazard trees, tree harvest, small placer dredges, etc.)	120 yards	401 & Portions of 402
Heavy equipment	120 yards	401 & Portions of 402
Burning where smoke will drift into occupied sites or unsurveyed habitat	0.25 miles	401, 402 & 403

Table G-9. Project Mitigation Measures for the Protection of Marbled Murrelet

Habitat	**For Survey Area A** - If the project removes or degrades suitable habitat, the project must be surveyed to protocol (current Pacific Seabird Group 2-year protocol to document presence/absence of the murrelet). If it is not feasible to complete the 2-year protocol, the USFWS will be contacted on a case-by-case basis to discuss other means of ensuring that potential nest trees are not impacted. A new unmapped LSR must be established for any timber stand in marbled murrelet Survey Areas A or B that is determined to be or assumed to be occupied by marbled murrelet. (per NWFP ROD, page C-10).
Habitat	Occasionally individual hazard trees are found which have not been surveyed for murrelet use and which have the potential to support a murrelet nest. If these trees are an immediate threat to human safety, they will be cut. Otherwise, these trees will be removed during the non-nesting season (16 September to March 31) (UDSI 2009).
Disturbance	**For Survey Area A -** Work activities (such as tree felling, yarding, road and other construction activities, hauling on roads not generally used by the public, muffled blasting) which produce noises above ambient levels **will not occur within specified distances (see above table) of any occupied stand or unsurveyed suitable habitat between April 1 – August 5**. **For the period of August 6 – September 15, work activities will be confined to between 2 hours after sunrise to 2 hours before sunset**.
Disturbance	**Blasting** (open air/unmuffled) – **No blasting activities 1 April through 15 September within 1.0 mile of occupied stands or unsurveyed suitable habitat.** This distance may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the blast and nest sites or less than 2 lbs of explosives are used.
Disturbance	**Clean up trash and garbage daily** at all construction and logging sites. Keep food out of sight so as to not attract crows and ravens (predators on eggs or young murrelets).
Disturbance	**Recommended -** Between 1 April and 15 September, concentrate disturbance activities spatially and temporally as much as possible (e.g., get in and get out, in as small an area as possible; avoid spreading the impacts over time and space).
Fuels	(I) Burning would not take place within 0.25 mile of known occupied marbled murrelet sites, or unsurveyed marbled murrelet habitat between April 1 and August 6 unless smoke will not drift into the occupied site. (II) All broadcast and under-burning operations (except for residual ~~s~~smokes") will be completed in the period from two hours after sunrise to two hours before sunset. (IV) During helicopter operations, flights over suitable habitat will be restricted (helicopter should be a least 1,500 feet above ground level); if not possible, fly a minimum of 500 feet above suitable habitat (above canopy).
Quarries	For any occupied stands or unsurveyed suitable habitat within 0.5 mile of the quarry operation, restrict operation of the quarry from April 1 to September 15. Agency biologists also have the discretion to modify the 0.5-mile zone depending on topography and the level of noise - what equipment will be present (crusher or dozer/ripper or only loading of existing stockpiled rock).

b. Direct and Indirect Effects

Marbled murrelet habitat would not be removed or degraded by the proposed activities. Over the long term, the thinning should allow the remaining trees to reach a larger diameter and develop larger branches sooner than would be possible if no thinning occurred. The planned haul route utilizes roads already receiving high timber haul use off of private lands and portions are open to public use. Any potential nesting murrelets along this route have likely developed a tolerance to motorized traffic on these roads including road maintenance and road improvement activities.

There are occasional scattered remnant trees within proposed treatment units. Field reviews have identified and removed scattered pockets of remnant trees from treatment areas and any subsequent pockets identified will also be excluded from treatment (PDC #6 Attachment A). Individual remnant trees would be retained and any remnant trees felled for safety or operational needs would remain on-site (PDC #9 Attachment A).

To prevent disturbance to occupied or unsurveyed potential habitat a seasonal restriction for activities within specified distances (see Table G-8) would be required for Unit 401 and all road work for portions of Road 5000-210 (PDC #7 Attachment A).

There would be "**no effect**" to murrelet **critical habitat** from the Action Alternatives because there is no identified critical habitat within the project area. Because of the potential for disturbance to nesting marbled murrelets from implementation activities to unknown sites, a "**may affect, not likely to adversely affect**" determination is made for the **marbled murrelet**.

c. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment (CHFT) Project within the Analysis Area.

Approximately 50 acres are currently being treated and treatments on the remaining 625 acres may occur during the life of the CHFT Project. No National Forest projects, which would remove murrelet habitat, are anticipated in the project area or Analysis Area. Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little habitat on private land for marbled murrelet in the Analysis Area. The remaining approximately 444 acres are managed by the BLM.

D. FOREST SERVICE SENSITIVE SPECIES

In compliance with the Forest Service Biological Evaluation process for Proposed, Threatened, Endangered, and Sensitive (PETS) wildlife species, the list of species potentially occurring within the RRSNF was reviewed. The January 31, 2008 Pacific Northwest Region (R6) listing of species applicable to the RRSNF was reviewed in regard to potential effects on any of these species by actions associated with the Eden Ridge Timber Sales Project.

Table G-10. R-6 Sensitive Species Known or Suspected to Occur on the RRSNF

R6 Sensitive Species	Habitat Presence	Species Presence	Determination of Effects with mitigation
American peregrine falcon	Habitat present	Species present	MIIH
Bald eagle	Habitat present	Species present	NI
Harlequin duck	No habitat	Suspected	NI
Lewis' woodpecker	No habitat		NI
White-headed woodpecker	Not within range		
Northern waterthrush	Not within range		
California wolverine	Not within range		
Pacific fisher	Habitat present	Suspected	MIIH
Pacific pallid bat	Not within range		
Townsend's big-eared bat	Habitat present	Suspected	NI
Fringed myotis	Habitat present	Suspected	MIIH
Northwestern pond turtle	Habitat present	Potential	NI
Oregon spotted frog	Not within range		
Foothill yellow-legged frog	Habitat present	Suspected	NI
Siskiyou mountains salamander	Not within range		NI
California slender salamander	Not within range		
Black salamander	Not within range		
Siskiyou short-horned grasshopper	Not within range		
Coronis fritillary	No habitat		NI
Mardon skipper	No habitat		NI
Insular blue butterfly	Not within range		
Hoary elfin	Not within range		
Johnson's hairstreak	Habitat present	Suspected	MIIH
Franklin's bumblebee	Not within range		
Siskiyou Hesperian	Not within range		
Crater Lake tightcoil	Not within range		
Traveling sideband	Not within range		
Green sideband	Not within range		
Chace Sideband	Not within range		
Oregon shoulderband snail	Not within range		
Evening fieldslug	Not within range		

NI = No Impact
MIIH = May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species

The Planning Area is outside the known range for the following species and they will not be discussed in this document further: **white-headed woodpecker, northern waterthrush, California wolverine, Pacific pallid bat, Oregon spotted frog, Siskiyou mountains salamander, California slender salamander, black salamander, Siskiyou short-horned grasshopper, insular blue butterfly, hoary elfin, Franklin's bumblebee, Siskiyou hesperian, pristine springsnail, Crater Lake tightcoil, Pacific walker, robust walker, green sideband, Chace sideband, traveling sideband, Oregon shoulderband, evening field slug.**

1. American Peregrine Falcon (*Falco pergrinus anatum*)

The American peregrine falcon was identified as an Endangered species in the 1970s and then delisted in 1999. Peregrine falcons are typically associated with cliffs, which serve as nesting and perching sites. Nest site criteria include ledges, potholes, and small caves that are near water, inaccessible to mammalian predators, and offer protection from rain and snow, and heat and cold. Peregrine falcons feed almost exclusively on birds.

Cliffs with suitable ledges provide nesting habitat for peregrine falcons. Peregrine habitat on the Siskiyou portion of the Forest is managed in accordance with the Regional Forester's letter of July 19, 1999 (USDA 1999b) and Standard and Guideline 4-5 of the Land and Resource Management Plan for the Siskiyou National Forest (1989). To date, six active nests are known on the Siskiyou portion of the Forest. On 25 August 1999, the USDI (1999) Fish and Wildlife Service removed (delisted) the American peregrine falcon throughout its range as a threatened species from the Federal List of Endangered and Threatened Wildlife, thereby removing all protections provided by the Act. A strategy for the 5-year monitoring plan that follows the delisting has been developed and is being implemented (FWS 2003). Evaluation of impacts of proposed actions on the peregrine falcon should follow the process described in FSM 2673.4 and be documented in the Biological Evaluation. If a proposed project may potentially impact the species or its habitat, surveys using the Regional protocol should be conducted.

a. Direct and Indirect Effects

The presence of humans detected by a raptor in its nesting or hunting habitat can be a significant habitat-altering disturbance even if the human is far from an active nest (Knight and Temple 1995). Some peregrine falcons are extremely sensitive and refuse to breed if humans have been in the vicinity of their aeries (Olsen and Olsen 1980). Even brief absence by parent birds can lead to missed feedings, predation on eggs or young, or to overheating, chilling, or desiccation of eggs or young (Suter and Joness, 1981).

There is one known peregrine falcon site within the Analysis Area. Three proposed treatment units (#401, #402, and #403) are within the disturbance distances and would be seasonally restricted for all activities - January 1 to July 31. Until a Site Management Plan is developed, disturbance distances for seasonal restrictions have been designated at the maximum distance for the primary management zone of 800m radius (Pagel 1991). However, based on the aspect, topography and location of the aerie, an additional 800 meters has been added to the NW half of the initial primary management zone radius. Maintenance activities on portions of roads 5000-200, 5000-210, and 5000-290 would also be seasonally restricted January 1 to July 31 or until it has been determined by the district wildlife biologist that either fledging has occurred or that the site is unoccupied (PDC #10 Attachment A). Helicopter landing locations within 1 mile of the known or any newly found peregrine falcon sites would require approval of the district wildlife biologist prior to implementation (PDC #11 Attachment A).

All **Action Alternatives** of the Eden Ridge Timber Sales Project **–may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide"** for the **American peregrine falcon** due to the potential for disturbance to individuals and potential limited adverse effects to prey species from treatments.

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands.

The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment (CHFT) Project within the Analysis Area.

Approximately 50 acres are currently being treated and treatments on the remaining 625 acres may occur during the life of the CHFT Project. No National Forest projects, which would remove habitat, are anticipated in the project area or Analysis Area. Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little habitat on private land for spotted owls in the Analysis Area. The remaining approximately 444 acres are managed by the BLM.

Road access around the peregrine falcon site is not available to the general public, because all access is through private gates, although the Forest Service has access through a cost share agreement. However, it is likely that peregrine falcons are habituated to vehicular traffic due to the nearly constant truck activity on the private timber lands. There are other potential nesting and roosting sites within the Analysis Area on private lands. It is not known whether there are any peregrine falcons utilize these areas.

2. Bald Eagle *(Haliaeetus leucocephalus)*

Bald eagles were listed as Endangered in Oregon and elsewhere by the FWS in 1967 (USDI FWS 1967). The bald eagle was removed from the federal list of endangered and threatened plants and wildlife by a ruling published in the Federal Register on July 9, 2007 and effective August 8, 2007 (72 FR37345). Bald eagles continue to be protected under the Bald and Golden Eagle Protection Act of 1940. The Act prohibits disturbance, recently defined by FWS as: *"to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior"* (50 CFR 22.3).

The Final Environmental Assessment Proposal to Permit Take Provided Under the Bald and Golden Eagle Protection Act (USDI 2009) and Eagle Permits; Take Necessary to Protect Interests in Particular Localities; Final Rule (50 CFR Parts 13 and 22) finalizes permit regulations to authorize limited take of bald eagles and golden eagles under the Bald and Gold Eagle Protection Act.

Bald eagle habitat on the Rogue River-Siskiyou NF is protected and managed in accordance with the Pacific Bald Eagle Recovery Plan (USDI FWS 1986), and Standards and Guidelines 4-3 and 4-4 of the Siskiyou National Forest Land and Resource Management Plan (USDA 1989). As part of the recovery plan, key nesting habitat areas have been identified on the Rogue River-Siskiyou NF along the Rogue, Illinois, and Sixes Rivers (USDI FWS 1986).

Most bald eagles nest within 0.6 to 1.2 miles of aquatic foraging areas, which is typically a lake, reservoir, large river, or coastal estuary (Anthony et al. 1982, Stalmaster 1987, Anthony and Isaacs 1989, Johnsgard 1990, Garrett et al. 1993). Nest trees are usually the dominant trees in the stand, often much larger than the surrounding trees (Anthony et al. 1982, Stalmaster 1987). The nest trees provide adequate support for the large nests, an open flight path to the nest, and a view of the surrounding terrain (Stalmaster 1987). Although bald eagles usually nest near water, they will search areas away from water to find suitable structure for their nest (Anthony et al. 1982, Stalmaster 1987). Young stands are avoided, but eagles do desire large openings in the canopy provided by lakes, rivers, and meadows (Stalmaster 1987).

Roosting and perching habitat is also important. Roost trees are often the largest trees in the stand (Anthony et al. 1982). When selecting roost trees, eagles choose trees providing greater shelter versus trees close to food. On the other hand, trees used for perching are usually near water and food. Perches are used for resting, hunting, and eating. The species of tree is less important than the location and form of the tree (Stalmaster 1987).

Bald eagles require an abundant supply of food because of their large size. Bald eagles feed on fish, waterfowl, small mammals, and carrion (Stalmaster 1987, Johnsgard 1990). The specific diet may vary by season and location (Stalmaster 1987).

On the Rogue River-Siskiyou NF, major rivers provide the best habitat for bald eagles. The South Fork Coquille River is the nearest large river, approximately 2.2 miles SW of the Planning Area. The nearest known nest is approximately 4.5 miles NW of the Planning Area and there are no known nests on the Powers Ranger District.

The Eden Ridge Timber Sales Project is considered a **"No Impact"** for the **Bald Eagle** because there are no known nests within disturbance distances from the project and the project is beyond the distance where most bald eagles nest.

3. Harlequin Duck *(Histrionicus histrionicus)*

The harlequin duck is a short-distance east-west migrant that moves to breeding streams from Pacific coastal areas (Cooper and Wright, 1998). Harlequin ducks migrate northward and inland in spring, arriving at their breeding areas in the intermountain western U.S. late-April through mid-May, with males departing for west coast molting areas soon after females begin incubating (Spahr et al. 1991). Breeding females move to the coast later depending on breeding success and whether or not females abandon young. Non-breeding females also remain on rivers through the incubation period. Successful females and juveniles arrive on the coast in mid to late September. Some coastal breeding populations are probably non-migratory (Cooper and Wright, 1998). Young accompany their mothers to coastal molting or wintering areas in the late summer (Regehr et al. 2001).

The harlequin duck winters on the coast as far south as central California, and nests on inland rivers as far east as Montana. The harlequin duck has been documented on National Forests in both states (COL, CRG, DES, GIP, MBS, MTH, OKW, OLY, RRS, SIU, UMP, WAW, WIL) and four BLM districts in Oregon (CB, EU, RO, SA).

In Oregon, records of arrival on inland streams can be found from the first week of March, including a few reports of pairs (Dowlan 1996). Breeding occurs primarily on the rivers in northern Oregon, with occasional records from the Umpqua drainage. A pair was on Lost Creek in the McKenzie drainage in January, 1992, and an unspecified number of ducks was reported from the McKenzie in late February, 1991.

Pairs are seen on breeding streams in greatest numbers between the second week of April and the end of May, though a few records of pairs can be found through June. Some of these late observations appear to represent late-nesting or non-nesting pairs (Dowlan 1996). In September 2007 a female with young was photographed on the Powers RD (J. Lowe 2007, pers. com.).

Inland, the harlequin duck dives for food in strong currents or fast-flowing streams, looking for prey on or near the bottom. Their diet is almost exclusively aquatic invertebrates, but also insects and a few small fish (Bellrose 1976).

Harlequin ducks typically nest on the ground in well-concealed locations, usually on mid-stream islands (Wiggins 2005) although successful nest sites have also been located in tree cavities or cliff ledges which afford safety from high water (Street 1999). Occasionally harlequin ducks may nest up to 45m away from a stream (EUG BLM), but nests are typically located close (within 10m) to water and have some degree of vertical cover close to the nest (Bruner 1997; Robertson and Goudie 1999). Nests may also be situated at the base of trees, on piles of woody debris, under fallen logs, or on sheltered banks (Robertson and Goudie 1999). They will sometimes nest beside mountain lakes and lake outlets. They tend to breed in the same area in successive years. The male defends the female until incubation begins, then the pair bond ends (NatureServe 2010). The female harlequin lays her eggs in a mass of down; after the eggs are laid, the male migrates to the coast to molt (Street 1999).

Harlequin ducks have been the focus of management actions in eastern North America, the Pacific Northwest, and in the Rocky Mountain states due to concern over declining populations. Relative to other species of ducks, they occur at low population densities and exhibit high breeding site fidelity, low reproductive rates, and delayed reproduction. All of these traits contribute to making harlequin duck populations particularly slow to recover from habitat degradation or loss (Wiggins 2005).

The primary factors thought to be responsible for local declines in the number of harlequin ducks are the degradation of breeding streams, such as damming, and human disturbance (such as rafting and other river-associated recreation) during the breeding season. In many areas, the vast majority of harlequin ducks breed on National Forest System lands, thus human recreation use of breeding streams during the summer months has the potential to cause stream abandonment or to decrease reproductive success (Wiggins 2005).

Hunting harlequin ducks contributes directly to mortality. Winter hunting is currently allowed in the state of Washington, despite the harlequin being listing as a priority species for the state. Wiggins (2005) has suggested that even a low level of hunting pressure is likely to have a significant impact on population stability in the western United States. Activities such as logging, road-building, and mining may act to increase sedimentation along breeding streams that may affect its food source. Livestock grazing may also represent a threat to harlequin duck nesting habitat. In areas with heavy livestock grazing, livestock may directly disturb nesting activities of female harlequin ducks (Wiggins 2005).

Suitable habitat for the species is not present in the Eden Ridge Timber Sales project area; however, suitable habitat does exist within the watershed outside of the Planning Area. The Eden Ridge Timber Sales Project is a **"No Impact"** determination for the **harlequin duck** because suitable habitat for the harlequin duck does not exist in the project area.

4. Lewis' Woodpecker *(Menalerpes lewis)*

Lewis' woodpeckers are migratory in southwestern Oregon, with sporadically large populations in the winter and scattered breeding pairs in the summer reported. Gilligan et al. (1994) reports that they are common breeders in summer in Jackson and Josephine Counties but in the last 10 years they have not been documented (N. Barrett 2008, pers. com.) and there are few recent breeding records (Janes et al. 2002). This species is closely tied to the ponderosa pine/oak savannah habitats of eastern and southwest Oregon.

Nests are often in large ponderosa pine snags or mature oaks while the birds forage on insects and acorn meat. In winter they store acorn meat in crevices in trees and power poles. Because this woodpecker does not usually excavate its own cavity, they have a close tie to older snags within the forest that are likely to contain cavities and have crevices for food storage.

Conservation: The population of Lewis' woodpeckers has fallen dramatically across Oregon as pine – oak woodlands are lost (Gilligan et al. 1994). A contributing factor in the decline has been the spread of the European starling, which aggressively out-competes this species for available cavities. Habitat loss is due to a wide variety of concerns that include urbanization of valley floors, fire suppression and encroachment of conifer forests, timber harvest of pine components in the oak forests, etc.

This species would benefit from a variety of active management practices designed to enhance large ponderosa pine snags in an open stand. This includes wide spaced thinning of ponderosa pine, and commercial thinning of young pine stands. Snag creation within pine stands would also benefit the species. Treatments that remove the large trees and older snags from stands would be detrimental to the species.

Suitable habitat for the species is not present in the Eden Ridge Timber Sales project area or along the haul route; therefore, a **"No Impact"** determination for **Lewis' woodpecker** has been made for this project.

5. Pacific Fisher (*Martes pennanti*)

Pacific fisher was petitioned for listing by the Center for Biological Diversity and several other environmental organizations in November 2000. After a 12 month review, the U.S. Fish and Wildlife Service found Pacific fisher to be a distinct population segment (DPS) and gave a "warranted but precluded" decision to the petition, designating the West Coast DPS a Federal Candidate species (USDI 2004).

According to reviews, the fisher occurs throughout most of Canada and possibly extreme southeastern Alaska. Its distribution extends south through several forested areas of the northeastern United States. In the western United States, fisher populations are known to occur in western Montana, the Idaho panhandle, the southern Sierra Nevada of California, the Klamath and Siskiyou mountains of northwestern California and extreme southwestern Oregon, and the southern Cascade Range of southwestern Oregon. There has been a recent fisher reintroduction effort in the Olympic Peninsula in 2007 and 2008 (Happe et al. 2008).

The fisher is one of the most habitat-specialized mammals in western North America (Buskirk and Powell 1994). Specialization appears to be tied primarily to denning and resting habitats. The varied diet of fishers suggests they may forage in a variety of habitats.

Fishers use landscapes at different spatial scales for different behaviors and activities (Powell 1994). For example, fishers may establish their home ranges at the landscape scale, forage at the patch scale, and select habitat for resting or denning at the patch scale as well as at a finer scale of habitat characteristics of elements within a patch (Powell 1994, Powell and Zielinski 1994).

In the southern Oregon Cascades, Aubry and Raley (2006) located and typed 641 different resting structures. Fourteen percent of the rest structures were reused by the same animal on more than 1 occasion, and 3 %were used by another radio-collared fisher at some time during the study. Both male and female fishers primarily used live trees for resting. Use of logs and cull piles by females and males was similar. Females used a greater proportion of snags for resting than males.

Both male and female fishers used mistletoe brooms in live trees more than any other micro-site (females 31%, males 21%). Mistletoe brooms in live trees were suspected rest sites for an additional 44 % of live trees used by females, and 33 %of live trees used by males. Rodent nests were used in 24 % of the trees used by male fishers.

Cavities in both conifers and hardwoods are used by fishers for resting. However, to create suitable rest cavities, trees must be old enough to have suffered the type of stresses that create infection courts for heartrot fungi, and large enough to form cavities large enough to be used by fishers (Zielinski et al. 2004). Large trees also provide platform-type resting structures such as mistletoe brooms, clumped branches that support rodent nests, or rust brooms that can support the weight of fishers. Once these large trees die and fall, they become the type of log that fishers have been known to use as rest sites. Removal of understory and mid-story canopies around large structures may also reduce the effectiveness of the structure as a secure rest site because they contribute to the microclimate of the site. Under- and mid-story canopies probably also provide some protection for female and juvenile fishers from predation or harassment by large raptors and mobbing by corvids because sight distance is reduced in dense, multi-storied stands.

In southwestern Oregon, Aubry and Raley (2006) located 13 natal and 18 maternal dens. For natal dens, fishers used both live trees and snags with openings that accessed hollows created by heartwood decay. The most commonly used tree species were incense cedar, true fir, and western white pine. Douglas-fir, incense cedar and true firs were used as maternal dens. Structures used for maternal dens were more variable than those used for natal dens, and included cavities in the bole or butt of large live trees and snags, and large hollow logs (Aubry and Raley 2006). Natal den trees need to be large enough to accommodate a cavity capable of containing an adult female fisher and multiple kits (Aubry and Raley 2006). In the southern Cascades of Oregon, the average dbh and height of live trees used for natal dens was 92 cm (36") and 40 m (131') respectively. The average dbh and height of snags used for natal dens was 89 cm (35") and 26 m 85') respectively (Aubry and Raley 2006).

Fishers appear to be a generalist predator and opportunistic in their foraging strategies, which is reflected in their diverse diet (Zielinski and Duncan 2004, Aubry et al. 2002, Zielinski et al. 1999, Powell 1993). There is some indication of seasonal variation in the fisher's diet (Zielinski et al. 1999) which is likely linked to seasonal abundance of prey and forage species. While fishers require structures provided by older aged or residual stands for denning and resting, they appear to use a wider variety of stands for foraging. Jones and Garton (1994) found that fishers did not use non-forested sites while resting or hunting, but they did use pole-sapling forests for hunting significantly more than for resting. The inclusion of berries in the diet of fishers suggests that they do forage, at least occasionally or seasonally, in more open stands where many fruit-bearing shrubs and forbs are found. Fisher have not been detected in the Analysis Area and there are only 4 records of fisher observations for the Powers Ranger District, the nearest being over 15 miles from a proposed treatment unit.

a. Direct and Indirect Effects

Thinning may reduce existing canopy closure of between 70 to 100%, to between 40 and 50%, which could result in a reduction of denning, resting and foraging habitat for 10-15 years, until shrub and tree canopy closure returns. This would occur incrementally over the life of this project, since the proposed 3,314 acres would be broken into multiple sales over an approximate 5 year span. Some remnant trees may be felled as hazards but would be subject to PDC #9 (see Wildlife Report and EIS Chapter II).

All **Action Alternatives** of the Eden Ridge Timber Sales Project "**may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide**," for **Pacific fisher** because it could result in a reduction of denning, resting and foraging habitat.

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands.

The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years. Density management projects could reduce canopy closure for 10-15 years until the shrub and tree canopies return. Stands that lack remnant tree structure likely only function as foraging habitat for fisher. Density management would likely increase growth and allow young stands to become suitable for fisher sooner than if they were not treated. No USFS projects, which would remove or degrade old-growth/remnant trees (other than safety hazards), are occurring or are anticipated in the project area or Analysis Area.

Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little habitat on private land for Pacific fisher in the Analysis Area because the vast majority of it is non-forested. Jones and Garton (1994) found that fishers did not use non-forested sites while resting or hunting. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

6. Townsend's Big-eared Bat (*Corynorhinus townsendii*)

Townsend's big-eared bats can be distinguished by their enormous ears, up to 40 millimeters in length and by the glandular masses on their muzzles. They are medium sized and have dull, soft hair. Their backs vary from brown, grayish brown, to black, with paler undersides. Their ears are by far the largest ears of any bat along the Oregon coast. Their flight membranes are dark brown and very thin.

They occur in a wide variety of habitats, its distribution tends to be geomorphically determined and is strongly correlated with the availability of caves or cave-like roosting habitat (e.g., old mines) (Pierson et al. 1999). Saul and others (1977) found Townsend's big-eared bats roosting in a variety of structures in southwest Oregon: caves, bridges, abandoned mines, barns and houses. Suitable roosts sites and hibernacula fall within a specific range of temperature and moisture conditions. The species may also use tree cavities for night roosting.

Townsend's big-eared bats seem particularly sensitive to almost any type of disturbance (Verts & Caraway 1998.) They roost in areas seldom disturbed by humans. Roost sites should be protected from disturbance (May to mid September for maternity roosts, and October-April for hibernacula) as human disturbance may cause the bats to permanently abandon roost sites (Maser et al .1981). Roosts commonly are deserted and the bats move to alternate, frequently less-desirable roosts in response to the mere presence of humans (Humphrey and Kunz, 1976).

Moths make up the majority of the diet for C. townsendii, but they will also ingest beetles, true bugs, and flies. Their flight is slow, and they are able to hover at a point that interests them. In addition to foraging on the wing, it will take insects from foliage.

The proposed project does not affect caves, mines, wooden bridges, or buildings. The Eden Ridge Timber Sales Project would have ~~–~~**No Impact**" on the **Townsend's big-eared bat** because suitable habitat for this species would not be impacted.

7. Fringed myotis (*Myotis thysanodes*)

Csuti et al. (1997) considered this species a cave-dwelling bat, even though most of the specimens they examined were from buildings. It appears to be adapted to living in areas with diverse vegetative substrates. In SW Oregon, *M. thysanodes* appears to be a snag obligate and they are known to roost within and under the bark of snags (D. Clayton, pers. obs.). Fringed myotis are suspected to occur in or near the project area.

Current management direction is the Northwest Forest Plan ROD page C-43. This standard and Guideline provides additional protection for caves, mines and abandoned wooded bridges and buildings that are used as roost sites for bats. There are no documented sightings for the area, however, they are known to occur in the coast range and are suspected to occur within the Analysis Area.

a. Direct and Indirect Effects

The project does not affect caves, mines, wooden bridges, or buildings. As such, no impact is expected to these potential bat roost sites. By design, the project maintains and promotes the development of large trees, large snags and decadent trees which could serve as roosting habitat. However, a few large snags may be felled as hazard trees during this project.

Due to minor direct and indirect effects, the Eden Ridge Timber Sales Project "**may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide**," for all Action Alternatives for **fringed myotis** because there may be some impacts to existing snags or trees with cavities.

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

No National Forest projects, which would impact caves, mines or abandoned wooded bridges and buildings, are anticipated in the Analysis Area or on the Powers Ranger District. These types of "structures" are not known to exist within the Analysis Area. Any cave or mine found within the Analysis Area or on the district would be surveyed for bats and likely fitted with a bat gate. There is potential for some existing snags or trees with cavities to be removed as hazards in conjunction with future Forest Service activities. This could occur on future CHFT thinning projects and hazard tree removal along open roads. Hazard tree removal is likely to have minimal impact to Townsend's big-eared bats.

Activities on private lands within the Analysis Area are likely to have similar impacts. Past and current removal of snags as hazard trees along roads and within timber harvest units occur. There is likely little recruitment of future snags within private timber lands because of regeneration harvest practices. The amount and disposition of abandoned wooded bridges and buildings is unknown, however, the few that are known to exist would not be impacted by the Eden Ridge Timber Sales Project, or any future Forest Service project.

8. Northwestern Pond Turtle (*Emmys marmorata marmorata*)

Northwestern pond turtles are capable of living in a wide variety of aquatic habitats. The northwestern pond turtle inhabits marshes, ponds, lakes, reservoirs, sloughs, and slow moving portions of creeks and rivers (Nussbaum et al. 1983, Stebbins 1985, Brown et al. 1995). Pond turtles may also be found in abandoned gravel pits, stock ponds, and sewage treatment plants (Holland 1994). In the Rogue River drainage, records of pond turtle sightings are almost equally divided amongst rivers, larger-order streams, and small ponds (Holland 1994).

The size of habitats used by northwestern pond turtles is quite variable from place to place. Turtles have been observed using small ephemeral ponds only a few square meters in size (Holland 1994). On the other hand, turtles are also known to live in Upper Klamath Lake which covers an area of several dozen square kilometers. In areas where water is present only part of the year, turtles aestivate in the mud in the watercourse or in upland areas during late summer or early spring (Holland 1994). Pond turtles seem to prefer areas that possess some type of refugia such as undercut banks, submerged vegetation, rocks, logs, or mud (Nussbaum et al. 1983, Stebbins 1985, Holland 1994, Brown et al. 1995). Areas containing basking sites for thermoregulation such as rocks, logs, or emergent vegetation are also preferred (Nussbaum et al. 1983, Stebbins 1985, Holland 1994, Brown et al. 1995). Partially submerged logs, vegetation mats, mud banks, rocks, and tree branches provide areas for sunning (Nussbaum et al. 1983, Stebbins 1985).

There is habitat for northwestern pond turtles within the Analysis Area. However, it is unlikely that any Action Alternative would impact turtles because suitable habitat would not be changed, removed or degraded by the proposed activities. Therefore, a **"No Impact"** determination for **northwestern pond turtle** has been made for the project.

9. Foothill Yellow-legged Frog (*Rana boylii*)

Foothill yellow-legged frogs live in sections of low-gradient streams with exposed bedrock or rock and gravel substrates. They lay their eggs in late spring or early summer, and they attach them to the bottom of quiet scour-pools or riffles in gentle-gradient streams, often where there is only slight flow from the main river. Hatchlings cling to the egg mass initially, and then to rocks. Tadpoles live in pools that often have a connection to the main river flow, but little or no silt. Froglets live in pools with gravel and cobbles.

Adults live in pool edges (often in a deep pool with sedge clumps around the edge), in bedrock at the edge of the main channel or under cobbles at the bottom of the pool (Corkran and Thoms, 1996). This is mainly a frog of rocky or gravelly streams in southwestern Oregon and is seldom seen far from water. Habitat is confined to the immediate vicinity of permanent streams below 1800 feet, including those that may be reduced to waterholes connected by trickles during the dry season (Nussbaum et al. 1983). The FAUNA database contains no records of sightings of foothill yellow-legged frog in the Eden Ridge Timber Sales Analysis Area.

The Eden Ridge Timber Sales Project would have **"No Impact**" on the **foothill yellow-legged frog** because suitable habitat for this species would not be impacted.

10. Mardon Skipper (*Polites mardon*)

Mardon skippers are univoltine, completing one life cycle annually. Adults typically emerge between May and July, but possibly later at higher elevations. Individuals live between five days and two weeks (Potter et al. 2002). A unique feature of this species is that it is reported as spending its entire life cycle in one location, without migration. Its dispersal distance is unknown. Eggs are laid into tufts of *Festuca* spp. bunchgrass upon which the larvae feed for approximately 3 months. Hibernation is believed to occur in the grass as well (USDA and USDI BLM 2007).

Surveys into areas neighboring known populations has expanded knowledge considerably from 37 known in 1999 to over 60 sites in 2004. Additional surveys in 2005 located approximately 11 additional sites in Oregon, and one additional site on the Cowlitz Valley Ranger District, Gifford Pinchot National Forest. In 2005, four new Mardon skipper sites were located on Rogue River National Forest lands 6.5 km north of Medford District BLM sites in the southern Oregon Cascades. The 2007 total of approximately 73 sites is almost double the number of sites known in 1999. However, this increase is likely not due to increased habitat or expanding populations, but instead due to increased survey effort in areas not previously surveyed (Kerwin and Huff 2007).

There is a historical record of the skipper from 2 miles north of Gold Beach just inland of the beach. The skipper has been found at Lone Ranch Beach in Curry County north of Brookings during surveys in 2007 (Ross, 2007). In 2008, another new site was located in the Signal Butte area on BLM land approximately 0.75 miles west of the forest boundary (USDI, 2008). In 2009, a site was located in the Quosatana watershed on the Gold Beach Ranger District. In 2010, another site in the Signal Buttes area was discovered as well as a large site in the East Fork Pistol watershed was discovered. Occupied sites in Curry County have all been in wet serpentine meadow with adjacent dry meadow habitat. These habitat characteristics do not occur in any treatment units. No records currently exist for the Powers Ranger District.

Adult skippers feed on nectar from a variety of herbaceous plants though they also make use of other grass/forbs including such species as common camas (*Camassia quamash*), western buttercup (*Ranunculus occidentalis*), and Idaho blue-eyed-grass (*Sisyrinchium idahoense*). The southern Oregon populations are reported as occupying small (0.5 – 10 ac.) high-elevation (4,500 – 5,100 ft.) grassy meadows with mixed conifer forests.

Witt (2009) indicated an apparent association between this butterfly species and serpentine influenced meadows. In California, the populations are located on serpentine balds dominated by *Festuca idahoensis* in sparse Jeffery pine (*Pinus jeffreyi*) forests. In both the Oregon and California areas, frequent low-intensity fires are considered to have historically played an important role in maintaining grassland plant communities.

The dominant threat to this species is loss of habitat including loss via encroachment by invasive nonnative and native vegetation, and vegetative succession from grassland to forest (Kerwin and Huff 2007).

The meadows in the Planning Area are typically sandstone, not serpentine and are not included in the proposed treatment areas. The Action Alternatives are not expected to impact Mardon skipper habitat and is very unlikely to affect individuals; therefore, the Eden Ridge Timber Sales Project is considered "**No Impact**" for **Mardon skipper**.

11. Johnson's Hairstreak *(Callophrys johnsoni)*

This small brown butterfly occurs in isolated pockets in the western mountains of California up into British Columbia. At lower elevations on the west slope of the Cascade Mountains and in the Coast Range, *M. johnsoni* feeds on *Arceuthobium tsugense* growing on large mature western hemlock in old growth forests. Butterflies fly in the forest canopy most of the time, but may nectar on flowers in open areas along roadsides. At higher elevations in the Cascade Mountains, this species feeds on *A. abietinum* growing on true firs in subalpine forests. Southward, *M. johnsoni* is particularly associated with an *Arceuthobium* growing on Brewer spruce at high elevations in the Siskiyou Mountains of southwestern Oregon and northwestern California (Miller and Hammond 2007). On the RRSNF, range maps indicate a population in the coastal mountains of Coos, Curry and Josephine counties. A second population is in northern Jackson County around Crater Lake National Park.

This butterfly is an old growth obligate and spends much of its time in the tops of mature conifer forests, making survey efforts extremely difficult. They do nectar on some plants, like Oregon grape and males come into damp earth sites, such as seeps and springs. Caterpillars feed on pine dwarf mistletoe (*Arceuthobium campylopodum*) which grows on pines and others conifers. It is also known to use coastal hemlock mistletoe. Timber harvest of mature forests may be a potential threat to this species (NatureServe 2010).

a. Direct and Indirect Effects

Because surveys have not been conducted in the project area and potential habitat may occur in treatment units, all Action Alternatives for the Eden Ridge Timber Sales Project "**may adversely impact individuals, but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range wide**" for **Johnson's hairstreak** due to the removal of overstory trees which may have mistletoe. Adverse effects are limited because the scale of impacts is very small compared to the scale of the distribution of this species and mistletoe would continue to persist within the Planning Area, as should this species if it does occur.

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the project area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years. Since Johnson's hairstreak is an old-growth obligate, it is not expected to occur in any CHFT projects and no USFS projects, which would remove or degrade old-growth/remnant trees, are occurring or are anticipated in the project area or Analysis Area. Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little habitat on private land for Johnson's hairstreak in the Analysis Area. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

12. Coronis Fritillary *(Speyeria coronis coronis)*

A relatively large (~ 3in.) butterfly that occurs in lower Rogue & Illinois River valleys of Jackson and Josephine counties. It is expected in Coos, Curry and Douglas counties and locally distributed in the Siskiyous.

The coronis fritillary inhabits lower elevation canyons and grasslands as well as mid-montane meadows and forest margins and openings (Pyle 2002). Caterpillars spend winter in first instar before feeding (Pyle 2002). In spring larvae feed mostly on Viola hallii, found in rocky serpentine habitats (Hammond pers. comm.). Adults seem to move uphill shortly after emerging, probably in search of nectar (Warren 2005). Adult's nectar on bull thistle, other composites, and chokecherry (Pyle 2002). Females, at least, apparently return to basin habitats later in the season to deposit eggs. The single annual brood flies from mid-May to mid-September.

Rocky serpentine meadow habitat does not occur in the Analysis Area or within proposed units. The project is not expected to impact habitat and is very unlikely to affect individuals. The Eden Ridge Timber Sales Project is considered a **–No Impact –**~~f~~or **coronis fritillary**.

IV. MANAGEMENT INDICATOR SPECIES

Management Indicator Species (MIS) associated with the Siskiyou NF LRMP (USDA 1989) represent the issues, concerns, and opportunities to support recovery of Federally-listed species, provide continued viability of Sensitive species, and enhance management of wildlife and fish for commercial, recreational, scientific, subsistence, or aesthetic values or uses. Management indicators representing overall objectives for wildlife, fish, and plants may include species, groups of species with similar habitat relationships, or habitats that are of high concern (FSM 2621.1).

An indicator species represents all other wildlife species which utilize a similar habitat type. Indicator species act as a barometer for the health of various habitats and will be monitored to quantify habitat changes predicted by implementation of the Forest Plan (1989 pages IV-10 and 11, FEIS page III-102). MIS and habitats include bald eagle (habitat along major rivers), osprey (habitat along large rivers), spotted owl (late-successional forest), pileated woodpecker and American marten (mature/interior forest), black-tailed deer and Roosevelt elk (early successional forest stages, and woodpeckers/cavity nesters (wildlife trees [snags]). Bald eagle and spotted owl are discussed in an earlier section.

The Forest has developed the Siskiyou National Forest MIS Forest-Wide Environmental Baseline and Species Account (Draft: USDA Forest Service) to which this document incorporates by reference. Please refer to this document for background information that includes a more exhaustive review of habitat use and ecology, distribution of the species, Forest-level habitat evaluations, and viability assessments.

A. MIS – RISK ASSESSMENT

Table G-11. Management Indicator Species and Determination of Effect

Species	Determination of Effects
Osprey	No Impact
Pileated Woodpecker	Minimal Impact
Woodpeckers (others)	Minimal Impact
American Marten	Minimal Impact
Black-tailed deer	Minimal Impact
Roosevelt elk	Minimal Impact

MIS and habitats include bald eagle (habitat along major rivers), osprey (habitat along large rivers), spotted owl (late-successional forest), pileated woodpecker and American marten (mature/interior forest), black-tailed deer and Roosevelt elk (early successional forest stages, and woodpeckers/cavity nesters (wildlife trees [snags]). Bald eagle and spotted owl are discussed in an earlier section .

1. Osprey *(Pandion haliaetus)*

Osprey are commonly observed along the South Fork Coquille River, the Rogue River, Elk River and in the Chetco fifth-field watersheds. This species is closely associated with open water (lakes, rivers, and streams). Ospreys historically have required large live trees (usually with broken tops) or large snags for nesting. However, by the mid-1970s they had begun to use artificial nest platforms, poles and other man-made structures (Marshall et al. 2003). Ospreys arrive during early spring (March), nest, and then leave for wintering grounds by October. Their primary diet includes fish and lamprey, which they hunt while in flight. Nests in Oregon are usually located within 2 miles of water and accessible fish populations (Marshall et al. 2003).

The nearest known osprey nest is approximately 1 mile from the haul route and over 3 miles from the nearest treatment unit. Road construction and thinning treatment activities are not likely to occur near any undiscovered nests, because the locations are not close to the main stem of the South Fork Coquille, where osprey are likely to nest. Removal of mature trees, unless determined a hazard, is not expected to occur during the project operations. Therefore it is unlikely that a potential nest tree would be removed or impacted. Therefore, a **"No Impact"** determination to osprey has been made for the Action Alternatives.

2. Pileated woodpecker *(Dryocopus pileatus)*

Pileated woodpeckers are generally associated (feeds and breeds) with the Mixed forest habitat type, and is present in the Oak habitat type. Pileated woodpeckers use mature and older, closed canopy stands for nesting and roosting, but may use younger (40-70 years), closed-canopy stands for foraging if large snags are available; large snags and decadent trees are critical habitat components for pileated woodpeckers; down logs do not appear to be an important foraging substrate for pileated woodpeckers on the west side of Oregon and Washington (Hartwig et al. 2004, Mellen et al. 1992, Raley and Aubry 2006).

In the Coast Range of western Oregon, pileated woodpeckers preferred deciduous riparian habitats and forest stands > 40 years of age for foraging, however, nests and roosts were located only in forest stands > 70 years of age (Mellen et al. 1992). Nests were predominantly in broken topped snags; Douglas-fir was the primary species used, with a few nests in red alder. Roosts were in snags and live trees and significantly larger in dbh than nest trees; Douglas-fir was the predominant species used, but also red alder, big-leaf maple, and western redcedar (Mellen 1987).

The selected alternative for the Northwest Forest Plan was determined to meet the NFMA requirement to provide for a diversity of plant and animal communities (USDA and USDI 1994a). The pileated woodpecker was one of 36 birds determined to be closely associated with late-successional and old-growth forests, with occurrence of large snags necessary for optimal habitat (USDA and USDI 1994b; 3&4-177). A viability assessment was completed by the Forest Ecosystem Management Assessment Team (FEMAT) (1993). The viability outcome for the pileated woodpecker was 100 percent likelihood of Outcome A – "Habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize, well distributed across federal lands" (USDA and USDI 1994b; 3&4-179). This outcome determination was based on provisions of: 1) a large system of late-successional reserves, 2) standards and guidelines for Riparian Reserves, and 3) retention of green trees, snags, and coarse woody debris within the Matrix.

A pileated woodpecker (*Dryocopus pileatus*) habitat relationship model was developed in July 2011 as part of the ILAP (Integrated Landscape Assessment Project). The Wildlife Habitats module was lead by Anita Morzillo of Oregon State University's College of Forestry. The model was developed for western Oregon and Washington.

The Wildlife Habitat Relationship Model (WHR) was developed by reviewing the literature on pileated woodpecker habitat to determine vegetation types and structural stages used by the woodpecker. Each combination of VDDT (Vegetation Dynamics Development Tool) State Class and PVT (Potential Vegetation Type) was determined to be habitat or non-habitat for each VDDT modeling zone.

Table G-12. Pileated Woodpecker Suitable Habitat Based on Literature Review by ILAP

Suitable Size Classes	Suitable Canopy Closures	Suitable Canopy Layers	Suitable Cover Types	Additional Habitat Info
Giant tree (> 30" dbh)	Closed (>60%)	Multi-layered	Douglas-fir	>100 logs/ha with majority > 38cm
Large tree (20 – 30" dbh)	Medium (40-60%)		Douglas-fir/Bigleaf maple/grand-fir	>8 snags/ha with 20% >51 cm dbh
Medium tree (15-20" dbh)			Douglas-fir/hardwoods	

The Forest Service has been implementing the NWFP and monitoring late-successional habitat trends since 1994. The 10-year monitoring report (Haynes et al. 2006) states "…it appears that the status and trends in abundance, diversity, and ecological functions of older forests are generally consistent with expectations of the Plan. The total area of late-successional and old-growth forest (older forests) has increased at a rate that is somewhat higher than expected, and losses from wildfires are in line with what was anticipated." As a result, projects consistent with the NWFP should be expected to maintain viability of late-successional associated species such as the pileated woodpecker.

a. Direct and Indirect Effects

Snags that pose a hazard to project operations would likely be felled and retained (see Attachment A – PDC #12). However, felled snags would still have woodpecker value as down wood foraging habitat. Trees damaged during operations may become future snags or trees with cavities. Additional snags would be created if funding is available. Non-commercial treatments that thin young stands are not expected to increase risks to pileated woodpeckers. This project is expected to have **M - minimal impacts** to these species, but there is the potential that an occasional existing snag or tree with cavities may be impacted.

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the Planning Area.

There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years. Density management projects could reduce canopy closure for 10-15 years until the shrub and tree canopies return. Density management would likely increase growth and allow young stands to become suitable for woodpecker foraging and/or nesting sooner than if they were not treated. No USFS projects, which would remove or degrade old-growth/remnant trees (other than when safety hazards), are occurring or are anticipated in the project area or Analysis Area.

Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little snag habitat on private lands for woodpeckers in the Analysis Area because the vast majority of it is non-forested and most snags are felled for safety purposes during regeneration harvest activities. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

The Eden Ridge Timber Sales project has the potential to cumulatively impact foraging habitats for pileated woodpeckers due to the potential of reducing snag density for operator safety requirements. This effect is expected to be minimal.

3. Woodpecker Group

The **woodpecker group** includes acorn, black-backed, downy, hairy, Lewis', and white-headed woodpeckers, as well as northern flickers and red-breasted sapsuckers. These species are generally associated (feeds and breeds) with oak woodland, Mixed forest, and/or Grassland habitat types. Woodpeckers excavate nests in snags and trees. They also forage in decayed wood. White-headed and black-backed woodpeckers are unlikely inhabitants of the fifth-field watersheds.

Acorn woodpecker *(Melanerpes formicivorus)***:** This species is common in the Rogue Valley and adjacent hills and was thought to be likely extirpated in Coos Co, although a likely wandering or vagrant individual was observed for a period of 4 days in Powers during the spring of 2011 (Lowe pers. Obs. 2011). Typically restricted to oaks, mixed conifer/oak, and tanoak, but uses adjacent stands (Marshall et al. 2003).

Black-backed woodpecker *(Picoides arcticus)***:** This species is rare to locally common near the summit and on the west side of the Cascades. The westernmost extent of its range is in the Siskiyou Mountains. It has been found in most types of conifer forests but observations increase dramatically if the forest contains a high proportion of dead trees. It is most abundant in recently burned or beetle killed forests.

Downy woodpecker (*Picoides pubeseus*): This species is found mostly at low to moderate elevation in deciduous and mixed deciduous-coniferous forests, and less often in coniferous forests (Marshall et al. 2003). All but one of several nest reports from Oregon were in dead trees. A preference is shown for decayed wood for nesting, though sound wood is also utilized (Marshall et al. 2003).

Hairy woodpecker (*Picoides villosus*): This species is resident in forests throughout Oregon with the exception of juniper. It is common throughout most of range, but uncommon to fairly common along the coast and in western interior valleys. Found primarily in mixed-conifer and ponderosa pine forests, as well as adjacent deciduous stands, especially during the breeding season (Marshall et al. 2003).

Lewis' woodpecker *(Melanerpes lewis)***:** This species is associated with open woodland habitat near water. Primarily breeds in Oregon white oak, ponderosa pine, and riparian cottonwood communities and important components of this breeding habitat include open woodland canopy and large-diameter dead or dying trees. Formerly widespread, it is currently common year-round only in the white oak-ponderosa pine belt east of Mt. Hood (Marshall et al. 2003).

White-headed woodpecker *(Picoides albolarvatus)***:** This species occurs mainly in open ponderosa pine or mixed-conifer forests dominated by ponderosa pine. A small population exists in true firs in the Siskiyou Mountains southwest of Ashland. In addition to uncut old-growth, they commonly use areas which have undergone various silvicultural treatments if large-diameter ponderosa pine and other old-growth components remain (Marshall et al. 2003).

Red-breasted sapsucker *(Sphyrapicus ruber)***:** This species is found in moist coniferous coastal forest and mixed deciduous-coniferous forest west of the Cascade crest. Studies in the Oregon Cascades, Coast Range, and S. Washington Cascades showed increasing abundance with stand age and a close association with old-growth forest. Nest cavities are typically in large snags or live trees with decayed interiors (Marshall et al. 2003).

Northern flicker (*Colaptes auratus*): Northern flickers are a common resident throughout Oregon (Marshall et al. 2003). Northern flickers may be encountered in almost any terrestrial habitat, but are generally most abundant in open forests and forest edges adjacent to open country. They typically avoid dense forest (Marshall et al. 2003). Most nests in forested areas are in older open forests, along older forest edges, and in larger-diameter remnant snags (Marshall et al. 2003).

a. Direct and Indirect Effects

Snags that pose a hazard to project operations would likely be felled and retained (see Attachment A – PDC #12. However, felled snags would still have woodpecker value as down wood foraging habitat. Trees damaged during operations may become future snags or trees with cavities. Additional snags would be created if funding is available. Non-commercial treatments that thin young stands are not expected to increase risks to cavity nesting woodpeckers. This project is expected to have **M - minimal impacts** to these species, but there is the potential that an occasional existing snag or tree with cavities may be impacted.

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

Density management effects of this project also combine with those of district-wide pre-commercial, commercial thinning, meadow restoration, and danger tree felling. Approximately 8,634 acres within the Analysis Area are managed by the USFS. There are approximately 300 acres currently being thinned under the Silver Doe Timber Sale within the project area. There are approximately 675 acres of commercial thinning identified under the Coastal Healthy Forest Treatment Project within the Analysis Area. Around 50 acres are currently being treated and treatments on the remaining acres may occur within the next 10 to 15 years.

Density management projects could reduce canopy closure for 10-15 years until the shrub and tree canopies return. Density management would likely increase growth and allow young stands to become suitable for woodpecker foraging and/or nesting sooner than if they were not treated. No USFS projects, which would remove or degrade old-growth/remnant trees (other than when safety hazards), are occurring or are anticipated in the project area or Analysis Area.

Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little snag habitat on private lands for woodpeckers in the Analysis Area because the vast majority of it is non-forested and most snags are felled for safety purposes during regeneration harvest activities. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

The Eden Ridge Timber Sales project has the potential to cumulatively impact foraging habitats for cavity nesting woodpeckers due to the potential of reducing snag density for operator safety requirements.

4. American marten *(Martes americana)*

Hargis et al. (1999) stated that in North America, American martens are closely associated with mature conifer stands with complete canopy closure, and small (<100m), limited, and interspersed openings that are used as forage areas. Thomas et al. (1993) and Forest Ecosystem Management Assessment Team (FEMAT 1993) list marten as —closely associated" with late-successional and old-growth forests and the old-growth elements of large snags and down logs. The reports also indicate a strong relationship of marten with riparian areas. Buskirk (1992) reported that knowledge is almost completely lacking regarding behavioral or population responses of martens to such landscape attributes as stand size, stand shape, area of stand interiors, amount of edge, stand insularity, use of corridors, and connectivity.

Marten use a variety of structures for rest and den sites. Resting and denning sites offer protection from predation and thermal stress; thus, availability of quality denning sites likely increases the rates of survival and fecundity in marten (Raphael and Jones 1997).

In northwestern California, Slauson and Zielinski (2009) found marten rest sites primarily in old-growth stands, which were used disproportionate to their availability. In serpentine habitats, rock piles and shrub clumps made up 42% of rest sites.

Table G-13. Structures Used as Resting Sites by American Martens in Northwestern California

Structure	Resting Sites	Comments
Snag	37%	Primarily conifer, dbh range 41-140 cm (16-55")
Log	23%	All conifer, diameter range 44-122 cm (17-48")
Live tree	17%	Conifer and hardwood, dbh range 57-165 cm (22-64")
Slash pile	10%	Used by a single male; composed of some large (>60 cm (32") diameter) logs
Rock pile	8%	Used more commonly in serpentine habitats
Shrub clump	6%	
Sample Size	56	

From Table 3 in Slauson and Zielinski (2009), comments added. (Klamath-Siskiyou and N California Coastal Forest ecoregions).

The diet of American marten is highly diverse. In the western United States in winter, most prey are captured beneath the snow surface, but squirrels may be caught in trees (Buskirk and Ruggiero 1994). Snags, downfall, and large woody material provide cover, denning sites, and access points to forage areas below the snow (subnivean habitat).

Zielinski and Duncan (2004) found that in the southern Sierra Nevada, diets of both marten and fisher were more diverse than previously reported for North America. Of the major taxonomic groups, mammals were most common followed by insects and plants (mostly fruits).

An American marten (*Martes americana*) model was developed in July 2011 as part of the ILAP (Integrated Landscape Assessment Project). The Wildlife Habitats module was lead by Anita Morzillo of Oregon State University's College of Forestry. The model was developed for western Oregon and Washington.

The Wildlife Habitat Relationship Model (WHR) was developed by reviewing the literature on American marten habitat to determine vegetation types and structural stages used by the marten. Each combination of VDDT (Vegetation Dynamics Development Tool) State Class and PVT (Potential Vegetation Type) was determined to be habitat or non-habitat for each VDDT modeling zone.

Table G-14. American Marten Suitable Habitat Based on Literature Review by ILAP

Suitable Size Classes	Suitable Canopy Closures	Suitable Canopy Layers	Suitable Cover Types
Giant tree (> 30" dbh)	Closed (>60%)	Multi-layered	Alaska-cedar
Large tree (20 – 30" dbh)	Medium (40-60%)		Cedar swamp habitats
Medium tree (15-20" dbh)			Douglas-fir

a. Direct and Indirect Effects

The FAUNA database contains no observations of marten within the Analysis Area and only 16 for the entire Powers Ranger District between 1979 and 1997, and none since. The nearest recorded sighting is over 7.5 miles from a proposed treatment unit.

Thinning may reduce existing canopy closure of between 70 to 100%, to between 40 and 50%, which could result in a reduction of denning, resting and foraging habitat for 10-15 years when shrub and tree canopy closure increases. This would occur incrementally over the life of this project, since the proposed 3,314 acres would be broken into multiple sales over an approximate 5 year span. Remnant trees, snags and down wood suitable for denning & resting would be retained per PDC # 9 Attachment A, however some may be felled and retained. The Eden Ridge Timber Sales Project is considered **M — ~~may~~ affect some individuals or some habitat but effect is minimal**" for **marten**

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion of the proposed project area.

Present and foreseeable future actions that may affect terrestrial wildlife species or habitats on the Forest include: wildland fire, fuels treatments, developed and dispersed recreation, timber harvest and vegetation treatments, reforestation, restoration, road management, and special uses. All of these activities would be designed to meet the direction provided within the Northwest Forest Plan and the local Land and Resource Management Plans (i.e., Forest Plans), and in accord with Aquatic Conservation Strategy objectives (NWFP 1994, Siskiyou NF LRMP 1989).

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Density management would likely increase growth and allow young stands to become suitable for marten sooner than if they were not treated. No USFS projects, which would remove or degrade old-growth/remnant trees (other than when safety hazards), are occurring or are anticipated in the project area or Analysis Area.

Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. There is little habitat on private land for marten in the Analysis Area because the vast majority of it is in an early successional stage. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

5. Black-tailed Deer *(Odocoileus hemionus columbianus)* and Roosevelt's Elk *(Cervus elaphus roosevelti)*

Black-tailed deer are an edge adapted species using dense hiding cover during the day, emerging in the morning and evening to feed in more open areas (Maser et al. 1981). Throughout much of western Oregon, black-tailed deer reside year-round in relatively flat areas at mid to low elevations, on south facing slopes dominated by vine maple (*Acer circinatum*), huckleberry (Vaccinium spp), and salal (*Gaultheria shallon*) plant communities (Oregon Department of Fish and Wildlife, 2008).

Black-tailed deer rely upon several different successional stages of vegetation to meet their life needs. Areas with heavy canopy closure are used during all seasons. In summer, areas of heavy canopy closure are used to facilitate thermal regulation during periods of high temperatures. During winter, heavy canopy closure moderates temperatures and intercepts snowfall during winter storms. The reduction of snow depth under heavy canopy reduces energetic expenditure during movements of deer and provides areas of browse that would normally be under the snow surface. Areas with little or no overstory canopy cover are important for deer as forage areas. Forest gaps and natural openings provide optimal conditions for shrubs and forbs to grow, which deer depend on for forage.

Quality deer ranges provide both forested conditions for thermal regulation and hiding/escape cover interspersed with open areas for optimal foraging conditions. Decreased canopy closure in young stands should provide increased light and resources for forage plants.

Summer Roosevelt elk forage consists of a combination of lush forbs, grasses, and shrubs high in nutrients and easily digestible. Generally, higher elevation wet meadows, springs, and riparian areas in close proximity to forested stands offer these conditions for the longest period. Such areas provide nutritious forage and moist, cool places for bedding and escaping summer heat and insects (Oregon Department of Fish and Wildlife, 2003).

Elk achieve peak body condition during late summer and fall. Winter survival depends on fat reserves animals are able to store, thus, quality forage during summer and fall is crucial. Additionally, this forage is needed to meet the rigors of breeding and migration for those animals moving to winter ranges. The late summer/fall period can be critical on many elk ranges during drought years (Oregon Department of Fish and Wildlife, 2003).

Winter is when elk survival is severely tested. Day length shortens, temperatures drop, and rain and snow increase. Forage becomes less abundant and accessible, and nutritional quality declines. Elk energy requirements can be high, and during this time they are dependent on stores of body fat. At this time they increasingly seek out an environment that helps minimize energy consumption. Such areas typically provide protection against weather and offer security for minimizing harassment or disturbance. During a typical winter, elk may lose 20 to 25 percent of their body weight. Elk losing more than 30 percent body weight likely will not survive (Oregon Department of Fish and Wildlife, 2003).

Cover is an important component of elk habitat and provides both thermal and hiding properties. During summer it provides cooler, shaded areas for elk to bed during the heat of the day. During winter it provides a warmer, protected environment out of the cold, wind, rain, or snow. Lichens and other plants associated with cover can be an important source of forage for wintering animals. Adequate thermal cover reduces the energy needed by elk and contributes to over winter survival (Oregon Department of Fish and Wildlife, 2003).

Cook et al. (2004), reviewed four thermal cover studies conducted on elk and deer across North America and concluded that they indicate the thermal cover benefit attributed to dense forest cover is probably not operative across a considerable range of climate, including climates in boreal ecosystems of the northeastern United States, maritime ecosystems of the inland Pacific Northwest, and in cold, dry ecosystems of the central Rocky Mountains. Cook et al. (2004) also concluded that the experimental studies outlined above evaluated the weather moderating influences of forest cover (i.e., influences on wind speed, ambient temperature, and long- and short-wave radiation fluxes). They did not evaluate other potentially beneficial aspects of forest cover, which under some circumstances could include enhanced security, reduced snow depth and a better foraging environment. Thus, results of these experimental studies cannot be used to categorically reject all potential benefits of forest cover to elk.

Hiding cover is also referred to as security cover and allows elk to escape and hide from intrusions or disturbances. These intrusions can be human (hunters, vehicles, hikers, etc.) or natural (predators). Factors affecting elk security are topographic relief, vegetation density, and proximity to human activity. Hiding cover becomes more important if other components that provide security are absent. This can be particularly important where predator numbers or human intrusions are high. Inadequate security or hiding cover can make elk more vulnerable to predators, harvest by hunters, or other sources of mortality that can lead to abandonment of traditionally used areas. Regulating hunters can sometimes help, however this provides little benefit if predation and/or other human disturbance are occurring (Oregon Department of Fish and Wildlife, 2003).

Roads are a major contributor to habitat fragmentation because they divide large landscapes into smaller patches and convert interior habitat into edge habitat. As additional road construction and timber harvest activities increase habitat fragmentation across large areas, the populations of some species may become isolated, increasing the risk of local extirpations or extinctions (Noss and Cooperrider 1994).

Heavily roaded areas may contain fewer patches of forest cover large enough to function effectively as habitat for elk. The direct impacts of roads and associated traffic on elk can be summarized in three basic categories: 1) Elk avoid areas near open roads, 2) Elk vulnerability to mortality from hunter harvest, both legal and illegal, increases as open road density increases, and 3) In areas of higher road density, elk exhibit higher levels of stress and increased movement rates (Rowland et al. 2004).

The adverse effects of roads and traffic on both deer and elk are numerous. High road densities and the associated traffic have been shown to decrease habitat quality and increase vulnerability for both deer and elk. Deer and elk are likely to be affected by the following road or motorized trail-associated factors: collisions, hunting, poaching, displacement or avoidance, disturbance at a specific site (Gaines et al. 2003). Elk experience higher levels of stress when exposed to increased road density. Physiological indicators of stress, such as fecal glucocorticoids, have been observed in elk exposed to increased road density and traffic on roads (Millspaugh et al. 2001). Energetic costs of moving away from disturbance associated with roads may be substantial (Cole et al. 1997). During winter, when big-game species are on winter ranges, forage availability and value is generally low due to senescence of grasses and forbs. During this period open roads and the associated traffic have even greater detrimental effects on big-game due to their inability to escape harassment (disturbance) and both legal and illegal hunting pressure due to deep snow. In elk, if body fat is reduced below 9% as animals enter the winter period, the probability of surviving the winter is reduced (Cook et al., 2004).

Numerous studies have demonstrated that elk frequency increases at greater distances from open roads. This response varies in relation to traffic rates, topography, and type of road. Wisdom (2004) found that the consistency of elk selection away from roads appeared to increase with increasing rates of traffic. Generally, higher open road densities increase both legal and illegal harvest of elk. McCorquodale et al. (2003) analyses supported the inference that harvest vulnerability in elk in the south-central Cascades of Washington was strongly affected by the presence and/or density of open roads, but that topographic complexity influenced the likelihood that elk were killed apart from roading effects. Elk experience higher levels of stress when exposed to increased road density. Physiological indicators of stress, such as fecal glucocorticoids, have been observed in elk exposed to increased road density and traffic on roads (Millspaugh et al., 2001). Energetic costs of moving away from disturbance associated with roads may be substantial (Cole et al., 1997).

Wisdom et al. (2005) studied the responses of elk to four (hiking, mountain biking, horseback riding, and ATVs) off-road recreational activities at the Starkey Experimental Forest and Range in northeast Oregon. They found that movement rates of elk were substantially higher during periods of all four off-road activities as compared to periods of no human activity. Within these activities, they found that movement rates of elk were highest during ATV riding in both morning and evening passes. Flight responses in elk were initiated from ATVs from as much as 1,600 yards away. Movement rates and flight responses in deer were not as substantial as in elk however deer tended to seek dense cover when disturbed, which may reduce forage opportunities and a reduction in opportunities to put on needed fat for winter.

Shifts in elk distribution away from roads used by motorized vehicles have been documented across many areas of the western United States (Rowland et al. 2000). Many National Forests in the west have incorporated this information into road density management objectives for big-game winter ranges in their Land and Resource Management Plans. However, road density and the effects of motorized use on elk are not limited to the winter period.

a. Direct and Indirect Effects

Black-tail deer and Roosevelt elk use all successional stages to meet their habitat needs for cover, forage and reproduction. Natural or created openings provide the majority of foraging habitat, which is assumed to be the most restrictive habitat component in this region (Forest Plan FEIS, III-106-107). Deer and elk represent more than 180 wildlife species that need early successional stages to meet some or all of their requirements (Brown, 1985).

Forage habitat is available within existing meadows, harvest units less than 10 years old and open canopy forested areas. Meadows and large grassy areas would be protected from disturbance. Corridors, skid trails, landings, slash piles, equipment operation and road construction will not be permitted within meadows and identified large grassy areas (see PDC # 14 in Attachment A).

Forested conditions provide hiding (vegetation capable of hiding 90% of a standing adult deer or elk at 200 feet or less), thermal cover (a forest stand > 40ft tall with $\geq$ 70% canopy cover) and optimal cover (a forest stand with overstory, sub-canopy, shrub, and herbaceous strata and $\geq$70% canopy). Proposed thinning units currently provide hiding and thermal cover.

Evidence is consistent that vehicular traffic on forest roads evokes an avoidance response by elk. Even though habitat near roads is not denied to elk, it may not be fully used (Lyon, 1983). Christenson et al. (1993) reported that even primitive roads that see little summer use are often used extensively during the hunting season.

Road construction of 10.8 miles of new road, 0.3 miles of temporary road and re-construction of 6.1 miles of unclassified roads could potentially increase harassment. Although temporary roads are scheduled to be closed to motorized use after implementation and the new roads would be closed unless being used for commercial operations, they still provide a vector for additional disturbance to deer and elk during implementation. They are also likely to increase non-motorized use of the area during hunting season and during other recreational activities.

The Eden Ridge Timber Sales project has the potential to improve forage for deer and elk by reducing canopy closure which would allow sunlight to penetrate the canopy and invigorate the grass, forb, and shrub component in the understory on an estimated 3,314 acres. The non-commercial treatment of 363 acres could also provide a forage benefit to big-game. This would depend upon the spacing of the residual stand. More open spacing would provide a greater benefit to big-game by allowing the understory forage component to grow which would increase forage.

The proposed treatment is considered **M –may affect some individuals or some habitat but effect is minimal** for **blacktail deer** and **Roosevelt elk** because of loss of thermal cover and adverse effects due to potential increased harassment from new and temporary roads. The increase in available forage would provide a beneficial effect.

b. Cumulative Effects

Cumulative Effects include the effects of past, present and foreseeable future State, local, or private activities that are reasonably certain to occur within the wildlife Analysis Area. Cumulative effects compound the effects of loss of habitat and harassment potential associated with timber harvest operations and other activities on both private and public lands. The Eden Ridge Timber Sales Planning Area is basically an island of Forest Service land, surrounded by Private and Bureau of Land Management land. Due to the private ownership status of the area surrounding the Planning Area, vehicular access by the public is limited to only the eastern portion.

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Plum Creek Timber owns approximately 30,000 of the 39,731 acres within the Analysis Area. These acres are on an approximate 40 year regeneration harvest rotation. Because of the current land management practices on these private lands, large amounts of forage habitat for deer and elk exist, however there is little hiding cover as a result. The remaining approximately 444 acres of the Analysis Area are managed by the Bureau of Land Management (BLM), whose management practices are similar to the USFS.

V. OTHER RARE OR UNCOMMON SPECIES

A. NORTHWEST FOREST PLAN SURVEY AND MANAGE SPECIES

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in Conservation Northwest, et al. v. Sherman, et al., No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the Final Supplemental to the 2004 Supplemental *Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007). In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

The Eden Ridge Timber Sales Project is consistent with the Siskiyou National Forest Land and Resource Management Plan as amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD), as modified by the 2011 Settlement Agreement.

The Eden Ridge Timber Sales Project applies a 2006 Exemption from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in *Northwest Ecosystem Alliance v. Rey*, No.04844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management. Also known as the Pechman Exemptions, the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

a. Thinning projects in stands younger than 80 years old:
b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and
d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Per the 2011 Settlement Agreement, the 2006 Pechman Exemptions remain in force:

"The provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash. Oct. 10, 2006), shall remain in force. None of the following terms or conditions in this Settlement Agreement modifies in any way the October 2006 provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04844-MJP (W.D. Wash. Oct. 10, 2006)."

The Eden Ridge Timber Sales Project meets Exemption a. because it entails no regeneration harvest and entails thinning only in stands less than 80 years old (USDI and USDA 2011).

Currently all treatment stands for all Action Alternatives are under 80 years of age and do not require Survey and Manage Surveys. Based on the Silvicultural Diagnosis and stand exams, the proposed stands range from 53 to 73 years of age in 2011 (see stand exam information in EIS Chapter II).

The 2011 Settlement Agreement states:

"For projects with signed Records of Decision, Decision Notices, or Decision Memoranda from December 17, 2009, through September 30, 2012, the Agencies will use either of the following Survey and Manage species lists:

a. The list of Survey and Manage species in the 2001 ROD (Table 1-1, Standards and Guidelines, pages 41-51).
b. *The list of Survey and Manage species and associated species mitigation, Attachment 1 to the Settlement Agreement."*

The Eden Ridge Timber Sales Project applies the Survey and Manage species list in the 2001 ROD (Table 1-1, Standards and Guidelines, pages 41-51) and thus meets the provisions of the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, as modified by the 2011 Settlement Agreement.

1. Del Norte Salamander *(Plethodon elongates)*

This species occurs in talus slopes protected by overstory canopy that maintains cool, moist conditions on the ground. The species is a slope-valley inhabitant, and sometimes occurs in high numbers near riparian areas. Riparian Reserves, in combination with Late-Successional Reserves and other reserves, will offer some protection to the species but substantial numbers also occur in upland areas.

Additional mitigation options in this upland matrix include identifying locations (talus areas inhabited by the species) by using a standardized survey protocol [no longer required; the species is in Category D], then protecting the location from ground-disturbing activities. Designate a buffer of at least the height of one site-potential tree or 100-feet horizontal distance, whichever is greater, surrounding the location. Within the site and its surrounding buffer, maintain 40 percent canopy closure and avoid any activities that would directly disrupt the surface talus layer. Partial harvest within the buffer may be possible if 40 percent canopy closure can be maintained; in such cases, tree harvest must be conducted using helicopters or high-lead cable systems to avoid compaction or other disturbance of talus (PDC #4 Attachment A).

There are 46 known Del Norte Salamander locations within the proposed units and one within a proposed non-commercial unit (Table G-15). All historical locations would be identified and given a protection buffer as described above. These buffers overlap multiple proposed treatment units in some cases. This Project (all Action Alternatives) is considered **M –may affect some individuals or some habitat but effect is minimal.**

Table G-15. Known Del Norte Salamander Locations

Alt 2 – Unit #	Del Norte Sites		Alt 3 – Unit #	Del Norte Sites		Alt 4 – Unit #	Del Norte Sites
006	1		006	1		006	1
211	1		211	1		211	1
303	1		215	6		215	7
308	2		303	1		322	3
322	3		307	2		323	6
323	2		322	3		326	8
326	8		323	2		331	2
329	6		326	8		332	1
331	2		329	6		334	2
332	1		331	2		341	4
333	6		332	1		342	2
334	7		333	6			
340	7		334	4			
341	5		341	4			
342	2		342	2			
Alt 2 – Road #Q4 1 site							
Non-Commercial Unit #906 1 site							

Note: Some Protection Buffers overlap multiple units

2. Oregon Red Tree Vole (*Arborimus longicaudus*)

The Oregon red tree vole is a nocturnal, arboreal mammal specialized in feeding on needles of Douglas-fir and other coniferous trees (Maser 1998). The species is endemic to western Oregon (Verts 1998) primarily in coniferous forests of western Oregon (Csuti et al. 1997, Maser 1998). Red tree voles are most commonly found in Douglas-fir but may also be found inhabiting Sitka spruce and western hemlock in coastal areas. Red tree voles are usually associated with old-growth forests; however, they may occur in younger stands and may not be dependent on old growth for survival (Aubry et al. 1991, Corn and Bury 1991, Gilbert and Allwine 1991). Nests are constructed of twigs and discarded resin ducts in the canopy of larger trees (Csuti et al. 1997, Maser 1998). Larger trees, at least 25 to 30 years old, are selected because they can provide the structural support for nests as well as adequate protection from inclement weather.

In southwestern Oregon, the largest available trees are selected for nesting, even in old growth (Carey 1991). Abandoned nests of birds and other small mammals are also used (Maser 1998). The home range of the red tree vole is one or more trees (Brown 1985) and they can spend their entire lives in the forest canopy (Carey 1991).

Portions of the Eden Ridge Timber Sales Project were surveyed to protocol in 2001. Eighteen of 24 nest trees confirmed in the Planning Area were found in proposed treatment units. Current Survey Protocol states: "Survey results using this protocol should be considered valid for 5 years after completion of the survey." Although the surveys are no longer valid, all confirmed nest trees have been identified and marked as Wildlife Trees to Protect.

Proposed treatments are expected to impact 3,314 acres of potential red tree vole habitat. Trees with undiscovered red tree vole nests may be cut or blown down following treatment. Thinning would isolate individual tree canopies and reduce the current inter-connected tree canopies. This Project (all Action Alternatives) is considered **M –may affect some individuals or some habitat but effect is minimal.**

3. Great Gray Owl *(Strix nebulosa)*

Within the range of the northern spotted owl, the great gray owl is most common in lodgepole pine forests adjacent to meadows. However, it is also found in other coniferous forest types. In some locations, such as on the Willamette National Forest west of the crest of the Cascade Range, at least some shelterwood harvesting seems to be beneficial for the species by opening up otherwise closed canopy cover for foraging. In doing so, consequences to species such as northern goshawk and American marten must be evaluated. Specific mitigation measures for the great gray owl, within the range of the northern spotted owl, include the following: provide a no-harvest buffer of 300 feet around meadows and natural openings and establish 1/4-mile protection zones around known nest sites. Protect all future discovered nest sites as previously described.

Great gray owls forage in relatively open, grassy habitat including bogs, natural meadows, open forests and selective/regeneration harvest areas. Diet in western US is primarily pocket gophers and voles. Great gray owls tend to select nest sites in mature or remnant old-growth mixed-conifer forests near openings (within 200m of openings) that have sufficient prey numbers (Platt & Goggans, 1992). Suitable nesting habitat adjacent to natural openings 10 acres and larger is necessary to be surveyed.

The FAUNA database contains one incidental sighting of a great gray owl within the Siskiyou portion of the Rogue River-Siskiyou National Forest. This location is over 2 miles from the nearest proposed treatment unit and over 4 miles from the nearest meadow or natural opening within the project area. There are no natural meadows 10 acres or larger within the Planning Area.

This project will have **NI** – **no impact** to great gray owl because suitable nesting/foraging habitat does not occur within or near the project or Planning areas.

B. PROTECTION BUFFER SPECIES

Under the 2001 ROD, Standard and Guidelines for certain cavity nesting birds, Canada lynx, and some bat roosts (protection buffer species) were identified as in the NWFP, 1994. Species potentially in the project area include bats that use caves, mines, and abandoned wooden bridges and buildings. Other protection buffer species: Canada lynx (*Lynx canadensis*), white-headed woodpecker (*Picoides albolarvatus*), black-backed woodpecker (*Picoides arcticus*), flammulated owl (*Otus flammeolus)*, and pygmy nuthatch (*Sitta pygmaea)* were not considered because the Eden Ridge Timber Sales Project is outside the known range for their species.

Bats that use caves, mines and abandoned wooden bridges and buildings. The project does not affect caves, mines, wooden bridges, or buildings. As such, no impact is expected to these potential bat roost sites. By design, the project maintains and promotes the development of large trees, large snags and decadent trees which could serve as roosting habitat. However a few large snags may be felled with this project (i.e., hazard trees). This project **M –may affect some individuals or some habitat but effect is minimal** to these species. There may be some impacts to existing snags or trees with cavities.

VI. NEOTROPICAL MIGRATORY BIRDS

In 1918 the Migratory Bird Treaty Act (MBTA) was passed to enforce a treaty between the United States, Mexico, and Canada. This law addressed the issue of poaching migratory birds - Under the M33TA, except as permitted by regulation, it is unlawful at anytime, by any means or in any manner, to pursue, export, import, transport, or carry any migratory bird. It is the position of the Federal Government that the prohibitions of the MBTA do not apply to land management activities of Federal agencies or their employees acting in their official capacities.

In September, 2000, the USDA Forest Service Land Bird Strategic Plan was distributed. This plan set forth goals and actions to assist meeting the Forest Service commitment to provide habitat for sustainable resident and migrant landbird populations and monitor their populations through time. An Executive Order (EO) 13186) was signed in 2001. Provisions within this document directed agencies to integrated bird conservation principles, measures, and practices into agency planning process, restore and enhance habitat of migratory birds as practicable, and ensure that analysis evaluates the effects of actions on migratory birds, especially species of concern.

In December, 2008, the USDA Forest Service and USDI Fish and Wildlife Service signed a Memorandum of Understanding (MOU) to Promote the Conservation of Migratory Birds (USDA, USDI 2008). The purpose of this MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds. Focus first on species of management concern along with their priority habitats and key risk factors. Within the National Forest System, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales. The Rogue River-Siskiyou NF is within Bird Conservation Region 5 (Northern Pacific Forest).

A. MIGRANT BIRD SPECIES AND ASSOCIATED HABITAT

This analysis is based on neo-tropical migratory birds/land bird focal species identified by Partners in Flight (PIF): Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington. As per the Partners In Flight Bird Conservation Plan —.. if you provide all of the habitats to some degree over some landscape, then you will probably be taking care of most if not all of the landbirds in that habitat. The conservation emphasis is on ecosystems, habitats, and habitat conditions, not species."

Table G-16. Focal Migrant Bird Species and Associated Habitat

Habitat	Condition	Habitat Attribute	Bird Species
Coniferous forest	Old-growth / Mature	Large snags	Vaux's swift, pileated woodpecker
Coniferous forest	Old-growth / Mature	Large trees; conifer cones; mid-story tree layers	Brown creeper; red crossbill; varied thrush
Coniferous forest	Mature / Young	Varied canopy closure; deciduous canopy & understory; complex forest floor	Hermit warbler, Hammond's flycatcher; Pacific-slope flycatcher; Wilson's warbler; winter wren, Northern goshawk, purple finch
Coniferous forest	Young / Pole	Deciduous canopy	Black-throated gray warbler
Coniferous forest	Pole	Deciduous subcanopy / understory	Hutton's vireo
Coniferous forest	Early-seral	Residual canopy trees, snags, deciduous vegetation; nectar-producing plants	Olive-sided flycatcher; western bluebird; orange-crowned warbler; rufous hummingbird
Coniferous forest	Unique	Mineral springs	Band-tailed pigeon
Coastal scrub	Early-seral	Coastal fog belt, dense riparian shrub.	Allen's hummingbird
Oak woodlands (including non-forested prairie)	Unique		California quail, western screech-owl, Nutall's woodpecker, oak titmouse, wrentit, California thrasher, black-chinned sparrow, Oregon vesper sparrow, horned lark
Cliffs, waterfalls & forest	Unique	Cliffs near waterfalls within forested habitat.	Black swift
Riparian	Riparian	Large trees adjacent to major rivers. Dense shrub habitat.	Bald eagle, willow flycatcher
Large cliffs	Unique		Peregrine falcon

1. Direct, Indirect, and Cumulative effects

Vaux's swift and pileated woodpecker are associated with large snags; effects to these species would be minimal as PDFs retain snag components in units and if funding is available, more would be created following treatment. The brown creeper; red crossbill and varied thrush are identified as old-growth/mature obligate species. Remnant trees and minor species including hardwoods would be retained thus having minimal effect to this species grouping. Hermit warbler is closely associated with a densely closed Douglas-fir canopy. Thinning treatment impacts have been reported as a 1-3 year slight reduction in relative abundance and abundance levels are similar to those in untreated stands in 5-15 years. (PIF, 1999). Hammond's flycatcher; Pacific-slope flycatcher, Wilson's warbler, winter wren, Northern goshawk and purple finch are most closely tied to deciduous canopy and complex forest floor/understory habitat which would be retained /increased in treatment prescriptions, therefore having minimal to beneficial effects to the species overall.

Some species such as Olive-sided flycatcher; western bluebird; orange-crowned warbler; Rufous hummingbird may decrease in the short term because habitat may be removed during landing clearing and temporary road construction. Effects to the peregrine falcon and bald eagle are addressed in the Sensitive Species section of this report.

Because of the limited acres of dry land grass sites, the biggest concern with NTMB on Forest Service lands may lie in degradation of riparian habitat, and subsequent loss of brush cover favored by many species (Bock et al. 1992). Riparian habitat in the project area would not be altered or impacted by the proposed activities since the Riparian Guidelines (USDA FS 2006) provide protection (no treatment within 25 feet) of riparian habitat. Since the majority of the species occupy or require a riparian habitat component; the proposed project would not be impacting this habitat type.

Overall, potential population numbers for grass and shrub nesting birds are expected to increase. The long term impacts of fuels reduction may have beneficial impacts by maintaining grasses by reducing brush competition for available space.

Another benefit is the creation of some snag trees (usually 0.5 - 1 per acre) caused by logging activities or scorching from burning; although there are mitigations to help limit this, some may occur; thus creating some foraging and nesting habitat for woodpeckers and secondary cavity nesters. For those species dependent on acorns, reducing conifer encroachment on oaks helps to maintain and increase growth of oaks, thus benefiting bird foraging habitat. Lastly, the remnants of some unburned or partially burnt piles may benefit nesting and cover habitat in areas that currently lack these components.

Disturbance from operations and smoke during the nesting period is also a concern for NTMBs. Efforts should be made to reduce impacts to nesting birds that may be present in the project area that may be directly impacted by operations. Timing of operations should occur outside of the spring breeding/nesting season as much as possible (May 15 to July 15).

Effects to NTMBs from the Action Alternatives are variable depending on the habitat associations of the individual species. Impacts to habitat for some species may occur from commercial thinning of mature and younger forests, hazard tree felling, landing clearing/road construction. However, due to the limited amount of area affected by these projects, relative to the availability of habitats within the watersheds and forest, effects to NTMBs are expected to be (**M**) minimal.

VII. DOWN WOOD AND SNAGS

Observations based on an informal walk through candidate stands prior to 2009 by the previous district silviculturist noted large woody material (LWM), 20 inch plus diameter at breast height (dbh), limited on the forest floor. Where observed, LWM was in the decomposition class 4 and 5 range (soft). Standing snags over 16 inch diameter are also limited with most snags being within the 8 to 11 inch diameter range.

Current Condition – Down Wood
Down woody material (large and small) fulfills a number of important ecological functions such as stabilizing surface soils, increasing organic content in soils over the long-term, providing habitat for the many organisms that depend on snags and down logs in various stages of decay, and ensuring adequate coarse woody material recruitment to meet the ecological needs of aquatic systems over time.

Existing snag numbers are expected to be low due to stand age, and site-specific observations. Most thinning at the age treatment is being proposed (60 to 80 years old) are currently lacking snags of sufficient size (14 inch dbh and above). Under the Action Alternatives, snags and down wood would be retained to support ecosystem function (PDC #12; Attachment A). Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem (SIS LRMP 1989). CWM already on the ground would be protected from disturbance to the greatest extent possible during logging and other land management activities that might destroy the integrity of the substrate.

Current Condition – Snags
Currently there are scattered snags in ER due to stand density, past fires and forest disease conditions causing tree mortality. Snags are deficient in two of the vegetation polygons inventoried in the eastern portion of the Planning Area, small 7 to16 inch snags are present in an older stand in the western portion near Coal Creek and scattered larger 20+inch snags are present in the non-commercial units west of the 5000 Road.

Field reconnaissance in combination with GPS location waypoints during summer 2011 noted clumps of five (5) to twelve (12), four (4) inch to thirty (30) inch diameter standing snags occurring in Port-Orford-cedar root disease pockets (*Phytophthora lateralis)* in the southern portion of the Planning Area adjacent to the 5000 Road. POC is not considered a desirable tree species for wildlife use as snag habitat[2].

Land and Resource Management Plan (LRMP)
The Siskiyou National Forest LRMP (1989) is the existing policy direction for snags and coarse down wood objectives. However, scientific studies on wildlife habitat (Johnson, O'Neil, 2001) have determined that snag retention based on biological potential is a flawed technique. This technique was used for determining snag requirement standards and guidelines in the LRMP.

The Southwestern Oregon Provincial Interagency Executive Committee requested a province-wide process be developed for determining levels of snags and down woody material in forests in the late 1990s. As a result, landscape stratification based on Plant Association Groups (PAGs), was developed across the Forest.

A key element of desired conditions for PAGs is down dead woody material. Existing large woody material varies depending on past logging operations and PAG in southwest Oregon. Desired levels of dead wood were modeled by PAG, based on Ecology Plot data, adjusted by past conditions with consideration of the DecAID[3] advisory system. These models were intended to be used as a baseline for managers to develop prescriptions for landscape management. Treatment units proposed for ER are within the maritime western hemlock PAG model derived from this process (Siskiyou NF, 2000).

Ecological processes within PAGs vary due to changes in climate, topography and soil. Each PAG has a mean and range for snags and down wood derived from ecological plot data. Recommended means and ranges (standard deviations) are broken into diameter classes: 6 to 9 inches, 10 to 19 inches and 20 inches and greater and into decay classes: 1 through 5 (Siskiyou NF, 2000; White et al., unpubl.).

Because the Forest's PAG data is at a finer scale, the Forest is currently using plant series data from new PAG classifications, delineated by geographical regions (Cascades, Siskiyous, Coast), for determining snag and down wood objectives on the Rogue River-Siskiyou National Forest[1].

Snag Recommendations
The LRMP specifies a desired snag quantity of 185 to 235 snags per 100 acres delineated into hard and soft 11+, 15+, 17+ and 25+ snag diameter classes to maintain habitat capability of woodpeckers (indicators of cavity nesting species) at not less than 60% of potential population levels (LRMP, IV-33 to 36). Snag quantities are dependent on woodpecker species present in the treatment area.

As previously discussed, the Forest is choosing to use plant series data derived from new PAG classifications to determine snag and down wood objectives

Table G-17 displays snag data (trees per acre) recently derived for the western hemlock plant series in the coast geographic region.[4] This data reflects snag quantities present in older stands derived from numerous PAG inventory plots and represents desired snag quantities (trees per acre) to develop in candidate units post-treatment.

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[2] Pers conv. David Clayton, Rogue River-Siskiyou National Forest Wildlife Biologist, January 18, 2012

[3] DecAID is a wood advisory tool for Washington and Oregon forests and is based on *Habitat Model for Wildlife Tree Retention*. USDA Forest Service, Region 6, Portland Oregon: Kim Mellen (editor) 2003. The title can be read as decayed wood advisor and management aid "decay-aid" or "decision-aid".

[4] Hochhalter (et al.) Ecology Group, Southwest Oregon Province, plant series data from PAG plots.

Table G-17. Snag Data for Western Hemlock Plant Series

COAST - Snags		
SERIES	**Diameter**	**Average TPA**
Western Hemlock	0-10"	28.64
Western Hemlock	11-19"	7.93
Western Hemlock	20"+	6.27

Large snags over 20 inch diameter are particularly essential for forest function. In addition, at least 96 wildlife species in Oregon and Washington are associated with snags in forests, using snags for shelter, roosting and hunting. Most species use snags greater than 14 inch diameter (Rose et al. 2001). Ridges, upper thirds of slopes, and riparian areas or lower third of slopes are especially important for late-successional dependent species. Snags in various size classes also are important to the recruitment pathways of the down, coarse materials important to soils.

In areas where past management has resulted in a lack of large snags needed for cavity nesting species, snags would be created from live trees left in stands. Whenever possible, creation of a minimum of 2 or more snags per acre over 20 inch dbh within all commercially treated units should be part of each silvicultural prescription. Creation can be through girdling, topping the trees with chain saws, blasting, inoculation with heart rot fungi, or deliberate injury. These methods would open the trunk to development of a hollow core used by woodpeckers and a variety of other birds, mammals, and other wildlife.

Evaluations would occur after density management treatments to assess potential needs for snag/down wood creation. In areas lacking adequate amounts of down woody material (include snags in calculations), green trees may be felled. Any Leave Trees damaged during harvest operations will be left standing or felled for safety, but left on site (PDC #12 Attachment A). The intent is to provide future snags or trees with cavities or deformities utilized by wildlife.

Large Wood Recommendations

As with snags, down logs are important for wildlife and aquatic ecosystem function. In addition, large coarse woody material is particularly important to maintaining and holding soils in place. The following table displays down wood data (pieces per acre, tons and size) for the western hemlock plant series in the coast geographic region[5] and represents desired down wood quantity and size objectives.

Table G-18. Down Wood Data for Western Hemlock Plant Series

COAST – Down Wood				
SERIES	**DIAMETER**	**Average PIECES PER ACRE**	**Average TONS**	**Average LENGTH (feet)**
Western Hemlock	0-10"	110	3	63
Western Hemlock	11-19"	52	11	64
Western Hemlock	20"+	35	38	111

Under the Action Alternatives, snags and down wood would be retained to support ecosystem function (see Wildlife Report). Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem (SIS LRMP 1989). LWM already on the ground would be protected from disturbance to the greatest extent possible during logging and other land management activities that might destroy the integrity of the substrate.

[5] Hochhalter (et al.) Ecology Group, Southwest Oregon Province, plant series data from PAG plots.

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Attachment A

Wildlife Project Design Criteria (PDCs), Mitigation Measures and Opportunities

PDC #	Project Design Criteria/Mitigation Measure	Objective	Where
1	**Canopy cover within proposed stands will be maintained at 40% or greater.** Decadent woody material such as large snags and downed wood will be retained per Forest Guidance (White 1994) providing benefits for spotted owl prey species.	Maintain northern spotted owl dispersal habitat.	**All Units - All Alternatives - Required to meet BABO Consultation**
2	If an active spotted owl nest or activity center is located within or adjacent to a project area, or work activities that produce loud noises above ambient levels, or produce thick smoke that would enter the stand, will not occur within restricted distances of any spotted owl nest site or activity center of known pairs and resident singles between 1 March and 30 June (or until two weeks after the fledging period) – unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt. The restricted zone is 1.0 mile for any unmuffled blasting. This distance may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the blast and nest sites. March 1 – June 30 is considered the critical early nesting period; the action agency biologist has the option to extend the restricted season during the year of harvest, based on site-specific knowledge (such as a late or recycle nesting attempt). The boundary of the prescribed area may be modified by the action agency biologist using topographic features or other site-specific information. The restricted area is calculated as a radius from the assumed nest site (point). Restricted Distances: ≤1 mile for blast of more than 2 lbs. of explosive; ≤1/4 mile for Type I or II helicopters; ≤120 yards for blast of < 2 lbs of explosive and Type III-IV helicopters or single-engine airplanes; ≤65 yards for chainsaws; ≤60 yards for impact pile driver, jackhammer, or rock drill; ≤35 yards for heavy equipment.	Limit harassment and disturbance to Threatened species (n. spotted owl).	Any newly discovered nest site within or adjacent to Project Area. **Restricted: Blasting - All Alternatives - Unit 401, 402, 403. Portions of Road - 5000-210.**
3	If an active spotted owl nest or activity center is located within or adjacent to a project area, delay the project activity until September 30th or until an action agency biologist determines that young are not present. For a given situation, the "~~a~~djacent" distance is determined by the action agency biologist. If any project activity is so close to a known or suspected owl site that the disturbance would flush a nesting spotted owl, curtail the project activity until September 30. The field biologist has the discretion to conduct surveys and determine fledging activity.	Limit harassment and disturbance to Threatened species (n. spotted owl).	Any newly discovered nest site within or adjacent to Project Area. No currently known nest sites impacted by this project.

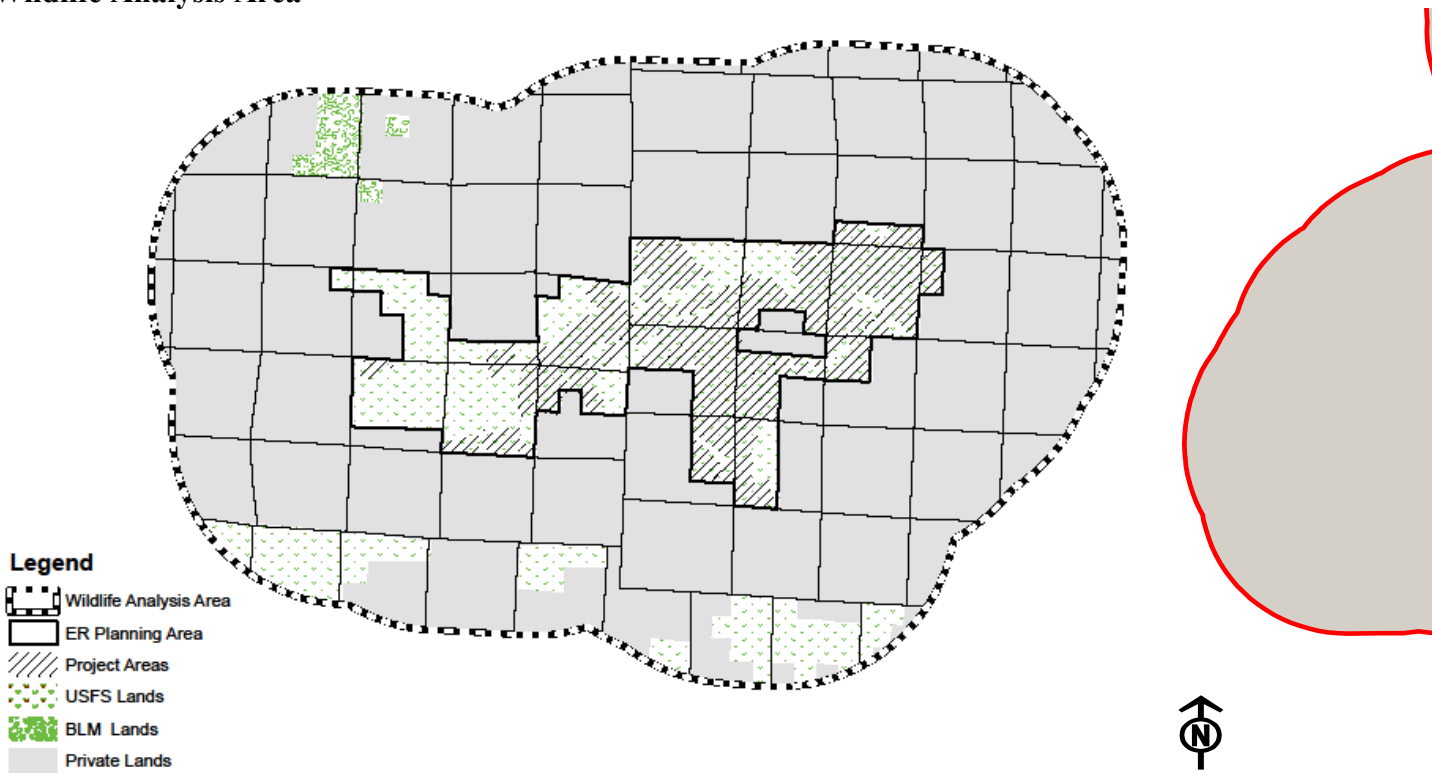
PDC #	Project Design Criteria/Mitigation Measure	Objective	Where
4	Protecting talus habitat from ground disturbing activities, designate a buffer of at least one site potential tree or at least 100' horizontal distance, whichever is greater for all known Del Norte Salamander locations. Maintain at least 40% canopy closure and avoid activities that would disturb the surface talus layer. Partial harvest within the buffer may be possible if 40% canopy closure can be maintained; in such cases, tree harvest must be conducted using helicopter or high lead cable systems to avoid compaction or other disturbance of talus.	Protect all known Del Norte sites from activities that may cause compaction.	Known sites - **Alt 2 Units**: 006, 211, 303, 308, 322, 323, 326, 329, 331, 332, 333, 334, 340, 341, and 342. **Alt 3 Units**: 006, 211, 215, 303, 307, 322, 323, 326, 329, 331, 332, 333, 334, 341, 342 **Alt 4 Units:** 006, 211, 215, 322, 323, 326, 331, 332, 333, 334, 341, 342 **Road Q4 and Non-Commercial Unit 906**
5	Exclude from treatment any stands meeting Recovery Action 32 high-quality spotted owl nesting, roosting, and foraging (NRF) habitat. To be determined by wildlife biologist	Protect n. spotted owl nesting, roosting, and foraging habitat.	All Units
6	As part of implementation, an analysis exercise will be done to determine whether or not any 5-acre portion of a candidate stand contains 6 or more trees with potential late—successional structure. If an area contains 6 or more trees with potential structure, it constitutes potential suitable habitat. Any stand with a potential suitable habitat (remnant late-successional tree component) will be further assessed with a walk-through of the area that would be impacted (USDI, 2006). If a late successional component is confirmed, that portion of the stand (or the entire stand) will be excluded from treatments (including ½ site tree un-thinned buffer).	To protect potential high-quality n. spotted owl nesting, roosting, and foraging habitat and potential marbled murrelet habitat.	All Units
7	For marbled murrelet Survey Areas A and B work activities (such as tree felling, yarding, road and other construction activities, hauling on roads not generally used by the public, muffled blasting) which produce noises above ambient levels will not occur within restricted distances of any occupied stand or unsurveyed suitable habitat between April 1 – August 5. For the period of August 6 – September 15, work activities will be confined to between 2 hours after sunrise to 2 hours before sunset. Restricted Distances: ≤1 mile for blast of more than 2 lbs. of explosive; ≤1/4 mile for Type I or II helicopters; ≤120 yards for all other noises above ambient.	Limit harassment and disturbance to Threatened species (marbled murrelet).	**RESTRICTED:** **All Alternatives - Unit 401.** **Portions of Road - 5000-210.**
8	Clean up trash and garbage daily at all project sites. Keep food out of sight so as to not attract predators [e.g., crows, ravens, and jays (predators on eggs or young birds)].	Limit harassment and disturbance to Threatened species (marbled murrelet) and other bird species.	Project Area
9	Remnant trees will be retained. Remnant trees felled for operational needs will be retained on-site.	Structural diversity for multiple species.	Project Area
10	Protect all existing and newly discovered peregrine falcon nest sites during the courtship period through the dispersal of young (January 1 - July 31). Implement Seasonal Restrictions on All Activities (January 1 to July 31) within disturbance distances.	Manage habitat for Sensitive species (peregrine falcon) viability and maintenance of populations throughout their existing range on the Forest.	Any newly discovered nests. One known nest site impacted by this project. **ALL ACTIVITIES RESTRICTED: Units 401, 402, and 403 (All Alternatives). Portions of Roads - 5000-200, 5000-210, 5000-290**

PDC #	Project Design Criteria/Mitigation Measure	Objective	Where
11	Helicopter landing locations within 1 mile of the known or any newly found peregrine falcon sites will require approval of the district wildlife biologist prior to implementation	Limit harassment and disturbance to nesting Sensitive species – peregrine falcon.	Project Area
12	To the extent compatible with safety provisions retain all snags with tree diameter >=10". Retain on site, all commercial size down-woody material. "Leave-trees" damaged during project operations will be left on site. The intent is to maintain or minimize the loss of existing snag numbers following all treatment activities. All snags felled for safety will remain on site.	Maintain wildlife reserve trees, snags, and down wood for multiple species.	Project Area
13	Leave trees damaged during harvest operations will be left standing or felled for safety, but left on site. The intent is to maintain damaged trees, which may become snags or develop cavities, to contribute to the large woody material needs following all treatment activities.	Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem for multiple species.	Project Area
14	Do not operate equipment in or construct/locate corridors, skid trails, landings, slash piles, or any roads within meadows and identified grassy areas.	Protect grassy areas which provide habitat for deer, elk, and other wildlife.	Project Area
15	In conformance with the marking guidelines, within harvest units, leave up to 4 dominant / co-dominant trees per acre which contain nests, wildlife cavities, structural deformities, and/or damage likely to lead to snag formation.	Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem for multiple species.	All Units
16	Decadent woody material such as large snags and downed wood will be retained per Forest Guidance providing benefits for spotted owl prey species. Multi-canopied, uneven-aged tree structure will remain post treatment, providing important habitat features for spotted owl NRF habitat. If found, no spotted owl nest trees will be removed.	To provide and maintain important habitat features for spotted owl NRF habitat.	Project Area
17	Following harvest operations, if KV or stewardship funding is available, snags will be created by girdling, inoculation, or topping to increase snags to an average of 2 or more snags >20 inches dbh per acre representative of the dominant and co-dominant tree class.	Management activities shall be planned to maintain enough large woody material (dead and down) to maintain a healthy forest ecosystem for multiple species.	All Commercially Treated Units
18	Following harvest operations, if KV or stewardship funding is available, non-commercial treatments to enhance meadow and other grassy area conditions, may be enacted. Treatments may include removal of encroaching brush and conifers, underburning and vehicle access controls. Treatment of these sites would be directed by Wildlife Biologists.	Meadow enhancement, which provide habitat for deer, elk, and other wildlife.	Coal Meadows, Sweeney Meadows, proximity of Alt. 2 Unit 316, and other identified locations within the Project Area but outside of treatment units.

PDC #	Project Design Criteria/Mitigation Measure	Objective	Where
19	Following harvest operations, if KV or stewardship funding is available, Seeding of disturbed sites associated with logging skid trails, landings, temporary roads and burned slash piles will reduce the opportunity for non-native plants(including noxious weeds) to invade disturbed sites and reduce erosion from exposed mineral soils. Seeding exposed mineral soil with native grass seed (~4-8 lbs/acre) will restore and improve forage for wildlife that benefit from grasses and forbs; e.g. deer, elk, mice, rabbits and their predators.	Reduce erosion, provide wildlife forage, and minimize invasive species establishment.	Skid trails, landings, temporary roads and burned slash piles.
20	Following harvest operations, if KV or stewardship funding is available, artificial nest/roost box creation may be appropriate.	Provide nesting sites for cavity nesters.	Any created gaps/openings within all treatment units, meadows or grassy areas, and riparian areas within the Project Area

Attachment B

Wildlife Analysis Area



APPENDIX H

AQUATIC BIOTA REPORT AND BIOLOGICAL EVALUATION
BIOLOGICAL ASSESSMENT

Aquatic Biota
Biological Evaluation & Specialist Report

Eden Ridge Timber Sales

Rogue River-Siskiyou National Forest
Powers Ranger District
42861 Highway 242
Powers, OR 97466

Title Page

Project Name:	Eden Ridge Timber Sales (ER)	
Project Location:		
4th Field HUC	Coquille River	17100305
5th Field HUC	Lower South Fork Coquille River	1710030501
	Middle Fork Coquille River	1710030502
6th Field HUC	Mill Creek	171003050106
	Headwaters S. Fork Coquille River	171003050101
	Coal Creek	171003050105
	Lower Rock Creek	171003050206
	Myrtle Creek	171003050209
Watershed Analyses (WA):	Middle Fork Coquille Analytical Watershed (BLM 1994) South Fork Coquille Watershed Analysis (USFS 1995)	
Land Allocation of Project Area:	Matrix Riparian Reserve	
Administrative Unit:	Powers Ranger District, Rogue River-Siskiyou National Forest	
Prepared By:	Karla Cottom, Fisheries Biologist, Powers RD	
Reviewed By:	Susan Maiyo, Forest Fisheries Biologist, RRSNF	
Document Date:	September 15, 2011	

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ATTACHMENT A

Fish Distribution and Project Activities Map – Alternative 2

I. INTRODUCTION

The overall Planning Area is located on National Forest System Lands within two 5th-Field watersheds, South Fork Coquille River and the Middle Fork Coquille River, which both have Watershed Analyses have been completed. The 6th Field watersheds within these 5th Field watersheds are Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek. Adjacent private timber company lands owned by Plum Creek surround the Planning Area.

The Planning Area for the Eden Ridge Timber Sales (ER) is located on Eden Ridge approximately four (4) air miles southeast of Powers, Oregon. The legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27, Willamette Meridian; Coos County, Oregon

Biological Evaluation Background Information
The Biological Evaluation process (FSM 2672.43) is intended to conduct and document activities necessary to ensure Proposed Actions will not likely jeopardize the continued existence or cause adverse modification of habitat for:

A. Fish species listed or proposed to be listed as **Endangered** (E) or **Threatened** (T) or **Proposed** for Federal listing (P) by the National Marine Fisheries Service.

B. listed as **Sensitive** (S) by USDA, Forest Service.

II. DESCRIPTION OF AFFECTED SPECIES AND HABITAT

A. Threatened, Endangered, and Sensitive Fish Species

In compliance with Section 7 of the Endangered Species Act (ESA) and the Forest Service Biological Evaluation (BE) process for **Endangered**, **Threatened, Proposed** or **Sensitive** fish species (Siskiyou LRMP S&G 4-2; page IV-27), the USDA Forest Service Region 6 Sensitive Species List (January 31, 2008) was reviewed and field reconnaissance was conducted in regard to potential effects on any of these species by actions associated with the Eden Ridge Timber Sales. The results are summarized in the Table H-1 below. Also see Attachment A (Fish Distribution and Project Activities Map).

Table H-1. Potentially Affected Species, Status, and Habitats Assessed (Pacific Northwest Regional Forester's Sensitive Species (List updated January 2008)

Species/Habitat		Pre-field Review	Field Surveys
Common name	**Scientific Name**	**Existing Sighting or Potential Habitat (Yes*/No**)**	**Habitat or Species Confirmed (Yes*/No**)**
Threatened Species			
OC Coho Salmon	*Oncorhyncus kisutch*	Yes	Yes
Critical Habitat			
OC coho salmon	*O. kisutch*	Yes	Yes
Essential Fish Habitat			
Coho salmon	*O. kisutch*	Yes	Yes
Chinook Salmon	*O. tshawytscha*	Yes	Yes
Sensitive Species			
SONCC Chinook salmon	*O. tshawytscha*	No	No

Species/Habitat		Pre-field Review	Field Surveys
Common name	**Scientific Name**	**Existing Sighting or Potential Habitat (Yes*/No**)**	**Habitat or Species Confirmed (Yes*/No**)**
PC chum salmon	*O. keta*	No	No
OC Steelhead	*O. mykiss*	Yes	Yes
Inland redband trout	*O. mykiss*	No	No
Pit sculpin	*Cottus pitensis*	No	No
Western ridged mussel	*Gonidea angulata*	No	No
Klamath rim pebblesnail	*Fluminicola sp.*	No	No
Highcap lanx	*Lanx alta*	No	No
Scale lanx	*Lanx klamathensis*	No	No
Robust walker	*Pomatiopsis binneyi*	No	No
Pacific walker	*Pomatiopsis californica*	No	No
Pristine springsnail	*Pristinicola hemphilli*	No	No

***Yes** – The proposed project"s potential effects on these species will be further analyzed in this document.
****No** – No further analysis is necessary, and a determination of "No Impact" is rendered.

B. Status of Listed Species, Essential Fish Habitat, and Critical Habitat

Oregon Coast Coho Salmon and Critical Habitat (Threatened)
Oregon Coast (OC) coho ESU was listed as Threatened on August 10, 1998 (63 FR 42587). This listing was reevaluated and National Marine Fisheries Service (NMFS) determined listing OC coho was not warranted on January 17, 2006. The listing was once again reevaluated and NMFS determined a listing of threatened was warranted on February 4, 2008 (73 FR 7816). OC coho salmon critical habitat was designated as threatened also on February 11, 2008 (73 FR 7816). Final protective regulations for OC coho salmon were issued on February 11, 2008 (73 FR 7816). On April 28, 2009 NMFS announced that it was initiating a status review of OC coho. On May 26, 2010, NMFS affirmed the listing of the OC coho salmon as Threatened (75 FR 29489).

Critical habitat is defined in Section 3(5)(A) of the ESA as "the specific areas within the geographical area occupied by the species Oregon Coast Coho on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection." Section 7 of the ESA prohibits the destruction or adverse modification of designated critical habitat (CCH).

On the RRSNF, the South Fork Coquille River, though occupied by OC coho, is exempt from Critical Habitat designation due to economic benefits of exclusion outweighing the benefits of designation. Further, marine habitats are not included as critical habitat due to the difficulty in identifying specific areas critical to the species. The habitat indicators addressed in this BE that are pertinent to aquatic habitat health, also represents the primary constituent elements of proposed CH for OC coho salmon. Therefore, this analysis is sufficient for consultation of proposed CH as well.

NMFS developed a list of Primary Constituent Elements (PCEs) that are essential for the conservation of OC coho, and which are based on the life history of the coho salmon. These PCEs are: freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, nearshore marine areas, and offshore marine areas. These PCEs in concert with OC coho distribution data, were used to delineate the spatial extent of the critical habitat. The lateral extent of this designation is limited to the ordinary high water mark (i.e., bankfull elevation). For the purposes of this BE, the PCEs are cross referenced with the respective Habitat Indicators in Table H-2 below.

Table H-2. OC Coho Critical Habitat Essential Habitat Features and Respective Habitat Indicators

PCEs of OC coho Critical Habitat	Habitat Indicator
Freshwater Spawning Sites	Change in Peak/Base Flows, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Substrate
Freshwater Rearing Sites	Change in Peak/Base Flows, Floodplain Connectivity, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Water Quality Indicators, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Off-channel Habitat, Streambank Condition
Freshwater Migration Corridors	Physical Barriers, Change in Peak/Base Flows, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Floodplain Connectivity, Off-channel Habitat, Streambank Condition
Estuarine Areas	Physical Barriers, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Change in Peak/Base Flows, Water Quality Indicators, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Floodplain Connectivity, Off-channel Habitat, Streambank Condition
Nearshore Marine Areas	N/A to RRSNF Actions
Offshore Marine Areas	N/A to RRSNF Actions

Essential Fish Habitat

Interim final rules for Essential Fish Habitat (EFH) under the Magnuson-Stevens Act (16 U.S.C. 1855(b)) were published in the Federal Register/ Vol. 62, No. 244, December 19, 1997 and final rules published in the Federal Register/ Vol. 67, No. 12, January 17, 2002. These rules are pertinent to Chinook salmon and coho salmon habitat within the Southern Oregon Coastal Basin. Essential Fish Habitat (EFH) has been defined by NMFS as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition includes all waters historically used by anadromous salmonids of commercial value.

Because federally listed Threatened fish species and/or critical habitat are present as associated with this project, consultation requirements were conducted in accordance with the ESA (SIS LRMP S&G 4-2). A Biological Assessment was prepared for consultation purposes and is contained in EIS Appendix H (and incorporated by reference into this BE).

Action Area

The Action Area, as defined by the Endangered Species Act (ESA), is all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action [50 CFR § 402.02]. The Action Area not only includes the immediate footprint of the harvest and road related activities, but any downstream reaches which may be affected indirectly. The ESA Action Area is also analyzed for Forest Service Sensitive Species.

The Proposed Action is located within portions of the South Fork Coquille River 5th field and the Middle Fork Coquille River 5th field. Timber harvest, timber hauling and new road construction would occur primarily in Coal Creek 6th Field watershed and in the upper headwaters of 6th Field Watersheds: Headwaters S. Fork Coquille River, Lower Rock Creek and Myrtle Creek. Only timber haul activities adjacent to units would occur within the headwaters of Mill Creek -South Fork Coquille 6th field watershed.

OC Steelhead (Sensitive)
On the RRSNF, Oregon Coast (OC) steelhead occurs within the South Fork Coquille River and Sixes River drainages. The OC steelhead trout distinct population segment (DPS) was proposed as threatened under the ESA on August 9, 1996 (61 FR 41541), but was found not warranted for listing. OC steelhead is currently listed as a species of concern by NMFS and as a Sensitive Species by USFS Region 6.

Other Species (Sensitive)
PC chum salmon, inland redband trout, pit sculpin, western ridged mussel, Klamath rim pebblesnail, highcap lanx, scale lanx, robust walker, pacific walker, and pristine springsnail, are not known to occur or have suitable habitat within proximity to any of the proposed changes included within any of the Action Alternatives. As such, a **No Impact** determination is rendered and these species will not be discussed further within this document.

C. Description of Habitat Environmental Baseline

Information used in this analysis includes Geographic Information System data and Aquatic Habitat Inventories (Forest Service 2010). Properly Functioning Condition ratings are based on the NOAA Table of Population and Habitat Indicators, as modified by the Rogue River/South Coast Level 1 Team for the Klamath Province/Siskiyou Mountains.

Refer to Eden Ridge Timber Sales Biological Assessment, August 2011 for a complete description of the environmental baseline conditions.

This analysis evaluates the direct and indirect potential effects of the proposed actions on Oregon Coast coho, CCH, EFH and OC steelhead trout. There is no potential to affect CCH 8.8 miles downstream, while there is potential to affect EFH and OC steelhead trout. EFH and OC steelhead are located in the Action Area, so any potential effect to one (i.e., EFH) would obviously result in an effect to the other (OC coho).

III. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Under Alternative 1, the No-Action Alternative, no forest management actions would be taken. There would be no thinning activities, road maintenance, or construction activities associated with this alternative.

A. Alternative 2 - Proposed Action

Alternative 2 proposes variable density thinning treatments, Port Orford cedar sanitation and planting treatments, laminated root rot treatment and other connected activities on approximately 3,680 acres within the Planning Area. The stands are located on suitable forest land designated as Matrix and Riparian Reserve land allocations under the Siskiyou National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan. Refer to EIS Chapter II for more detail on these treatments, including location maps.

Approximately 3,314 acres would be designed for timber harvest on 75 units with associated harvest systems that would use a combination of ground-based and skyline operations depending on soil, slope and hydrological concerns. Tractor, or ground-based systems, would be used on approximately 2,119 acres, or 64% of the treated area. Skyline systems would be used on approximately 1,195 acres, or 36% of the treated area. Helicopter systems are not proposed under this alternative but could be an option to reduce environmental effects if economics were favorable. Under this alternative, harvest systems were designed to meet specific environmental protection needs and Forest Plan Standards and Guidelines in the most cost-effective manner.

It is estimated the Proposed Action could produce up to 53 million board feet from the 3,314 acres being considered, from multiple timber sales over approximately five years. Also included in this project is an additional 363 acres of non-commercial silvicultural treatments. Two yarding landings are being *Constructed/Reconstructed* within the Riparian Reserve (RR).

To access the 3,314 acres of treatment, approximately:

- 31 miles of existing roads would be used for *Timber Haul* route;
- 0.3 miles of temporary *Road Construction and Decommissioned* (0.3 miles in RR);
- 6.1 miles of *Road Reconstruction* of existing road or railroad templates (1.4 miles in RR);
- 10.8 miles of *New Road Construction* would be built (1.6 miles in RR); and
- 5.5 miles of *Road Maintenance* within the units.

B. Alternative 3

Alternative 3 would enact the following vegetation management actions: 3,240 acres of commercial variable density management thinning treatments (in several separate timber sales), on 65 Units, producing approximately 52 million board feet of commercial volume; Within the 3,243 acres of treatments, also included are treatments within Riparian Reserves that overlap into overstocked drier upland forests (1,053 total acres).

Ground-based systems would be used on approximately 1,789 acres, or 55%; Skyline systems would be used on approximately 941 acres, or 29%; and helicopter systems would be used on approximately 513 acres, or 16% of the treated area. Use of approximately 31 miles of existing roads, construction of 4.5 miles of new road, construction and decommissioning of 0.03 miles of temporary road, use and reconstruction of 4.1 miles of existing road, use of and maintenance of 5.5 miles of existing road; and 363 acres of non-commercial silvicultural treatments are included.

C. Alternative 4

Alternative 4 would enact the following vegetation management actions: 3,058 acres of commercial variable density management thinning treatments on 53 Units, producing approximately 49 million board feet of commercial volume. Within the 3,058 acres of treatments, also included are treatments within Riparian Reserves that overlap into overstocked drier upland forests (965 total acres).

Ground-based systems would be used on approximately 1,441 acres, or 47%; Skyline systems would be used on approximately 457 acres, or 15%; and helicopter systems would be used on approximately 1,160 acres, or 38% of the treated area. Use of approximately 31 miles of existing roads, use and reconstruction of 1.74 miles of existing road, use of and maintenance of 5.0 miles of existing road; and 363 acres of non-commercial silvicultural treatments are included**.**

IV. DESCRIPTION OF PROJECT ELEMENTS AND DESIGN CRITERIA

A. Overview of Eden Ridge Project Actions

The actions of the project alternatives can be divided into five Project Elements (PE):

1. *Timber Felling and Yarding*
2. *Timber Hauling*
3. *Fuels Treatment*
4. *Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, and New Road Construction*
5. *Other Enhancement Activities*

Table H-3. Summary of Project Elements by Alternative

Project Elements	Alternatives			
	1	2	3	4
1. Timber Felling and Yarding				
Timber Harvest	0 acres	3,314 acres	3,240 acres	3,058 acres
Timber Harvest within RR	0 acres	1,097 acres	1,053	965 acres
2. Timber Hauling				
Timber Haul	0 miles	31 miles	31 miles	31 miles
3. Fuels Treatment				
Fuels Treatment	0 acres	1,600 acres	1,145 acres	1,300 acres
4. Roads				
Temporary Road Construction and Decommissioned	0 miles	0.3 (0.3 miles in RR)	0.3 (0.3 miles in RR)	0.3 (0.3 miles in RR)
Road Reconstruction of existing road or railroad templates	0 miles	6.1 miles (1.4 miles in RR)	4.1 miles	1.74 miles
New Road Construction	0 miles	10.8 miles (1.6 miles in RR)	4.5 miles	0.25 miles[1]
Road Maintenance	0 miles	5.5 miles	5.5 miles	5.5 miles
5. Other Enhancement Activities				
Non-commercial silvicultural treatments	0 miles	363 acres	363 acres	363 acres
Snag/down wood creation, riparian snags, stream enhancement, native grass/forb seeding/invasive plant treatments	None	Yes	Yes	Yes

B. Project Elements and Project Design Criteria

1. Timber Felling and Yarding

a. Timber Felling – Commercial Silvicultural Treatments

The ER project proposes intermediate **c**ommercial harvest treatments using variable density thinning (VDT) techniques and other connected actions on approximately 3,314 acres of second growth conifer stands artificially and naturally regenerated following timber harvest during the 1920s through the 1930s. Design Criteria associated with commercial treatments are detailed in Table H-4.

Commercial treatments would involve harvest (felling and yarding) of conifers with diameters 7 inches and larger DBH which is a viable product size under current and anticipated market conditions. No old residual trees (old growth; trees > 80 years old) would be cut, except for danger trees. Trees could be felled using mechanized feller-bunchers, cut-to-length harvesters, or hand (chainsaw) felling. The acreage of Riparian Reserves to be treated is likely to be less due to some areas not needing treatment.

The primary silvicultural objective for ER is to control existing dense stocking conditions and to treat subordinate amounts of root disease infection within candidate stands to improve forest health and to sustain or increase tree growth and vigor throughout treatment areas including the Riparian Reserve. Felling actives would be designed using VDT techniques. VDT uses a combination of low and crown thinning to release larger dominant and co-dominant trees. Spacing between trees is variable depending on tree diameter distribution on the ground and thinning intensity. Individual stand characteristics would be heterogeneous and post-harvest tree spacing would not have a rigid, grid-like appearance.

[1] Reconstruction along 3 rail grades includes new road construction where stream crossings replace rail trestle bridges.

Table H-4. Overall Design Criteria for Timber Yarding and Felling within Riparian Reserves

Channel	Project Activities	Buffer	Riparian Reserve	PDCRR Name	Range of Commercial Prescriptions Outside of Buffer (TPA)
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 25 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Light Thin = 150-225,
	Density management and commercial extraction allowed.	25 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Light Thin = 150-225,
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 35 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Medium Thin = 90-150
	Density management and commercial extraction allowed.	35 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Medium Thin = 90-150,
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 40 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Heavy Thin = 50-90.
	Density management and commercial extraction allowed.	40 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Heavy Thin = 50-90.
Perennial ***Non-fish*** **Bearing Stream**	*No-cut buffer* (same as Ephemeral and Intermittent	Streamside to 50-60 feet along both sides of channel	**Same as above.**	**Primary Shade Zone** (includes Stream Channel Protection Zone)	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
	Density management and commercial extraction allowed (same as Ephemeral and Intermittent).	50-60 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on *one size potential tree height*.		**Riparian Treatment Zone**	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
Perennial ***Fish*** **Bearing Streams**	*No-cut buffer* (same as Ephemeral and Intermittent	Same as Perennial ***Non-fish*** Bearing Stream	**Two** site potential tree height each side of stream (350 feet each side; total width 700 feet)	Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
	Density management and commercial extraction allowed (same as Ephemeral and Intermittent).	Same as Perennial ***Non-fish*** Bearing Stream, except Riparian Treatment Zone extends from 50-60" buffer limit to edge of *two site-potential tree buffer*		Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.

Intensity of density management prescription treatments ranges from light, medium or heavy thins with a target relative density (RD) of approximately 35-50%. Tree species composition is maintained or enhanced by favoring a diverse mixture of conifers and hardwoods. Trees per acre (TPA), including the Riparian Reserves, is described as light thin equals a range of 150-225 per acres, medium thin equals a range of 90-150 TPA, and a heavy thin equals 50-90 TPA.

Approximately 80% of the treatment would consist of medium thins based on productivity of the landscape. Areas within units that occur on the perimeter of existing openings or are predominately western hemlock may receive no thinning or light thin buffers to prevent wind throw.

VDT may include creation of irregular shaped openings (i.e., gaps) interspersed within some thinning throughout the units, including the Riparian Reserve. Gaps would primarily treat root disease pockets by removing all tree species predisposed to infection. Gap size is estimated to be ¼ to 2 acres depending on extent of root disease and proximity to existing openings on adjacent private timber company lands.

VDT may include no-thin areas (i.e., skips). Skips can be strategically placed to protect hardwood thickets, minor tree species, pockets of large down wood, other unique stand attributes and inaccessible areas.

Wide-thin gaps (WTG) may occur around genetic trees selected for cone collection, Port-Orford-cedar root disease pockets favoring resistant trees, or dominant tree release of desirable trees from competing vegetation. Generally, one (1) to four (4) trees would be retained in WTG. The size of WTG would be approximately ¼ - ½ acre.

Thinning treatments within Riparian Reserves are designed to enhance development of late seral conditions as recommended in the South Fork Coquille Watershed Analysis (1995) by moving stand structure forward by increasing tree growth through density management, creating structural diversity through skip and gap treatments, and to improve forest health and resistance to forest pathogens.

Site-specific silvicultural prescriptions would be developed for each individual stand identified for treatment and address each land allocation classification (Matrix, Riparian Reserve) during implementation. Silvicultural prescriptions would describe the desired future condition; specify tree spacing, target residual density (RD), preferred species, canopy retention, post-harvest treatments and other key stand components. Final silvicultural prescriptions would be approved by a Region 6 certified silviculturist.

VDT treatments would harvest conifers with diameters ranging approximately 7-24 inches and larger. Extracted commercial timber volume is estimated to range 8-20 thousand board feet (mbf) per acre and could potentially yield up to 53 million board feet for the entire project.

b. Timber Felling – Laminated Root Rot Silvicultural Treatments

Laminated root rot (*Phellinus weirii*) disease infection extensively decays roots of susceptible host trees and either causes windthrow or mortality by destroying the tree‟s ability to take up water and nutrients (Hadfield et al., 1986). Windthrow is more common with laminated root rot than other root pathogens. Tree species present in proposed treatment units are listed as follows in decreasing order of susceptibility: Douglas-fir and white fir> western hemlock > Port-Orford-cedar. All hardwoods are immune. Proposed treatment sites would occur outside of the Riparian Reserve since disease infection prefers a drier environment to subsist. These gaps would be openings of ¼ acre in size up to 2 acres located in the upper portions of watersheds. These gaps would be 10% or less of the individual unit and would equal less than 1% of the entire 5th field watersheds.

Laminated root rot is affecting forest health on portions of Eden Ridge Planning Area, particularly in the northern half in forest stands adjacent to FS roads 5000440, 5000440003, and 5000448. Treatments for non-commercial silvicultural treatments are the same as described for the commercial silvicultural treatments, including no-cut buffers. Irregular shaped openings ¼ to 2 acres for tree yield (Matrix) reasons centered on root rot pockets may be created to treat portions of stands infected with laminated root rot. No more than fifteen percent of the acres within each unit would be treated.

Gap Development Treatment
Approximately 330 acres (.1%) of Gap Development Treatment would be treated out of the total project 3,300 acres and is only within the Coal Creek 6th field watershed. These openings would not occur within the watersheds with the same year and would be planted with POC following the treatment.

Treatments would fall all susceptible tree species within and along the perimeter of infection pockets while favoring resistant or immune species for leave trees. Gaps may be site prepared and planted afterwards with Port-Orford-cedar seedlings for stand health and enhance structural and species diversity within a stand.

c. Timber Felling – Port Orford Cedar Root Disease (POC) Silvicultural Treatments

Port Orford cedar root disease (*Phytophthora lateralis*) (PL) treatment consists of Wide Thin Gaps, roadside sanitation and tree planting resistant POC seedlings. Proposed activities would occur mostly in Riparian Reserves.

Wide-Thin Gap Treatments (WTG)
Fall all live POC within PL infection sites. Leave non-susceptible tree species on site. Thin out all live POC within 2 to 3 crown radii (50-100 feet) from last infected POC along the perimeter of infection sites to separate healthy POC from potential root contact with infected POC. Pile and burn all POC slash and follow-up underburn to potentially mitigate disease presence. Sites can be planted with non-susceptible tree seedlings. This treatment would likely be an understory treatment of infested POC seedlings, saplings and small poles and not result in creation of a gap in the overstory canopy.

Roadside Sanitation
The Roadside Sanitation is located on ridge top roads. Treatment would manage for non-susceptible tree species by removing all POC along road sides and high risk sites as follows:

- 100-feet each side of roads at stream crossings.
- 25 feet above roads and 50-feet below roads in areas with measurably contributing POC.

Only one headwater perennial stream crossing is located in a proposed new classified road construction (road „W") for accessing unit 327, which is approximately 4 miles above the CCH habitat. All other treatments if near stream crossings are on ephemeral or intermittent streams. Approximately 104 acres (.031%) of Roadside Sanitation would be treated out of the total project 3,300 acres.

Planting
POC would be restored within its natural range by planting non-PL infested areas with resistant POC seedlings. Also, laminated root rot pockets would be planted with resistant POC seedlings after treatments as described in the section on laminated root rot.

d. Timber Felling -- Non-Commercial Silvicultural Treatments for Instream Enhancement

Removal or thinning of 150 non-commercial sized trees is proposed for 363 acres within the ER Planning Area. When occurring within Riparian Reserve, most of the trees would be directional felled toward the creek for future instream enhancement and left onsite. A few of the trees in Unit 345 or any other unit located near a road and outside of the Riparian Reserve may be removed via log truck and placed instream during a future instream enhancement project.

The purpose of the non-commercial treatments is to improve the health and vigor of Riparian Reserves for future large wood instream recruitment within the South Fork Coquille 5th Field Watershed. The project acres with these stand conditions that would benefit from these treatments are located in Units 900, 901, 902, 903, 904, 905, 906 and 345 (see EIS for detail). Portions of proposed units for non-commercial treatments have high height to diameter ratios on overstory trees and forest health issues with laminated root rot, shallow soils and potential wind throw. Approximately 50 trees per mile would be placed within approximately 3 miles of stream (150 trees total, approximately 22,650 cubic feet of wood). The proposed enhancement is located in resident fish habitat ranging from two miles to seven miles upstream of CCH.

e. Timber Yarding

As noted above, tractor, or ground-based systems, would be used on approximately 2,119 acres, or 64% of the treated area. Skyline systems would be used on approximately 1,190 acres, or 36% of the treated area. Helicopter systems are not proposed under this project but could be an option if economics were favorable. Some terrain would require partial suspension (or full suspension) systems on stands that had previously been cable logged without suspension in the past.

Project Design Criteria for Timber Felling and Yarding

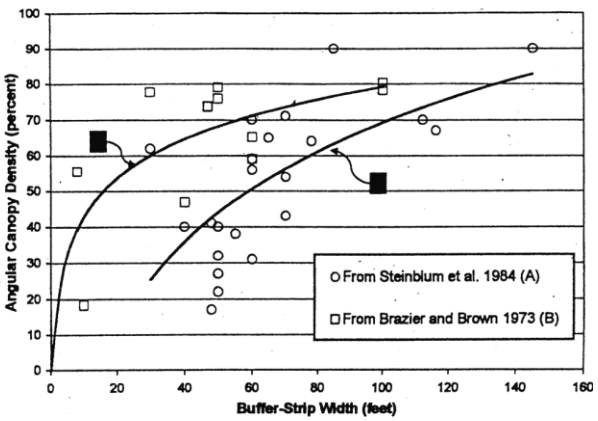
Project Design Criteria for Riparian Reserves (PDCRR) (Park 2005) are used to prevent shade reduction in riparian areas. Density management thinning is designed to improve stand health with treatments and/or commercial extraction while allowing attainment of or restoration of Aquatic Conservation Strategy (ACS) objectives under the Northwest Forest Plan. Riparian buffers originally estimated were adjusted slightly wider for ephemeral and intermittent non-fish bearing streams with medium and heavy thin buffers, a change from 25 feet to 35 feet and 40 feet respectively, as suggested by NMFS in order to facilitate an expeditious consultation. NMFS suggested that the buffer change would reflect their concern for addressing activities in riparian areas in relation to riparian buffer adequacy and loss in the short-term of small wood contribution to streams. Their concern has been elevated to a Level 2 Interagency Science Team and is currently being addressed.

Exposure to direct solar radiation, as described in the PDCRR will often cause a dramatic increase in stream temperatures. When shaded throughout the entire day, far less heat energy would be transferred to the stream. The ability of riparian vegetation to shade the stream depends on vegetation height, density, stream width and position relative to the stream.

Thinning can affect stream temperature by removing shade trees. The amount of shade lost depends on stream width, tree height and stream orientation. The following figure display thinning effects similar to those proposed under this project, for one mile of stream. Most daily solar radiation occurs between 10am and 2pm. Trees that provide stream shade during this time are considered “primary shade trees”. Primary shade trees would not be removed. Figure H-1 displays buffer width as a function of angular canopy density for mature trees. A mature tree is defined an individual tree that has reached most of its potential height growth.

At a point the shade density increases very little as the sun‟s angle decreases or the sun gets lower in the sky. This is the secondary shade zone. The primary shade tree zone for mature trees varies from 50 to 60 feet in width. Very little additional shade is gained when the sun is low enough to intercept the secondary shade trees. Therefore, in dense stands such as the plantations proposed for treatment, trees outside the "primary shade zone" can be thinned with a neutral effect on stream shade.

Figure H-1 Buffer Widths and Angular Canopy Density



Riparian Reserve treatments and project design elements fall into three categories; **fish-bearing perennial streams, non-fish-bearing perennial streams, and intermittent and ephemeral streams** (see next sections).

General Design Criteria for Riparian Reserves

- **No density management treatment would reduce the existing overstory canopy within Riparian Reserve to less than 50% (on average at the stand level).**
- ***No commercial extraction of trees would occur within 25 ft. of stream course.***
- To reduce the risk of sediment delivery, soil compaction or the loss of soil infiltration capacity in the riparian area to the streams, yarding activities, **within 100 feet of stream courses, pre and post activity would not result in a loss of more than 10% of the soil infiltration capacity which reduces concerns for sediment reaching the stream**. This activity would include existing skid trails, which could be re-utilized as necessary and then be deep ripped (as feasible) to re-establish soil infiltration capacity.
- Yarding activities should achieve full suspension over the active channel[2]. To facilitate log suspension with skyline operations, corridors for cable rigging would be allowed to pass through Riparian Reserves. A maximum clearing width of 12 ft. is required and logs may be yarded through this corridor if necessary. Corridors must be spaced at a minimum of 200 feet apart if they pass through Riparian Reserves. Corridor "rub trees" within the Riparian Reserve, even if damaged, would either be left standing or felled and left in place.

Design Criteria for Perennial Streams

This includes permanently flowing perennial fish-bearing and nonfish-bearing streams. The primary concern regarding yarding Riparian Reserves with fish bearing streams is prevention of sediment delivery to streams, prevention of concentrated overland flow, wood recruitment, and maintenance of stream temperatures.

[2] Active channel is the bank full width of flowing perennial or intermittent streams.

Project design features would follow direction provided in NWFP Temperature TMDL Implementation Strategies 2005[3]. This involves protection, maintenance and enhancement of existing stream shade, and maintenance of the existing micro-climate, ambient air temperature, and air movement.

The primary difference between fish-bearing and nonfish-bearing stream is the width of the entire Riparian Reserve (which is differentiated by fish-bearing status) as shown below:

> **<u>Fish-bearing</u> Riparian Reserve widths are two site potential tree heights each side of stream course (175 ft. X 2 = 350 ft. each side; total width 700 ft).**
>
> **<u>Nonfish-bearing</u> Riparian Reserve widths are one site potential tree height each side of stream course (175 ft. each side; total width 350 ft.).**

The **Stream Channel Protection Zone** is from the edge of stream course up to 25 feet. **No commercial extraction) would occur within 25 ft. of the active stream channel.**

The **Primary Shade Zone** is an area where canopy retention standards to meet TMDL Implementation Strategies, however some density management, fuels reduction or other enhancement treatments could occur. The Primary Shade Zone is an area where no commercial extraction would occur (larger trees felled for skyline corridor clearing would be left), however some density management or other enhancement treatments could occur. Distance from active stream channel varies according to height of existing overstory trees and hill slope in immediate area. The following table establishes the width of the Primary Shade Zone.

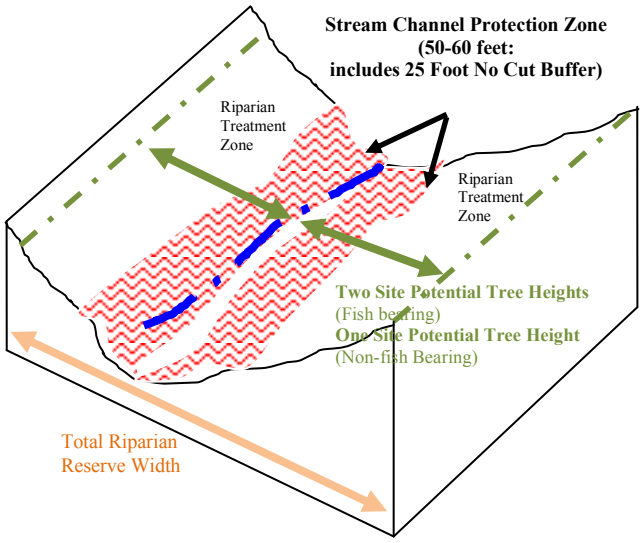
Table H-5. Primary Shade Zone Width, Based on Adjacent Hill Slope within Perennial Streams

	Hill Slope <30%	Hill Slope 30% to 60%	Hill Slope >60%
Primary Shade Zone Width (slope distance)	50 ft.	55 ft.	60 ft.

The Temperature Implementation Strategies allow the distances in the above table to be less (but not less than 25 ft.) if the trees are located on a south facing slope (175-185 degree azimuth) and therefore do not provide stream shade. Note: no large wood, old residual trees (old growth; trees>80 years old), with a potential for instream recruitment would be cut).

[3] Northwest Forest Plan Temperature TMDL Implementation strategies - Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy and Associated Tools to achieve and maintain stream temperature water quality standards. USFS and BLM; latest version September 9, 2005.

Figure H-2. Riparian Reserve Design Elements – *Perennial Fish & Non-Fish Bearing Streams*

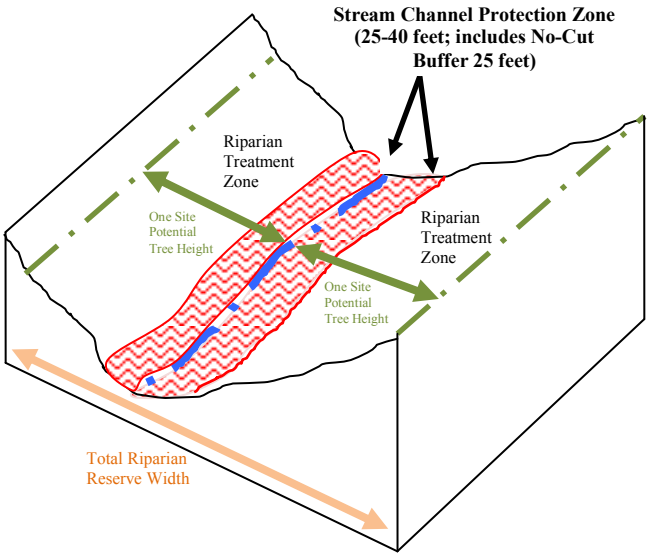


Design Criteria for Non Fish-bearing Intermittent and Ephemeral Streams

Seasonally flowing intermittent and ephemeral non-fish-bearing streams have buffers established for the prevention of sediment delivery to streams, prevention of concentrated overland flow, and maintenance of micro-climates, ambient air temperature and humidity. There are no fish-bearing ephemeral and intermittent stream channels.

The primary difference between perennial and intermittent/ephemeral stream are the buffers for no-cut, and density management and commercial extraction. The intermittent/ephemeral Riparian Reserves and non-fish bearing Riparian Reserves are the same, one site potential tree heights on each side of stream course (175 feet on each side; total is 350 feet); see Table 4.

Figure H-3. Riparian Reserve Design Elements – *Ephemeral and Intermittent Stream Channels*



2. Timber Hauling

The only haul route segment adjacent to EFH with a gravel-surface is the remaining 200 feet of road NFSL 5000 with a 12 percent slope, which parallels Coal Creek. This section of road is crowned, has two ditch relief culverts which drains into an 80 feet vegetated buffer. The remaining road segment of haul route coming from the gravel-surface road is a 50 feet asphalt-surfaced segment, which drains around a corner into a well vegetative buffer before reaching the stream. The haul routes from the units are gravel surfaced roads down to the paved NFSL Road 3300 adjacent the South Fork Coquille River. Table H-6 displays the amount of haul occurring over perennial stream crossings within the most impact being in the Coal Creek 6th Field. At the junction of the NFSL Road 5000 and NFSL Road 200, the entire haul merges into the NFSL Road 5000 for approximately one mile. The timber haul would average about 14 truckloads daily from this location down the 5000 Road.

Table H-6. Summary of Perennial Stream Crossings That Would Occur during Haul

Watershed	Number of Perennial Stream Crossings
South Fork Coquille 5th Field ,Headwater South Fork 6th Field watershed	3
South Fork Coquille 5th Field, Coal Creek 6th Field watershed	22
South Fork Coquille 5th Field, Mill Creek 6th Field watershed	4
TOTAL	29

Design Criteria for Haul

OPERATIONS WITHIN THE NORMAL OPERATING SEASON **(June 1 to Oct 31st).** Project design features would be implemented to make it unlikely that sediment would reach stream channels.

- Road crown would be maintained.
- Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.
- If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.

IF OPERATIONS OUTSIDE THE NORMAL OPERATING SEASON: November 1 through May 31st are allowed, the following rules must be applied to timber haul on gravel roads adjacent EFH or any stream type stream channels:

> Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.
>
> If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.
>
> Road Rutting: No hauling down the gravel road surface if rutting is occurring, indicating the subsurface is wet.
>
> Wet weather conditions must be monitored daily by the Forest Service for the chance of precipitation, especially 1 inch of rain in 24 hours.

3. Fuels Treatment

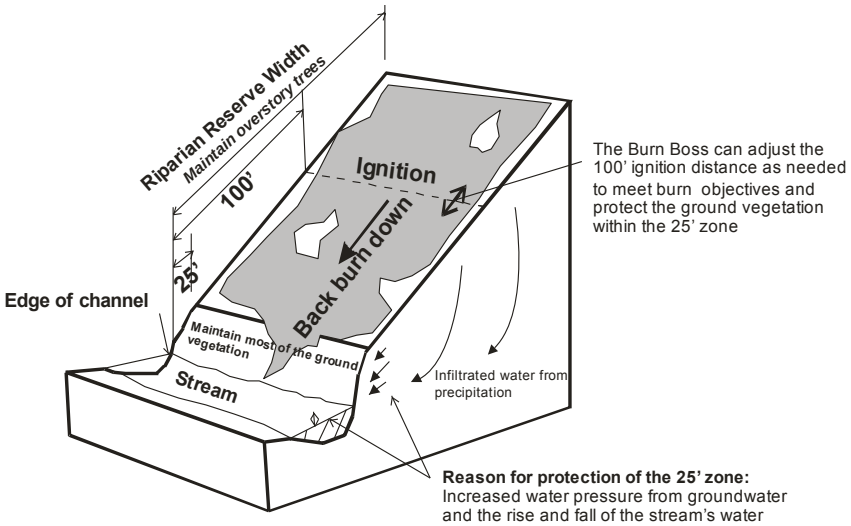
Activity fuels treatment refers to the slash and accumulated fuel resulting from the proposed density management treatments. While there may be some slash from previous harvesting or from natural conditions, the majority of material would be generated through density management treatment and commercial removal. Activity fuels treatments proposed for this project include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk. Several methods of activity fuels treatment are being proposed, and include the following: burning tree tops that were yarded to landing site, burning materials accumulated by harvest activity that is piled (by hand or mechanical equipment), or under burning.

Design Criteria for Fuels Treatment in Riparian Reserves

- The Stream Channel Protection Zone cited in the PDCRR is from the edge of the stream course up to 25 feet. No vegetation management would occur within 25 feet of the active stream channel.
- No hand piles would be located or burned within the channel.
- Prescribed fire would not be ignited within this zone but fire may be allowed to "back down" to the stream channel. Specially designed criteria for prescribed burning within Riparian Reserves are show in Figure H-4.

Roque River Siskiyou N.F
August 2008
Prescribed Burn in Riparian Reserves
Project Design Criteria

Figure H-4. Riparian Reserve Design Elements - Prescribed Under Burning



Reducing high fuel Loading - Use mechanical treatment and pile burning as needed prior to under burning to protect the overstory trees. Pile and burning should be no closer to the stream than 25' to maintain ground vegetation.

Pump chances - Fire, engineering and aquatic resource personnel will work together to determine suitable pump chances and the measures needed for the protection of aquatic resources. Pump chances will be chosen where the use of the pump does not reach flowing water. Water withdrawal equipment must have a 3/32 intake screen in order to avoid fish entrapment.

4. Road Maintenance, Temporary Road Construction and Road Decommissioning, Road Reconstruction, Landing Construction, and New Road Construction

The Eden Ridge Planning Area currently has a minimal existing road network, because it has not been vegetatively managed for many decades, and when the logging that created the candidate stands of today were created, most of the area was logged by railroad systems. Most of the existing roads evolved from these early railroad grades but do not adequately serve the Planning Area for today"s needs and systems. The current existing road system within Eden Ridge, overall, is currently managed and maintained.

Refer to EIS Chapter II for the general locations of road use, proposed reconstruction/road decommissioning, road reconstruction and maintenance needs associated with the 6th field watersheds. There would be 23 Intermittent/Ephemeral Non Fish bearing crossings built and 12 perennial crossings in the 3.19 miles of road activities that would occur in Riparian Reserve.

Table H-7. Summary of All Road Activity in *Riparian Reserves*

Road System – By Road Type	Road Number or Unit	Number of Intermittent/Ephemeral Non-fish Bearing Road Crossings	Number of Perennial Road Crossings	Total Road Segments Miles	Distance from CCH/EFH
Temporary Road (Access) Construction – New Roads to be Built in Riparian, No Existing Template. Decommission Afterwards					
	Q4	1	1	0.21	9.3/2.3
	R	0	0	0.03	9.4/2.4
Total Crossings/Miles		**1**	**1**	**0.25**	**Total Miles**
Road Reconstruction					
	5000299	0	1	0.57	11.7/4.7
	5000442	1	0	0.25	11.0/4.0
	5000442.1	1	0	0.07	11.0/4/0
	5000443	2	0	0.28	11.7/4.7
	5000446	1	0	0.09	11.8/4.8
	5000451	2	0	0.11	4.2/5.2
Total Crossings/Miles		**7**	**1**	**1.36**	**Total Miles**
New Permanent Road Construction					
	B	2	0	0.16	8.8/8.8
	F	1	0	0.17	11.7/11.7
	J	0	1	0.05	23.6/4.6
	O4	4	0	0.10	14.5/7.5
	S1	0	1	0.06	9.8/2.8
	S3	0	1	0.06	9.7/2.7
	S5	0	1	0.05	10.3/3.3
	S6	1	0	0.06	10.3/3.3
	S7	0	2	0.11	11.0/4.0
	S8	1	0	0.04	10.3/3.3
	S9	3	0	0.05	12.0/5.0
	T	1	0	0.10	17.5/10.5
	U	0	1	0.12	14.5/7.5
	W	1	3	0.33	15.4/8.4
	Z	1	0	0.13	15.6/8.6
Total Crossings/Miles		**15**	**10**	**1.58**	**Total Miles**
Grand Total – Proposed Crossings and Miles of Roads to be Built in Riparian Reserves		**Intermittent/Ephemeral Crossings 23**	**Perennial Road Crossings 12**	**Total Miles 3.19**	

a. Road Maintenance

This activity includes several routine related activities which maintain drainage, cuts and fills and surfacing of the road prism to accommodate light and commercial road traffic; while maintaining the integrity of the road facility and minimizing effects to natural resources adjacent to the road. Much of this work is done with a motor grader, dump trucks and backhoe and includes travel way surface maintenance, drainage ditch maintenance, culvert cleaning, surface rock replacement, shaping of the roadway and ditches by blading, removal of slough materials, compacting and other mechanized and hand work.

It is estimated that road maintenance would be needed on the road system utilized for this project, over at least ten years. The FS Road 290 that access some of the timber sales is gated to prevent public access during periods when POC disease could spread.

b. Temporary Road (Access) Construction & Decommissioning

Approximately 0.29 miles of new temporary road is proposed, in two segments, not longer than 0.25 miles in length (Table H-8). Temporary roads include those roads needed only for the purchaser‟s use, such as roads used to haul timber from landings to permanent National Forest System roads. The Eden Ridge Timber Sales Project may need other new temporary road construction for candidate stand access if it minimizes resource damage. These roads would be built and removed by the operator as part of the Forest Service timber sale or stewardship contract.

Table H-8. Proposed *Temporary* Road (Access) Construction & Decommissioning

Road Segment Reference	Length (miles)	Notes	Distance to Coho Critical Habitat (Stream Miles)/EFH
Q4	0.25	No template, crosses a intermittent channel	9.3/2.3
R	0.03	Short spur; joins with existing road	9.4/2.4
TOTAL	**0.29**		

c. Road Reconstruction

Reconstruction involves maintenance and improvements to existing road or railroad template, to make them suitable for logging equipment and harvest treatment access. Reconstruction involves restoring a road to operational condition.

Road repairs could have one or more of the following work items: removing fallen trees, cleaning out culvert inlets, removing and disposing of small cut slope slides, falling danger trees, replacing minor amounts of road surfacing, replacing, adding additonal drainage structures, etc. Treatments could include grading, clearing, restoring road width loss, or stabilizing a cut or fill (embankment) slope that was lost due to storm damage, by placing riprap materials (large boulders) against existing slopes, and may include widening and surface rock replacement.

Table H-9. Road Reconstruction in Relation to CCH/EFH

Road Numbers	Distance to CCH/EFH (miles)
5000291	8.9/1.9
5000298	10.0/3.0
5000299	26.8/19.8
5000299.1	9.9/2.9
5000442	18.5/11.5
5000442.1	11.4/4.4
5000443	11.8/4.8
5000446	23.8/4.8
5000447	4.6/4.6
5000448.1	10.7/3.7
5000451	4.2/4.2

d. Landing Construction/Reconstruction

Some of the areas associated with the candidate stands have an existing network of roads and landings from previous harvests. However, there would also be a need for some additional areas created for log landings. These would primarily occur in areas where no landing currently exist or where a change in logging systems (e.g., where skyline logging is now prescribed in areas previously railroad logged). Two existing landings are known to exist in the Riparian Reserve and outside of the primary shade zone.

Site L-13 is an existing landing with a primary road located within it. It is situated where 90% of the landing is upslope of the road and 10% of the landing is downslope of the road, approximately 100 feet above the stream channel above the break in slope. The 10% section of the landing is where the yarder would be located and in a well vegetated site.

Site L-14 is a new landing and is located adjacent to the main haul route road and would be situated completely above the road. The road is located approximately 80 to 100 feet above the stream channel. The riparian zone buffer consists of large trees and a brush and forbs well vegetative component. The yarder would be stored away from the stream on the upslope side of the road.

Design Criteria for Landings in Riparian Reserve

All landings, designated skid trails, staging or decking within Riparian Reserves would:

- Be of minimum size as possible to only allow operations;
- Be located above the break in slope above the stream channel;
- Landing slopes would be armored with logs or other woody material capable of protecting the slope surface;
- Landing surfaces would drain away from the stream channel during use, and, would be revegetated/mulched after use; and
- Landing site restoration would consist of :
  - -Loose soil material on the downslope side would be pulled back.
  - -Placement of slash on bare soils located on the downhill slope.
- All new landings will be at least 100 feet away from stream channels.

Landing site restoration would consist of:

- Placement of slash on bare soils located on the downhill slope.
- Loose material on the downslope side would be pulled back.
- Be of minimum size as possible to only allow operations;
- Be located above the break in slope above the stream channel;
- Have a well vegetated strip between the work site and the stream channel, which is a minimum or greater of the no-cut buffers;

Table H-10. Landings in Riparian Reserves

Landing in Riparian	Distance to Coho Habitat/EFH	Existing or New	Perennial or Intermittent
L-13	9.0/2.0	Existing	Perennial, non-Fish Bearing
L-14 (unit 309)	9.4/2.4	New	Perennial, Fish Bearing (non CCH)

e. New Road Construction

In order to adequately and efficiently access the Planning Area for today"s management systems, there is a need for additional classified roads. Given the current situation, these new access roads could not be developed without the need to cross some drainages designated as Riparian Reserve. A total of approximately 11.1 miles of new road construction is proposed. Of the 11.1 miles of road, 0.3 miles would be temporarily contructed, used then decommssioned. The remaining new road construction would include approximately 10.8 miles, in 43 segments, ranging from 0.11 miles to 1.93 miles. Most of the new roads would be managed as Maintenance Level 1 (closed until further need). ***New permanent roads in Riparian Reserve total 1.58 miles.***

All proposed new system roads would be rocked as needed to minimize erosion and allow for extended use during wet conditions. All new roads (including those crossing Riparian Reserve) would be engineered and designed to minimize environmental impacts. Designed roads constructed on NFSL would be accomplished to standards appropriate for the intended uses; considering safety, cost of transportation, and impacts on lands and resources. Designed roads would be constructed as stable and durable structures to facilitate maintenance during and after use and monitored every five years.

This design would include necessary drainage facilities, adequate erosion control, closure devices, and resource protection devices. Closure of all new construction of system roads would typically be accomplished via a road entrance closure of native materials (logs, earth, boulders) after timber sale activites had occurred, placing them into Maintenance Level 1 Status.

Table H-11. Proposed New Road Construction, Location and Distance to CCH

Road Segment Reference	Road Length (Contiguous - miles)	Notes	Distance to Coho Critical Habitat/EFH (Stream Miles)
A	0.23	Ridgetop road, skyline access, no grade	4.3/4.3
B	0.74	Crosses some riparian; some grade up to 10%	9.1/9.1
C	0.03	Begins on PVT; ties to road M for FS access	24.3/5.3
D	0.60	Ridgetop road, skyline access, no grade	28.5/9.5
E1	0.34	Ridgetop road, skyline and GB access, no grade	24.0/5.0
E2	0.22	Ridgetop road, skyline and GB access, no grade	24.05.0
E3	0.20	Ridgetop road, skyline access, no grade	24.05.0
F	0.39	Crosses riparian, minimal grade	7.9/7.9
G	0.15	Ridgetop road, skyline access, no grade	3.7/3.7
H	0.21	Ridgetop road, skyline access, no grade	3.33.3
I	0.09	Ties to existing route planned for reconstruction	23.9/4.9
J	0.08	Crosses riparian; provides GB access	23.8/4.8
K	0.36	Begins on PVT; for FS skyline access	23.3/4.3
L	0.01	Begins on PVT; for FS skyline access	23.5/4.5
M	0.81	Ties to road C for FS access, minimal grade	28.1/9.1
N	0.04	Begins on PVT for FS access	23.1/3.1
O1	0.28	First segment for skyline access; minimal grade	23.6/4.6
O2	0.23	Second segment for skyline access; minimal grade	23.5/4.5
O3	0.24	Third segment for skyline access; minimal grade	23.4/4.4
O4	0.18	Additional segment for skyline access; minimal grade	23.2/4.2
P1	0.06	Begins on PVT, ties to P2 for FS access	8.9/1.9
P2	0.08	Ties to P1 for FS access	9.0/2.0
P3	0.13	Ridgetop skyline access	9.3/2.3
P4	0.11	Ridgetop skyline access	9.4/2.4
Q1	0.11	Begins on PVT; ties to roads Q2 & Q3 for FS access	9.1/2.1
Q2	0.05	Second segment for GB access	9.1/2.1
Q3	0.10	Second segment for GB access	9.1/2.1
S1	0.09	Joins existing road with existing road planned for reconstruction	10.0/3.0
S2	0.12	Joins existing road with existing road planned for reconstruction	9.9/2.9
S3	0.06	Construction of old railroad grade trestle to classified road	10.0/3.0
S4	0.15	Additional segment for GB access	9.9/2.9
S5	0.05	Construction of old railroad grade trestle to classified road	10.0/2.0
S6	0.24	Additional segment for GB & skyline access	11.9/4.9
S7	0.11	Construction of old railroad grade trestle to classified road	10.2/3.2
S8	0.04	Construction of old railroad grade trestle to classified road	10.4/3.4
S9	0.06	Construction of old railroad grade trestle to classified road	10.8/3.8
T	1.93	Crosses some riparian; some grade up to 10%	13.0/6.0
U	0.38	Crosses some riparian; minimal grades	14.6/7.6
V	0.14	Ridgetop road, skyline & GB access, no grade	11.3/4.3
W	0.61	Crosses some riparian; minimal grades	12.0/5.0
X	0.22	GB access; minimal grade	11.6/4.6
Y	0.18	GB access; minimal grade	12.0/5.0
Z	0.35	Crosses some riparian; some grade up to 10%	11.9/4.9
TOTAL	**10.81**		

Design Criteria for Road Maintenance, Temporary Road Construction and Reconstruction, Road Decommissioning, and Landing Construction

General Design Criteria

- ***Minimize hydrologic connectivity and sediment delivery from roads.*** This includes roads inside and outside of Riparian Reserves. Road drainage will be routed away from potentially unstable channels, fills, and hillslopes.
- All exposed soils near streams will be mulched for erosion control measures.
- No side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in Riparian Reserves
- Minimize or avoid disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow when considering constructing or reconstructing roads or landings either inside or outside of Riparian Reserves.
- New or replaced permanent stream crossings would be designed to accommodate at least the 100-year flood, including associated bedload and debris.
- Where physically feasible, construction or reconstruction of stream crossings would avoid diversion of streamflow out of the channel and down the road
- All designated skid trails, staging or decking within Riparian Reserves would:
  - Be of minimum size as possible to only allow operations;
  - Be located above the break in slope above the stream channel;
  - Have a well vegetated strip between the work site and the stream channel, which is minimum or greater of the no-cut buffers;

Temporary Road Construction and Decommissioning Design Criteria

Temporary Road Construction and Decommissioning would be managed in accordance with water quality Best Management Practices[4] (BMPs) R-23. In order to prevent continued low level casual use, and to minimize resource impacts, such roads would be obliterated at the completion of their intended use. Effective obliteration is generally achieved through a combination of the following measures:

- Temporary culverts are removed and natural drainage configuration is re-established;
- Road surfaces are ripped;
- Sideslopes are reshaped and stabilized; road is effectively drained; and
- Road is blocked to further use, and road is returned to vegetation production through revegetation (seeding, planting browse species, or hardwood/conifer trees).
- Temporary roads built would be closed after the season of use of if kept open over winter would be winterized. Drainage work to winterize temporary roads would include water bars at suitable intervals and out sloping.

New Road Construction Project Design Criteria

Some of the new classified roads would cross Riparian Reserves under specially designed Project Design Criteria for Riparian Reserves (see below).

- ***No new road construction is proposed nor would be allowed to cross or disturb any fish bearing perennial stream,*** especially the banks of fish bearing portions/tributaries of Coal Creek and Wooden Rock Creek.

[4] *General Water Quality Best Management Practices,* Pacific Northwest Region, November 1988.

- New classified road construction would only be allowed to cross non fish bearing perennial streams or intermittent streams and would include engineering design as Operational Maintenance Level 2 roads during use and Maintenance Level 1 (Table 11) when not in use for harvest activities.
- Perennial channels will be dewatered or water will be rerouted during construction with manufactured or natural sediment filters will be placed within the channel to prevent sediment from discharging downstream.
- New permanent stream crossings would be designed to accommodate at least the 100-year flood, including associated bedload and debris.
- Relief ditch spacing would get spaced and the road sloped such that water does not channelize when leaving the relief culvert.
- Roads would be designed to minimize hydrologic connectivity and sediment delivery. This includes roads inside and outside of Riparian Reserves. Road drainage would be routed away from potentially unstable channels, fills, and hillslopes.
- No side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in Riparian Reserves
- Minimize or avoid disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow when considering constructing or reconstructing roads or landings either inside or outside of Riparian Reserves.
- Where physically feasible, construction of stream crossings would avoid diversion of streamflow out of the channel and down the road.

5. Other Enhancement Activities

a. Snag/Down Wood Creation

In areas where past management has resulted in a lack of large snags needed for cavity nesting species, snags may be created from live trees left in stands. Creation can be through girdling, topping the trees with chain saws, blasting, inoculation with heart rot fungi, or deliberate injury. These methods would open the trunk to development of a hollow core used by woodpeckers and a variety of other birds, mammals, and other wildlife. Whenever possible, creation of snags over 14" DBH should be part of each prescription through top removal or girdling. Evaluations would occur after density management treatments to assess potential needs for snag/down wood creation. In areas lacking adequate amounts of down woody material (include snags in calculations), green trees may be felled.

b. Riparian Snags

Snags and down large coarse wood would be retained to support forest function. This project is planned for down logs to be retained and are considered excess only when all site considerations have met and in accordance with Forest Plan Standards and Guidelines.

Large woody material (LWM) fulfills a number of important ecological functions such as stabilizing surface soils, increasing organic content in soils over the long-term, providing habitat for the many organisms that depend on snags and down logs in various stages of decay, and ensuring adequate large woody material recruitment to meet the ecological needs of aquatic systems over time.

Within Riparian Reserve, prescriptions would account for future large woody material recruitment. If residual trees are felled (e.g., human safety or skyline corridors), provisions for replacement trees would be made during operations. Whenever possible, creation of snags over 20" DBH within riparian areas of each treatment unit should be part of each prescription through top removal, inoculation or girdling.

Throughout the Riparian Reserves, snags 10 inches diameter or greater are not considered a fuel or safety hazard. Site specific treatments such as hand piling would depend on specific fuel loading and wildlife recommendations.

There would be long term biological diversity beneficial effects from accelerating the development of late-successional conditions within Riparian Reserves to enhance the recovery of the northern spotted owl and marbled murrelet, improving stand conditions to reduce the likelihood of future stand replacement fires, restoring species diversity, adding snags and down wood, and reducing the effects of fragmentation in the long term.

Snag/Down Wood Creation Design Criteria

In areas where past management has resulted in a lack of large snags needed for cavity nesting species, snags would be created from live trees left in stands. Whenever possible, creation of 2 or more snags over 20" dbh within each treated acre should be part of each silvicultural prescription. Creation can be through girdling, topping the trees with chain saws, blasting, inoculation with heart rot fungi, or deliberate injury. These methods would open the trunk to development of a hollow core used by woodpeckers and a variety of other birds, mammals, and other wildlife.

Evaluations would occur after density management treatments to assess potential needs for snag/down wood creation. In areas lacking adequate amounts of down woody material (include snags in calculations), green trees may be felled. Any leave trees damaged during harvest operations would be left standing or felled for safety, but left on site. The intent is to provide future snags or trees with cavities or deformities utilized by wildlife.

c. Stream Enhancement

The Eden Ridge Project proposes to place 150 large trees in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Live and dead trees may be removed from riparian areas to provide wood for enhancement projects, under special conditions described in the Design Criteria. This action would involve the use of log trucks and dump trucks for transport and excavator-type machinery, spyders, cable yarders, draft horses, or helicopters for placement. Plans and designs would be consistent with Forest Plan direction, K-V opportunities, and watershed restoration plans (e.g., USDA FS 2006). Approximately 1 Mile of upper Coal Creek tributaries within Units 905 and 906 would have trees felled toward the channel and approximately 1 mile of Wooden Rock would have stream enhancement. Approximately 50 trees per mile would be placed within approximately 3 miles of stream (150 trees total, 22,650 cubic feet). The proposed enhancement is located in resident fish habitat ranging from 10 miles to 27 miles upstream of CCH and 3 to 8 miles for EFH.

Stream Enhancement Design Criteria

- Place LW and boulders only in those areas where they would naturally occur and in patterns that closely mimic that which would naturally occur for that particular stream type.
- LW includes whole conifer and hardwood trees, logs, and root wads. LW size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5 x bankfull channel width, while logs without root wads should be a minimum of two times the bankfull width. Place wood in a manner that most closely mimics natural accumulations of LW for that particular stream type. Structures may partially or completely span stream channels or be positioned along streambanks.

- No conifers should be felled in the riparian area for in-channel large wood placement unless conifers are fully stocked and are consistent with project design criteria in vegetation treatment categories. Felled hazard trees can be used for in-channel wood placement.
- LW may be buried into the streambank or channel but shall not constitute the dominant placement method of LW.
- Tree Removal for LW Projects:
    - Trees may be removed by cable, ground based equipment, horses or helicopters, or felled directly into the stream. Felled trees may be stock-piled for later instream enhancement projects.
    - Individual trees or small groups of trees (<5) should come from the periphery of permanent openings (roads etc) or from the periphery of non-permanent openings (e.g. plantations, along recent clear-cuts, etc.).
    - Trees selected for LW enhancement projects must be spaced at least one site potential tree height apart and at least one crown width from any trees with potential nesting structure for ESA-listed bird species.
- Instream work would occur during the ODFW instream work period.

d. Native Grass/Forb Seeding

Exposed mineral soil (landings and temporary roads) may be seeded with native grass seed to restore and improve forage for wildlife that benefit from grasses and forbs; e.g., deer, elk, mice, rabbits and their predators. Seeding may also reduce the opportunity for non-native plants (including noxious weeds) to invade disturbed sites and reduce erosion.

e. Invasive Plant Treatments

Monitor and treat invasive plants within project area boundaries to reduce/eliminate current populations and reduce the future spread of non-native vegetation. Treatment would be completed in disturbed areas within the watersheds by hand pulling only.

V. EFFECTS OF ALTERNATIVES

A. Effects of the No Action Alternative (Alternative 1)

With this alternative, no activities would occur; there would be no direct (or indirect) effects from this alternative. The consequences of this alternative would be that riparian stands would continue to have natural suppression occurring, and younger non-dominant trees would continue to die off. The stands would continue on the same trajectory of attaining late-successional habitat characteristics of large diameter trees, multi-storied canopy, and a diverse species component, but it could take several hundred years for this to occur through the natural process of stand development.

B. Effects of the Proposed Action (Alternative 2)

The overall effects of Alternative 2 have been analyzed for ESA listed coho salmon and its critical habitat and coho and Chinook essential fish habitat in the 2011 Eden Ridge Timber Sales Biological Assessment. The effects for listed aquatic species and their habitat are similar to the effects for OC steelhead since they occupy similar habitat. The effects analysis from the biological assessment is summarized in this section; refer to the August 2011 ER Thin Fish BA for a complete analysis.

As stated earlier, the proposed activities under the ER Timber Sales were split into five project elements: 1) Timber Felling and Yarding, 2) Timber Hauling, 3) Fuels Treatment, 4) Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction and New Road Construction, and 5) Other Enhancement Activities. Below is a table which displays proximity of project activities in relation to EFH.

Table H-12. Proximity of Project Elements to EFH within Coal Creek 6th Field Watershed

Project Elements (PE)	Distance to EFH*
Timber Felling and Yarding	1.8 miles > 10.5 miles
Timber Hauling (Gravel Roads)	*50 feet to100 feet > 10.5miles
Fuels Treatment	1.8 miles > 10.5 miles
Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction and New Road Construction	1.8 miles > 10.5 miles
Other Enhancement Activities	1.8 miles > 10.5 miles

***OC Steelhead habitat is one mile above EFH.**

****This section of road is about 200 feet long and immediately leaves the EFH and travels up the ridge where it normally is about 1.8 mile > 10.5 miles above EFH.**

The effects analysis from the Biological Assessment analyzed Alternative 2 and are summarized in this section; refer to the August 2011 ER Timber Sales Fish BA for the complete analysis. Effect analysis for the other Action Alternatives is contained below.

Direct Effects
The Proposed Action for Eden Ridge Timber Sales has only stream enhancement activities occurring directly within the stream channels that contain fish or fish habitat. The direct effects from the Proposed Action are expected to be on resident fish only (non-Endangered, Threatened, Proposed or Sensitive fish species). Therefore, there would be no impact to any Endangered, Threatened, Proposed or Sensitive fish species.

Indirect Effects
The Proposed Action for Eden Ridge Timber Sales would be removing some trees within the Riparian Reserve. In the Project Area only Unit 309 is adjacent a fish bearing perennial stream channel in the Coal Creek Drainage. The harvesting that is occurring within the Riparian Reserve would be providing a 25-foot Stream Channel Protection Zone and an additional 30-40 foot Primary Shade Zone for the Perennial Stream Channel. These zones would not allow any removal of vegetation for timber harvest. There is a small chance that during project implementation that a few trees may be felled within these two zones, however the project is designed to not allow tree removal within these two zones. With the possibility that a few trees are removed from the Primary Shade Zone or the Stream Channel Protection Zone, it is unlikely to affect water temperatures in stream reaches. Much of the streams in the project area are small systems that are heavily vegetated, and have a large groundwater influence on water temperature.

All the other units are upstream of the fish bearing perennial stream or they are located on non fish bearing ephemeral or intermittent stream channels. The harvesting that is occurring within the Riparian Reserve would be at least providing a 25-foot Stream Channel Protection Zone for all channels, and an additional 30-40 foot Primary Shade Zone for Perennial Stream Channels. These zones would not allow any removal of vegetation for timber harvest.

The harvesting of timber within Riparian Reserves is designed to promote growth of larger trees as well as allow the growth of understory species to provide for diverse, healthy, riparian vegetation. By allowing other species to come in under the current Douglas-fir dominated stand, the project would put these stands on a trajectory of attaining late-successional characteristics sooner within the Riparian Reserve.

The Stream Channel Protection Zone (25 foot no cut buffer on either side of the channel) is a buffer designed to protect the actual riparian area that occur along stream channels. This buffer width provides protection from ground based activities and harvesting of vegetation. These buffers would protect all species that utilize the riparian areas within the project. This area of protection would ensure that water temperatures in these areas would not be affected, and that there would be a source of small woody material for aquatic species that depend upon the riparian areas, along with ensuring that groundwater flow would continue to maintain the riparian zones at the project scale.

The proposed timber harvest would not impact shade producing trees, nor would it be impacting future large wood recruitment to fish habitat. The stream channels within the Project Area are on average 3 feet wide for ephemeral and intermittent channels and 8-feet wide for perennial stream channels. If any of the trees cut by thinning harvest were to fall into a channel, they are 10 times greater in length than the streams are wide, and would not move with the flows typically occurring in these channels. Much of these pieces of LWD would not have naturally made it downstream to stream reaches where fish are present.

There is a causal mechanism for *Timber Hauling and Road Maintenance* since these activities would occur near EFH. Specifically, along the haul road (NFSL 5000) where two relief culverts are located along a rocked road that parallels EFH for about 200 feet. There are no stream crossings or bridges along the haul route in proximity of EFH. The haul route does cross perennial streams that flow into Coal Creek; which are well over two miles upstream of EFH if sediment from haul was to reach the stream the sediment would not move downstream to EFH. The remaining 11 miles of the haul route are not in proximity with EFH. There is approximately 50 million board feet of timber that could be removed with this project. On average one truckload of timber would contain 5,000 board feet. This would equate to approximately 11,000 truckloads of timber to be hauled over the haul route that exits along Coal Creek over an approximate five year period (seasonal hauling of approximately 14 truckloads per day).

The activities of *Timber Hauling* and *Road Maintenance* are extremely unlikely to deliver sediment to EFH. The main haul route for the project consists of maintained, gravel surfaced roads with an engineered drainage system. These roads are designed for all-weather use and carry year-round truck traffic generated by private timber harvest. The Forest Service is currently implementing the Coastal Healthy Forest Treatments Project 2007 along this same haul route. Existing traffic levels have resulted in no known detrimental sediment contributions to Coal Creek. Haul traffic in support of the proposed action is well within the design limits of the haul route.

Approximately 200 feet of NFSL Road 5000 is adjacent to EFH. This section of road is relatively steep, well maintained gravel surfaced road, with a crown. Approximately 800 feet of the road in this section (which contains a tight switchback) receives surface water from itself and about six acres of adjacent hillside. Drainage of this area is provided by the two relief culverts onto naturally vegetated slopes adjacent to Coal Creek. These relief culverts on the crowned road, partially drain to vegetative buffers (50-80 feet), while the other part of the road crown drain onto steeply sloped dissipater transporting onto a steep slope that ends at the channel. Sediment delivery could occur from runoff during rain events and deliver to EFH. At this time, there is no indication that sediment is being delivered to the stream in the 200 feet of the haul route that is adjacent Coal Creek. Project design features would minimize road generated sediment entering EFH as described below:

OPERATIONS WITHIN THE NORMAL OPERATING SEASON **(June 1 to Oct 31st),.**
Project design features would be implemented to make it unlikely that sediment would reach stream channels.

Road crown would be maintained.

Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.

If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.

IF OPERATIONS OUTSIDE THE NORMAL OPERATING SEASON: November 1 through May 31st are allowed, the following rules must be applied to timber haul on gravel roads adjacent EFH or any stream type stream channels:

Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.

If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.

Road Rutting: No hauling down the gravel road surface if rutting is occurring, indicating the subsurface is wet.

Wet weather conditions must be monitored daily by the Forest Service for the chance of precipitation, especially 1 inch of rain in 24 hours.

Adding additional rock to the road where needed to ensure that hauling occurs on a durable surface.

Restricting grading/cleanout in ditches that delivery water to EFH; this will retain vegetation that captures fine sediment.

If a cross drain or relief culvert is determined to contribute sediment to EFH, then appropriate sediment controls will be installed to prevent sediment delivery.

The road maintenance that will occur with this project will upgrade the road by placing new rock on the surface of this road and improving drainage along the road. In the long term the road maintenance will reduce the amount of sediment coming off the road by preventing erosion of the native substrate, and by preventing saturation and failure of the travel way and associated drainage system

The amount of sediment which could reach EFH would be insignificant and indistinguishable from background levels. Sediment derived from *Timber Haul* would be primarily directed to ditch lines and then out of the ditch lines via ditch relief culverts to the forest floor with little to no sediment above existing levels. Sediment could be transported to stream channels along the two hundred feet of road adjacent Coal Creek where the road and ditch line are connected to streams. *Road Maintenance* work completed prior to haul and *Road Maintenance* work conducted after haul would further reduce the amount of off-site sediment movement after hauling. Any sediment generated as a result of the proposed haul would be immeasurable. Lastly, a restriction on when log haul can occur would minimize sediment generation on the surface of the road where it could wash into the ditch lines.

Timber Hauling and Road Maintenance design criteria in conjunction with the distance from EFH would minimize sediment effects to OC coho. The criteria have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek from *Timber Hauling and Road Maintenance* under the Proposed Action would be undetectable from the small amounts already generated at this location, and therefore insignificant.

There is a causal mechanism for sediment generation on units since *Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities* are occurring near perennial streams approximately two miles to 11 miles above EFH. The stream enhancement component of *Other Enhancement Activities* would occur within Coal Creek approximately three to eight miles upstream of EFH. *New Road Construction* would consist of 12 perennial crossings and at least 23 intermittent channels crossings in the Coal Creek subwatershed. The closest perennial crossing associated with a proposed activity unit is over two miles above EFH. This crossing is on a small channel that is approximately two feet wide and flows intermittently below the road crossing for approximately 1,500 feet before flowing into Coal Creek approximately two miles above EFH. The remaining crossings are approximately three miles above EFH and the remaining nine perennial crossings are over two miles upstream from EFH and will not be further analyzed.

Landing Construction/Reconstruction would occur within Riparian Reserves at two locations, L-13 and L-14. L-13 is an existing landing site located mostly uphill (90%) of the main haul road, approximately 50 feet from a non-fish bearing perennial stream and two miles from EFH. HL-14 is new landing located immediately uphill of the main haul route road. Downhill of the main haul route is a resident fish bearing section of Coal Creek approximately 80 to 100 feet downslope, and 2.4 miles from EFH.

The activities of *Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities* are extremely unlikely to deliver sediment to EFH approximately two miles to 10.5 miles downstream to EFH in Coal Creek. The closest perennial crossing associated with a proposed road activity unit is over two miles above EFH. The next two closest crossings are approximately two miles above EFH and the remaining nine perennial crossings are over two miles upstream. There is no probability construction of roads would modify peak or base flows, because openings created by new roads would be of insufficient size to affect flows.

All but two landings are located outside of the Riparian Reserves. *Landing Construction/Reconstruction* would have adequate vegetative cover or mulch material to prevent erosion and retain local sediment. The two landings located inside of the Riparian Reserve have been field reviewed by a hydrologist and an engineer. These landings are not within areas occupied by flowing water or riparian-dependent vegetation. Trees yarded to the landings could disturb slopes of the landing and generate sediment that would wash into stream channels. In order to prevent this, landing slopes would be armored with logs or other woody material capable of protecting the slope surface. Landing surfaces would drain away from the stream channel during and after use, and, would be revegetated and mulched after use. All landings are subject to season of use restrictions. These design features in addition to the two mile+ distance from EFH ensure that sediment would not be delivered to EFH.

Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities design criteria in conjunction with the distance from EFH would minimize sediment effects to EFH. The criteria have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment.

Any sediment yield to Coal Creek from *Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities* under the Proposed Action would be undetectable from the small amounts already generated at this location, and therefore insignificant.

Overall, the Eden Ridge Timber Sales Project Proposed Action has been designed to minimize impacts to aquatic habitats. Field reconnaissance during implementation by Interdisciplinary Team specialists would refine this project to only apply vegetation management where needed. Project Design Criteria and Mitigation Measures were developed to minimize impacts to water quality, Riparian Reserves, and aquatic habitats.

Cumulative Effects

Past activities that have occurred on National Forest System lands are documented in the Silvicultural Diagnosis Repot (EIS Appendix B). Table B-7 lists previous commercial timber sale activity within the Planning Area (since historical railroad logging in the 1920s and 1930s). None of the candidate stands for Eden Ridge Timber Sales are located within these previous contemporary timber sale units.

The most recent activity is primarily commercial thinning and has not been observed to result in increased measurable sediment delivery to streams within the Coal Creek Watershed. These projects would have no adverse cumulative effects when combined with the effects of the Eden Ridge Timber Sales Project. In general, there are several different types of foreseeable projects that occur across the landscape in these watersheds such as non-commercial thinning for fuels reduction and meadow restoration. These projects are designed to avoid treatments in Riparian Reserves. There would be some prescribed burning associated with these projects that would not impact Riparian Reserves or aquatic habitats. The 2005 Coastal Healthy Forest Treatments Project has one or two candidate stands within the Eden Ridge Planning Area that may eventually be thinned (but is not as yet, planned or scheduled).

Activities that occur off forest are primarily timber harvests within private timberlands and are seen to be impacting upstream reaches of the Coal Creek Drainage. Under the Oregon Forest Practices Act, timber harvest is allowed to occur within riparian areas; however a one tree buffer is necessary along fish bearing streams. These restrictions reduce the amount of sedimentation that occurs on private lands. Some sedimentation may occur from areas where there are intermittent stream channels or where perennial non-fish bearing streams are found. This increase in sedimentation could impact fish habitat by filling in pool habitat and reducing spawning habitat.

In general, the Oregon Forest Practices Act provides direction for protection and maintenance of important aquatic habitats across the state. Currently on private lands, small landslides have been observed to be contributing sediment to the immediate channel but no observed sediment has been reaching listed species habitat.

Overall, cumulative effects on NFS and private lands from past and present project actions have impacted large woody material that would provide habitat to fish within these watersheds; the Eden Ridge Project does not propose to impact Riparian Areas adjacent to stream channels with listed species present. Although there is a slight chance that sediment might be delivered to fish habitat from roads and the haul route, the amount of sediment delivered is expected to be of a small quantity, and during a time of year when the amount of sediment being created by this project would not be measurable beyond background levels naturally within the stream channels. The overall predicted cumulative effect for the affected watershed would be an immeasurable contribution of sediment from landslides from private land and above Endangered, Threatened, Proposed or Sensitive fish species habitat. This effect is likely to occur only when the winter rains come and it would be part of the background sediment.

C. Effects of Alternative 3

Direct Effects
Alternative 3 for Eden Ridge Timber Sales has only stream enhancement activities occurring directly within the stream channels that contain fish or fish habitat. The direct effects from this alternative are expected to be on resident fish only (non-Endangered, Threatened, Proposed or Sensitive fish species). Therefore, there would be no impact to any Endangered, Threatened, Proposed or Sensitive fish species.

Indirect Effects
Effects from this alternative are expected to be similar to the effects of the Proposed Action. This alternative would reduce the number of trucks hauling down the road but since the amount of sediment that may enter the stream channel due to log haul activities and road maintenance activities is not measurable, the effects are similar to the Proposed Action.

There would be less riparian vegetation treated as compared to Alternative 2. Treating fewer riparian acres would promote less growth of larger trees as well as allow the growth of understory species to provide for diverse, healthy, riparian vegetation. By treating less riparian vegetation acres as compared to Alternative 2, other species would not come in under the current Douglas-fir dominated stand and would result in slowing down attainment of late-successional characteristics within the Riparian Reserve. This could result in an increase of future small diameter instream recruitment in perennial, intermittent, and ephemeral streams instead of mature, large woody material.

Cumulative Effects
Cumulative effects for this alternative would be similar to those listed for the Proposed Action.

D. Effects of Alternative 4

Direct Effects
Alternative 4 for Eden Ridge Timber Sales has only stream enhancement activities occurring directly within the stream channels that contain fish or fish habitat. The direct effects from this alternative are expected to be on resident fish only (non-Endangered, Threatened, Proposed or Sensitive fish species). Therefore, there would be no impact to any Endangered, Threatened, Proposed or Sensitive fish species.

Indirect Effects
Effects from this alternative are expected to be similar to the effects of the Proposed Action and Alternative 3. This alternative would reduce the number of trucks hauling down the road but since the amount of sediment that may enter the stream channel due to log haul activities and road maintenance activities is not measurable the effects are similar to the Proposed Action.

There would be less riparian vegetation treated as compared to Alternative 2. Treating fewer riparian acres would promote less growth of larger trees as well as allow the growth of understory species to provide for diverse, healthy, riparian vegetation. By treating less riparian vegetation acres as compared to Alternative 2, other species would not come in under the current Douglas-fir dominated stand and would result in slowing down attainment of late-successional characteristics within the Riparian Reserve. This could result in an increase of future small diameter instream recruitment in the project"s perennial, intermittent, and ephemeral streams instead of mature, large woody material.

Cumulative Effects
Cumulative effects for this alternative would be similar to those listed for the Proposed Action.

E. All Action Alternatives – Habitat and Watershed Condition Indicators

The NMFS "matrix of pathways and indicators" (NMFS 1996), was used to help determine the effects of the Action Alternatives (Alternatives 2, 3, and 4). This process was intended to be utilized when considering project level effects at the watershed scale.

All Action Alternatives would result in a **neutral** effect to the following indicators:

Temperature: *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Enhancement Activities* would not affect shade to the extent to causes changes in stream temperature to EFH >0.8 miles away. The Proposed Action would result in a **neutral (0) effect** to the temperature indicator. The Proposed Action for Eden Ridge Timber Sales would harvest trees within the Riparian Reserve. Only unit 309 is adjacent to a non-Endangered, Threatened, Proposed or Sensitive species fish bearing perennial stream channel, in the Coal Creek drainage. The harvesting that would occur within the Riparian Reserve adjacent to the fish bearing stream segment would be located outside of the 25-foot Stream Channel Protection Zone and an additional 30-40 foot Primary Shade Zone for the Perennial Stream Channel. These zones would not allow any removal of vegetation for timber harvest.

There is a small chance that during project implementation that a few trees may be cut within these two zones, however the project is currently designed to not allow tree removal within these two zones. In the likelihood that a few trees are removed from the Primary Shade Zone or the Stream Channel Protection Zone, it is unlikely to affect water temperatures in the adjacent stream reaches. Much of the streams in the Project Area are small systems that are heavily vegetated, and exhibit a large groundwater influence on water temperature.

All the other units are upstream of fish bearing perennial streams or they are located on non fish bearing ephemeral or intermittent stream channels. The harvesting that would occur within the Riparian Reserve would be located outside of the 25-foot Stream Channel Protection Zone for all channels, and an additional 30-40 foot Primary Shade Zone for Perennial Stream Channels. These zones would not allow any removal of vegetation for timber harvest.

The harvesting of timber within the project area is designed to promote growth of larger trees as well as allow the growth of understory species to provide for diverse, healthy, riparian vegetation. By allowing other species to come in under the current Douglas-fir dominated stand, the project would put these stands on a trajectory of attaining old growth characteristics sooner within the Riparian Reserve.

The Stream Channel Protection Zone (25 foot no cut buffer on either side of the channel) is a buffer designed to protect the actual riparian area that occur along stream channels. This buffer width provides protection from ground based activities and harvesting of vegetation. These buffers would protect all species that utilize the riparian areas within the project. This area of protection would ensure that water temperatures in these areas would not be affected, and that there would be a source of small woody material for aquatic species that depend upon the riparian areas, along with ensuring that groundwater flow would continue to maintain the riparian zones at the project scale.

The proposed timber harvest would not impact shade producing trees, nor would it impact future large wood recruitment to fish habitat. The stream channels within the Project Area are approximately 3 feet wide for ephemeral and intermittent channels and 8-feet wide for perennial stream channels. If any of the trees removed by thinning harvest were to fall into a channel, they would be at least 10 times greater in length than the streams are wide, and would not move with the flows typically occurring in these channels. Much of these pieces of LWD would not have naturally made it downstream to stream reaches where fish are present.

Chemical contamination/nutrients: *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Enhancement Activities w*ould have a **neutral (0) effect** since there is **no causal** mechanism on the Chemical Contamination/Nutrients indicator.

Physical barriers: There is **no causal** mechanism for *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Enhancement Activities* to affect this indicator because no culverts would be installed or replaced on any fish bearing streams as a result of these timber sales. Because no PEs would create or remove barriers for fish, these timber sales would result in **neutral (0) effect** to the physical barrier indicator.

Large woody debris: *Timber Hauling, Road Maintenance, Temporary Road Construction and Decommission, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Enhancement Activities* would have a **neutral (0) effect** on Large Woody Debris. Thinning prescriptions are designed to create a large tree forest within Riparian Reserves. These effects occur from 0.8 miles to 11.7 miles in distance away from EFH and 0.8 miles from OC steelhead trout and based on the topography, size of the stream channels, and distance from EFH, trees in the Riparian Reserve are not expected to affect EFH downstream

Off-channel habitat, refugia, width/depth ratio, stream bank condition, floodplain connectivity: The elements would have a **neutral (0) effect** on Off-channel Habitat, Width: Depth Ratio by Channel Type, Stream bank Condition, and Floodplain Connectivity because the PE‟s for this project would not occur within stream channels. The activities are 1.8 miles to 12.7 miles upstream of EFH and 0.8 miles above OC steelhead trout. These activities are not occurring in a location that would affect coho salmon, EFH or OC steelhead.

Changes in peak and base flows: There would be a **neutral (0) effect** to Peak and base Flows from the ER project. There would be no effect to peak and base flows from *Timber Hauling, Fuels Treatment, and Road Maintenance.* These PE‟s have **no causal** mechanism to impact peak or base flows as they are not creating openings that would increase runoff from rain events nor changing flow regimes in any channels or increasing road densities. *Temporary Road Construction and Decommissioning, Road Reconstruction and Landing Construction/Reconstruction, New Road Construction* would have a **discountable insignificant negative (-) effect** on peak or base flows in Coal Creek due to increased road densities.

The *Timber Felling and Yarding of trees and Other Enhancement* activities would have a **neutral (0) effect** on changes in peak and base flows for the following reasons:

- The Action Alternatives would occur over small, scattered areas of each subwatershed.
- Proposed harvest units contribute fractional runoff to the receiving mainstem channels.
- Impact thresholds are based on regeneration harvest leaving a wide margin of safety for impact assessment resulting from proposed thinning.
- NFS lands are hydrologically recovered.
- Surface disturbance is slight in the Riparian Reserve (see Riparian Project Design Criteria in PE section.
- Direct surface disturbance resulting from tractor yarding is limited to gentle slopes and ridgeline units.

- Variable Density Thinning leaves variable canopy retention from 40% to 60% in uplands (Matrix) and equal or greater than 50% in riparian zones, with the exception of Port Orford Cedar Root Disease Silvicultural treatments (POC). POC would be treated with Gap Development Treatment to treat portions of stands infected with laminated root rot. The total amount of openings created from the POC treatment within Coal Creek 6th field watershed (9,952 acres) would be .1%. Therefore, 330 acres of small openings from POC treatments, scattered throughout the project, would only occur in .003% of the Coal Creek 6th field watershed.

Increase in drainage network, road density: Due to the small magnitude of road density increase (0.9 percent), a neutral effect to temperature, and a discountable insignificant negative effect to the sediment and pool character & quality habitat indicators from these PEs, the ER Thin project would have an insignificant negative effect to the road density/location indicator in the Coal Creek 6th field watershed.

Sediment & Pool Character & Quality Indicators: *Timber Felling and Yarding, Fuel Treatment.* There would be a **neutral (0) effect** to the Sediment and Pool Character & Quality Habitat indicators from *Timber Felling and Yarding*. The project design features for activities in the Riparian Reserves would provide adequate vegetative buffers to filter sediment, distance from EFH, location of units in stable terrain and ridge top/midslope and no ground based machinery in the RR, would ensure that the sediment would not be delivered to EFH. There would be a **neutral (0) effect** to the sediment and pool character & quality habitat indicators from the *Fuel Treatment.* The PDCs for *Fuel Treatment* activities in the Riparian Reserves would provide adequate vegetative buffers to filter sediment and distance from EFH would ensure that the sediment would not be delivered to EFH.

VI. SUMMARY AND COMPARISON OF ALTERNATIVES

Table H-13. Comparison of Effects to Fish Species by Alternative and Activity Type

Alternative	Timber Felling and Yarding	Timber Hauling	Fuels Treatment	Road Maintenance, Construction and Decommissioning	Stream Enhancement
1	Neutral	Neutral	Neutral	Neutral	Neutral
2	Neutral	Potential sediment from haul route	Neutral	Potential sediment from haul route	Neutral
3	Neutral	Potential sediment from haul route	Neutral	Potential sediment from haul route	Neutral
4	Neutral	Potential sediment from haul route	Neutral	Potential sediment from haul route	Neutral

The **No Action** Alternative would not alter the project area on National Forest System land. Thus, no effect to aquatic species or habitat would occur.

All of the **Action Alternatives, 2 through 4**, would have a similar effect to Endangered, Threatened, Proposed or Sensitive aquatic species due to the potential of sediment entering the stream channel from the "*Timber Hauling and Road Maintenance"* activities along the haul route. This amount of sediment for all Action Alternatives is non-measurable.

All of the Action Alternatives, 2 through 4, would have similar effects to aquatic habitats and a neutral effect on Endangered, Threatened, Proposed or Sensitive aquatic species from the "*Stream Enhancement and Fuels Treatment*" activities.

Specific to Alternatives 3 and 4, there would be less riparian vegetation treated from "Timber Falling" as compared to Alternative 2. Falling fewer trees in the riparian areas would promote less growth of larger trees as well as less growth of understory species to provide for diverse, healthy, riparian vegetation. By falling less riparian vegetation as compared to Alternative 2, other species would not come in under the current Douglas-fir dominated stand and this would result in a longer timeframe to attain late-successional habitat characteristics within the Riparian Reserve, when compared to Alternative 2. This could result in a smaller average size of future LWD recruited within the project"s perennial, intermittent, and ephemeral streams above fish habitat, when compared to Alternative 2.

Effects to Endangered, Threatened, Proposed or Sensitive aquatic species are similar under all of the Action Alternatives, 2 through 4. This is due to the same site specific design elements being included in all of these alternatives. The differences in activities between Action Alternatives are not large enough to create any measurable difference downstream on aquatic species.

VII. CONCLUSIONS AND DETERMINATIONS

Alternative 1 – No Action
Alternative 1 would have no direct, indirect or cumulative effects to SONCC coho salmon, SONCC coho CH, OC coho salmon, OC coho CH, SONCC Chinook salmon, OC steelhead, PC chum salmon, inland redband trout, pit sculpin, western ridged mussel, Klamath rim pebblesnail, highcap lanx, scale lanx, robust walker, pacific walker, or the pristine springsnail since there is no action. Therefore, a "*No Impact"* determination is rendered.

Action Alternatives - Alternatives 2, 3 and 4
The indirect and cumulative effects from Alternative 2, 3 and 4 would result in an overall non-measureable negative sediment effect to OC coho salmon and its critical habitat and OC steelhead on the Powers Ranger District. Thus, a **May Affect, Not Likely to Adversely Affect** determination is rendered for OC coho salmon, **No Effect** determination to OC coho salmon critical habitat, **Will Not Adversely Affect** Essential Fish Habitat for coho salmon or Chinook salmon and **May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species** OC steelhead trout due to the non-measureable sediment delivery of the hauling and road maintenance activities.

These Alternative would have a **No Impact** to PC chum salmon, inland redband trout, pit sculpin, western ridged mussel, Klamath rim pebblesnail, highcap lanx, scale lanx, robust walker, pacific walker, or the pristine springsnail because these species are not known to occur or have suitable habitat within proximity to any of the proposed activities.

Table H-14. Summary of Conclusion of Effects

Endangered, **Threatened, Proposed** or **Sensitive Species**	**Alternatives**			
	1	**2**	**3**	**4**
OC coho	NE	NLAA	NLAA	NLAA
OC coho CH	NE	NE	NE	NE
EFH – coho	NE	NLAA	NLAA	NLAA
EFH – Chinook	NE	NLAA	NLAA	NLAA
OC steelhead	NI	MIIH	MIIH	MIIH
PC Chum	NI	NI	NI	NI
Inland redband trout	NI	NI	NI	NI
Pit sculpin	NI	NI	NI	NI
Western ridged mussel	NI	NI	NI	NI
Klamath rim pebblesnail	NI	NI	NI	NI
Highcap lanx	NI	NI	NI	NI
Scale lanx	NI	NI	NI	NI
Robust walker	NI	NI	NI	NI
Pacific walker	NI	NI	NI	NI
Pristine springsnail	NI	NI	NI	NI

NE = No Effect
NLAA = Not Likely to Adversely Affect
NI = No Impact
MIIH = May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species

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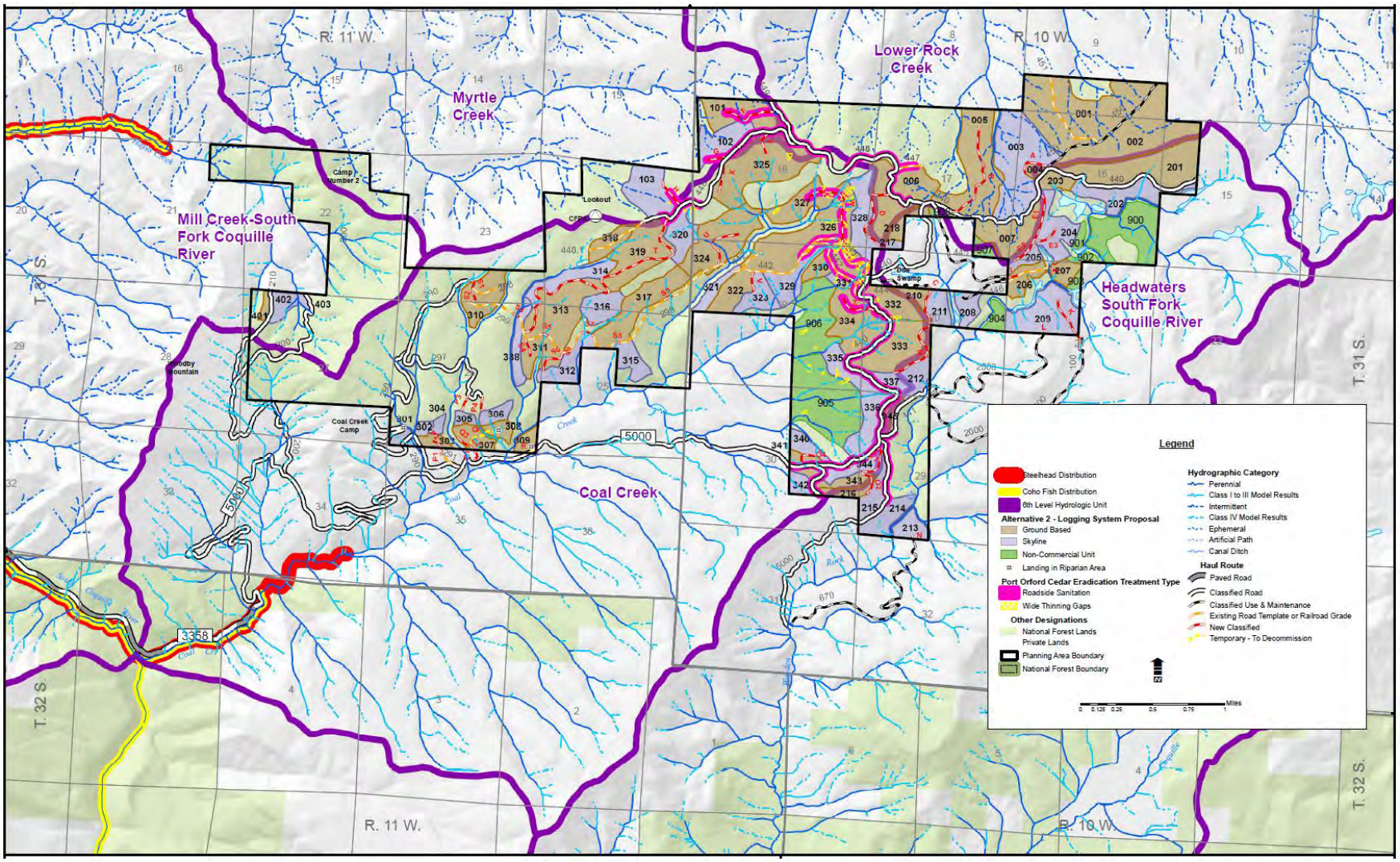
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ATTACHMENT A **Fish Distribution and Project Activities Map – Alternative 2**



Biological Assessment for Eden Ridge Timber Sales

Project Name:	Eden Ridge Timber Sales (ER)
Species of Concern:	Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*); listed as Threatened, 1997. Oregon Coast Critical Habitat (CCH), Essential Fish Habitat (EFH).
Determination of Effects:	Oregon Coast coho salmon, CCH, and EFH: NLAA: ―May Affect, Not Likely to Adversely Affect"

Project Location:

4th Field HUC	Coquille River	17100305
5th Field HUC	Lower South Fork Coquille River	1710030501
	Middle Fork Coquille River	1710030502
6th Field HUC	Mill Creek	171003050106
	Headwaters S. Fork Coquille River	171003050101
	Coal Creek	171003050105
	Lower Rock Creek	171003050206
	Myrtle Creek	171003050209

Watershed Analyses (WA):	Middle Fork Coquille Analytical Watershed (BLM 1994) South Fork Coquille Watershed Analysis (USFS 1995)
Land Allocation of Project Area:	Matrix Riparian Reserve
Administrative Unit:	Powers Ranger District, Rogue River-Siskiyou National Forest
Prepared By:	Karla Cottom, Fisheries Biologist, Powers RD
Reviewed By:	Maureen Joplin, Hydrologist, RRSNF Susan Maiyo, Forest Fisheries Biologist, RRSNF
Document Date:	August 10, 2011

This consultation is undertaken pursuant with Section 7(a)(2) of the Endangered Species Act and the Magnuson-Stevens Fishery Conservation and Management Act, and is implementing Federal regulations 50 CFR Part 600

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I. EXECUTIVE SUMMARY

The following Biological Assessment analyzes the effects of the Eden Ridge Timber Sale for the Powers Ranger District (RD), Rogue River-Siskiyou National Forest (RRSNF). Below the Action Area are Oregon Coast (OC) coho salmon, listed as a "Threatened" species under the Endangered Species Act (ESA). The analysis contained herein has resulted in a determination of "May Affect, Not Likely To Adversely Affect" to OC coho salmon, "No Effect" determination to OC coho critical habitat (CCH) and "Would Not Adversely Affect" coho and Chinook salmon (*O. tshawytscha*) Essential Fish Habitat (EFH). There is no anticipated incidental take associated with the proposed project actions. Any questions and/or comments regarding this assessment or the proposed project should be addressed to Karla Cottom, Fisheries Biologist, Powers RD at (541) 439-6250 or Susan Maiyo, Forest Fisheries Biologist, RSNF at (541) 618-2052.

II. INTRODUCTION

The following assessment was prepared to initiate consultation pursuant to the Endangered Species Act of 1973, as amended (ESA), to evaluate and describe the potential effects of proposed Powers Ranger District actions on Oregon Coast Evolutionarily Significant Unit (ESU) of coho salmon.

The overall Planning Area is located on National Forest System Lands within two 5th-Field watersheds, South Fork Coquille River and the Middle Fork Coquille River, which both have Watershed Analyses have been completed. The 6th Field watersheds within these 5th Field watersheds are Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek. Adjacent private timber company lands owned by Plum Creek surround the Planning Area.

The Planning Area for the Eden Ridge Timber Sales (ER) is located on Eden Ridge approximately four (4) air miles southeast of Powers, Oregon. The legal description is Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 23, 24, 25, 26, and 27 Willamette Meridian; Coos County, Oregon

III. DESCRIPTION OF THE PROPOSED ACTIONS (S) AND ACTION AREA

Note: This Biological Assessment (BA) was being prepared as the Environmental Impact Statement (EIS) was being prepared. Some acreages and road miles may not exactly correspond with the Final EIS numbers; however, any discrepancies are small and have been factored into this analysis. The overall scope of the project has been adequately analyzed and disclosed in this BA. Consultation would be reinitiated if the scope of the EIS expands to include effects greater than those consulted on under this BA.

A. PROPOSED ACTION (S)

Summary

The Powers Ranger District proposes variable density thinning treatments, Port Orford cedar sanitation and planting treatments, laminated root rot treatment and other connected activities on approximately 3,700 acres (Maps 1 through 7) within the Planning Area. The stands are located on suitable forest land designated as Matrix and Riparian Reserve land allocations under the Siskiyou National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan.

There are no OC coho salmon, CCH or EFH located adjacent or within any thinning treatments. All project activities range from 8 .8 miles upstream to 20 miles upstream of CCH and 1.8 miles to 12 miles upstream of EFH except for the haul route which is located 50 to 80 feet adjacent to EFH for approximately 200 feet on a gravel-surfaced road before it continues onto an asphalt-surfaced road for the remaining haul route. Coal Creek is a resident fish bearing perennial stream just beyond Unit 309. There are no fish-bearing ephemeral and intermittent stream channels within proposed units.

See attached maps for project location and activities:

Map 1 Vicinity
Map 2 Project Activities includes all project elements and fish distribution
Map 3 Mill Creek
Map 4 Headwaters S. Fork Coquille River
Map 5 Coal Creek
Map 6 Lower Rock Creek
Map 7 Myrtle Creek

3,300 acres would be designed for timber harvest with associated harvest systems that would use a combination of ground-based, skyline and helicopter operations depending on soil, slope and hydrological concerns (Table 1) are being considered over a 10-year period. Also included in this project is an additional 385 acres of non-commercial silvicultural treatments. Two yarding landings are being *Constructed/Reconstructed* within the Riparian Reserve.

To access the 3,300 acres of treatment, approximately

- 31 miles of existing roads would be used for *Timber Haul* route;
- 0.3 miles of temporary *Road Construction and Decommissioned* (0.3 miles in RR);
- 6.1 miles of *Road Reconstruction* of existing road or railroad templates (1.4 miles in RR);
- 10.8 miles of *New Road Construction* would be built (1.6 miles in RR); and
- 5.5 miles of *Road Maintenance* within the units.

Table 1. Eden Ridge Timber Sales Unit Summary

Unit Reference	Estimated Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access	New Road Access Reference	Unit Distance to Critical Coho Habitat/ EFH (Stream Miles)
Middle Fork Coquille 5th Field, Rock Creek 6th Field Watershed									
001	187	95	92	VDT/LRR/POC-PLT	GB	YTA	CRM & CRR	-	4.2/4.2
002	137	108	29	VDT/LRR/POC-PLT	GB	YTA	CRM	-	3.9/3.9
003	135	63	72	VDT/LRR/POC-PLT	S	YTA,P & B	CRU	A	12.9/12.9
004	8	8	0	VDT/LRR/POC-PLT	GB	YTA, P & B	-	A	4.3/4.3
005	126	66	60	VDT/LRR/POC-PLT	GB	YTA, P & B	-	B	8.8/8.8
006	102	87	15	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU & CRR	D	4.2/4.2
007	70	54	16	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	E1, E2	4.0/4.0
Middle Fork Coquille 5th Field, Myrtle Creek 6th Field Watershed									
101	65	46	19	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	F	11.7/11.7
102	46	32	14	VDT/LRR/POC-PLT	S	YTA, P & B	CRU	G	7.4/7.4
103	61	46	15	VDT/LRR/POC-WTG	S	YTA	CRU	H	6.3/6.3
South Fork Coquille 5th Field, Headwater South Fork 6th Field Watershed									
201	117	105	12	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	-	11.7/4.7
202	57	24	33	VDT/LRR/POC-PLT	S	YTA, P & b	CRU	-	15.3/8.3
203	19	15	4	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	-	12.1/5.1
204	48	40	8	VDT	S	YTA, P & B	-	E1, E3	11.8/4.8
205	14	13	1	VDT	S	YTA	-	E2	11.9/4.9

Unit Reference	Estimated Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access	New Road Access Reference	Unit Distance to Critical Coho Habitat/ EFH (Stream Miles)
206	25	18	7	VDT	GB	YTA	CRU & CRR	I	11.8/4.8
207	17	10	7	VDT	GB	YTA	CRR	I & J	11.6/4.6
208	21	13	8	VDT	S	YTA	CRM	-	12.0/5.0
209	79	41	38	VDT	S	YTA, P & B	CRM	K & L	11.4/4.4
210	13	13	0	VDT	GB	YTA	CRM	C & M	12.2/5.2
211	23	11	12	VDT	S	YTA	CRM	C & M	12.0/5.0
212	26	18	8	VDT	S	YTA, P & B	CRM	C & M	11.8/4.8
213	22	8	14	VDT	S	YTA	CRM	N	11.0/4.0
214	36	18	18	VDT	S	YTA, P & B	CRU		14.4/7.4
215	29	29	0	VDT	S	YTA, P & B	-	O1, O2	11.4/4.4
216	17	17	0	VDT	GB	YTA	-	O1, O3	11.3/4.3
217	6	6	0	VDT	S	YTA, P & B	-	D	12.3/5.3
218	17	14	3	VDT	**GB**	YTA, P & B	CRU	-	12.3.5.3
South Fork Coquille 5th Field, Coal Creek 6th Field Watershed									
301	13	3	10	VDT/P-3 treatment	S	YTA, P & B	CRU	-	**8.8/1.8**
302	7	5	2	VDT/P-3 treatment	S	YTA, P & B	CRU	-	**8.9/1.9**
303	12	12	0	VDT	GB	YTA, P & B	CRU	P2	**8.9/1.9**
304	6	6	0	VDT	S	YTA	-	P3	9.0/2.0
305	8	7	1	VDT	S	YTA	-	P3	9.1/2.1
306	15	11	4	VDT	S	YTA	-	P4	9.3/2.3
307	25	16	9	VDT	GB	YTA	-	Q1, Q2, Q3	9.1/2.1
308	14	1	13	VDT	GB	YTA	-	Q1, Q2, Q4	9.3/2.3
309	14	3	11	VDT	GB	YTA, P & B	CU	R	9.4/2.4
310	49	37	12	VDT	GB	YTA	-	S1, S2	9.8/2.8
311	36	24	12	VDT	GB	YTA	CRR	S1, S2, S3, S4, S5, S6 & T	9.72.7
312	38	19	19	VDT	S	YTA	CRR	S1, S2, S3, S4, S5, S6, & S7	11.7/4.7
313	93	73	20	VDT	GB	YTA	CRR	S1, S2, S3, & T	12.1/5.1
314	40	22	18	VDT	S	YTAYTA	-	T	17.5/10.5
315	26	22	4	VDT	S	YTA	CRR	S1, S2, S3, S4, S5, S6, S7, S8, & S9	10.3/3.6
316	33	23	10	VDT	S	YTA	-	T	10.3/9.3
317	74	48	26	VDT	GB	YTA	CRR	S1, S2, S3, S4, S5, S6 & S8	10.2/4.0
318	25	20	5	VDT	GB	YTA	CRR	-	10.6/3.6
319	86	72	14	VDT	GB	YTA	CRU & CRR	T	16.3/9.3
320	37	21	16	VDT/LRR/POC-PLT	S	YTA	CRU	T	11.0/4.0
321	16	16	0	VDT	S	YTA	CRR	-	10.9/3.9
322	35	35	0	VDT	GB	YTA	CRR	V	11.0/4.0
323	31	11	20	VDT	S	YTA	CRR	V	11.1/4.1
324	95	58	36	VDT/LRR/POC-PLT	GB	YTA	CRR	U	14.5/7.5
325	135	101	34	VDT/LRR/POC-PLT	GB	YTA, P & B	CRU	X & Y	15.1/8.1
326	155	106	49	VDT/POC-WTG/ P3,P8,P9 treatment	GB	YTA	CRR	W	15.4/8.4

Unit Reference	Estimated Acres	Matrix Acres	Riparian Reserve Acres Within Unit	Silvicultural Prescription	Proposed Logging System	Fuels Treatment	Existing Road Access	New Road Access Reference	Unit Distance to Critical Coho Habitat/ EFH (Stream Miles)
327	47	23	23	VDT/LRR/POC-PLT/ POC-WTG	GB	YTA	CRR	W	11.7/ 4.7
328	52	42	10	VDT/P3 treatment	S	YTA	-	D	12.1/5.1
329	41	14	27	VDT/POC-WTG/ P9 treatment	S	YTA	CRR	-	15.2/8.2
330	18	7	11	VDT/P9 treatment	GB	YTA	CRR	-	11.7/4.7
331	13	7	6	VDT/POC-WTG/ P3 treatment	S	YTA, P & B	CRR	-	11.8/4.8
332	44	39	5	VDT/POC-WTG	GB	YTA, P & B	CRU	-	12.0/5.0
333	86	65	21	VDT/POC-WTG	GB	YTA, P & B	CRU	-	11.7/4.7
334	88	46	42	VDT/POC-WTG	GB	YTA, P & B	CRU	Z	15.6/8.6
335	38	27	11	VDT/POC-WTG	S	YTA, P & B	CRU	-	11.6/4.6
336	49	24	25	VDT/POC-WTG	S	YTA, P & B	CRU	-	11.5/4.5
337	19	16	3	VDT	S	YTA, P & B	-	C & M	11.8/4.8
338	24	2	22	VDT	S	N/A	CRR	S1, S2, S3, S4, & T	9.7/2.7
340	19	11	8	VDT	S	YTA, P & B	-	O4	11.2/4.2
341	25	12	13	VDT	GB	YTA, P & B	CRU		14.5/7.5
342	16	7	9	VDT	S	YTA	CRU	-	11.1/4.1
343	18	18	0	VDT	GB	YTA	-	O1, O3	11.3/4.3
344	30	27	3	VDT	S	YTA, P & B	-	O1, O3	11.3/4.3
South Fork Coquille 5th Field, Mill Creek 6th Field watershed									
401	8	8	0	VDT/P6 treatment	GB	YTA	CRU	-	3.2/3.2
402	20	14	6	VDT/P6 treatment	S	YTA	CRU	-	3.2/3.2
403	5	2	3	VDT	S	YTA	CRU	-	3.4/3.2
Total Units	**3,300**	**2,203**	**1,097**						

Table Notes and Legend

VDT Variable Density Thinning (Commercial)
POC-PLT Port Orford Cedar; site prep and planting of resistant POC seedlings
POC-WTG Port Orford Cedar; Wide Thin Gap, eradication treatment
LR Laminated Root Rot; gap treatments centered around disease pockets, possible plant with POC and other species
P-# Plantation thinning (circa 1939-1963); commercial and noncommercial thinning
YTA Yarding Tops Attached
P&B Pile and Burn
GB Ground based logging systems
S Skyline logging systems
CRU Classified road use = existing roads
CRM Classified road use with reconstruction = existing roads
CRR Classified road use with reconstruction-existing as a road template or railroad grade.

Note: There is no Unit 339

The actions of the project can be divided into five Project Elements (PE) and are described below:

1. Timber Felling and Yarding
2. Timber Hauling
3. Fuels Treatment
4. Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, and New Road Construction
5. Other Restoration Activities

1. Timber Felling and Yarding

a. Timber Felling – Commercial Silvicultural Treatments

The ER project proposes intermediate **c**ommercial harvest treatments using variable density thinning (VDT) techniques and other connected actions on approximately 3,300 acres of second growth conifer stands artificially and naturally regenerated following timber harvest during the 1930s through the 1940s. Design Criteria associated with commercial treatments are detailed in Table 2 and individual units are displayed on Map 2.

Commercial treatments would involve harvest (felling and yarding) of conifers with diameters 7 inches and larger DBH which is a viable product size under current and anticipated market conditions. No old residual trees (old growth; trees > 80 years old) would be cut, except for danger trees. Trees could be felled using mechanized feller-bunchers, cut-to-length harvesters, or hand (chainsaw) felling. The logging systems proposed for use during thinning, including the Riparian Reserve, would actually be less acreage than stated in Table 1. This is due to the limitation of the reach of the logging system equipment, i.e., lift and slope. Therefore, some Riparian Reserves buffers could be greater than stated in Table 2 and therefore less acres likely treated.

The primary silvicultural objective for ER is to control existing dense stocking conditions and to treat subordinate amounts of root disease infection within candidate stands to improve forest health and to sustain or increase tree growth and vigor throughout treatment areas including the Riparian Reserve. Felling actives would be designed using VDT techniques. VDT uses a combination of low and crown thinning to release larger dominant and co-dominant trees. Spacing between trees is variable depending on tree diameter distribution on the ground and thinning intensity. Individual stand characteristics would be heterogeneous and post-harvest tree spacing would not have a rigid, grid-like appearance.

Table 2. Overall Design Criteria for Riparian Reserves

Channel	Project Activities	Buffer	Riparian Reserve	PDCRR Name	Range of Commercial Prescriptions Outside of Buffer (TPA)
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 25 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Light Thin = 150-225,
	Density management and commercial extraction allowed.	25 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Light Thin = 150-225,
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 35 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Medium Thin = 90-150
	Density management and commercial extraction allowed.	35 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Medium Thin = 90-150,
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 40 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Heavy Thin = 50-90.
	Density management and commercial extraction allowed.	40 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Heavy Thin = 50-90.
Perennial ***Non-fish*** **Bearing Stream**	*No-cut buffer* (same as Ephemeral and Intermittent	Streamside to 50-60 feet along both sides of channel	**Same as above.**	**Primary Shade Zone** (includes Stream Channel Protection Zone)	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
	Density management and commercial extraction allowed (same as Ephemeral and Intermittent).	50-60 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on *one size potential tree height*.		**Riparian Treatment Zone**	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
Perennial ***Fish*** **Bearing Streams**	*No-cut buffer* (same as Ephemeral and Intermittent	Same as Perennial ***Non-fish*** Bearing Stream	**Two** site potential tree height each side of stream (350 feet each side; total width 700 feet)	Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
	Density management and commercial extraction allowed (same as Ephemeral and Intermittent).	Same as Perennial ***Non-fish*** Bearing Stream, except Riparian Treatment Zone extends from 50-60‘ buffer limit to edge of *two site-potential tree buffer*		Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.

Intensity of density management prescription treatments ranges from light, medium or heavy thins (see Figure 1) with a target relative density (RD) of approximately 35-50%. Tree species composition is maintained or enhanced by favoring a diverse mixture of conifers and hardwoods. Trees per acre (TPA), including the Riparian Reserves, is described as light thin equals a range of 150-225 per acres, medium thin equals a range of 90-150 TPA, and a heavy thin equals 50-90 TPA.

Approximately 80% of the treatment would consist of medium thins based on productivity of the landscape. Areas within units that occur on the perimeter of existing openings or are predominately western hemlock may receive no thinning or light thin buffers to prevent wind throw.

VDT may include creation of irregular shaped openings (i.e., gaps) interspersed within some thinning throughout the units, including the Riparian Reserve. Gaps would primarily treat root disease pockets by removing all tree species predisposed to infection. Gap size is estimated to be ¼ to 2 acres depending on extent of root disease and proximity to existing openings on adjacent private timber company lands.

VDT may include no-thin areas (i.e., skips). Skips can be strategically placed to protect hardwood thickets, minor tree species, pockets of large down wood, other unique stand attributes and inaccessible areas (see Figure 1.).

Wide-thin gaps (WTG) may occur around genetic trees selected for cone collection, Port-Orford-cedar root disease pockets favoring resistant trees, or dominant tree release of desirable trees from competing vegetation. Generally, one (1) to four (4) trees would be retained in WTG (Figure 1.). The size of WTG would be approximately ¼ - ½ acre.

Thinning treatments are designed to enhance development of late seral conditions as recommended in the South Fork Coquille watershed assessment (1995) by moving stand structure forward by increasing tree growth through density management, creating structural diversity through skip and gap treatments and to improve forest health and resistance to forest pathogens.

Site-specific silvicultural prescriptions would be developed for each individual stand identified for treatment and address each land allocation classification (Matrix, Riparian Reserve) during implementation. Silvicultural prescriptions would describe the desired future condition; specify tree spacing, target residual density (RD), preferred species, canopy retention, post-harvest treatments and other key stand components. Final silvicultural prescriptions would be approved by a Region 6 certified silviculturist.

VDT treatments would harvest conifers with diameters ranging approximately 7-24 inches and larger. Extracted commercial timber volume is estimated to range 8-20 thousand board feet (mbf) per acre and could potentially yield up to 55 million board feet for the entire project.

b. Timber Felling – Laminated Root Rot Silvicultural Treatments (See Map 2)

Laminated root rot (*Phellinus weirii*) disease infection extensively decays roots of susceptible host trees and either causes windthrow or mortality by destroying the tree‘s ability to take up water and nutrients (Hadfield et al., 1986). Windthrow is more common with laminated root rot than other root pathogens. Tree species present in proposed treatment units are listed as follows in decreasing order of susceptibility: Douglas-fir and white fir> western hemlock > Port-Orford-cedar. All hardwoods are immune. Proposed treatment sites would occur outside of the Riparian Reserve since disease infection prefers a drier environment to subsist. These gaps would be openings of ¼ acre in size up to 2 acres located in the upper portions of watersheds. These gaps would be 10% or less of the individual unit and would equal less than 1% of the entire 5th field watersheds.

Laminated root rot is affecting forest health on portions of Eden Ridge Planning Area, particularly in the northern half in forest stands adjacent to FS roads 5000440, 5000440003, and 5000448. See Figure 2 for photograph examples of laminated root rot.

Figure 1. Illustration of Stand Treatments

Figure 1. Examples of Stand Treatment; Eden Ridge Timber Sales













Figure 2. Examples of Laminated Root Rot in Northern Portion of Planning Area



Unit 2



Unit 201

Gap Development Treatment (See Map 2)

Treatment for non-commercial silvicultural treatments are the same as described for the commercial silvicultural treatments, including no-cut buffers as stated in Table 2.

Irregular shaped openings ¼ to 2 acres for tree yield (Matrix) reasons centered on root rot pockets may be created to treat portions of stands infected with laminated root rot.

No more than fifteen percent of the acres within each unit would be treated.

Approximately 330 acres (.1%) of Gap Development Treatment would be treated out of the total project 3,300 acres and is only within the Coal Creek 6th field watershed. These openings would not occur within the watersheds with the same year and would be planted with POC following the treatment.

Treatments would fall all susceptible tree species within and along the perimeter of infection pockets while favoring resistant or immune species for leave trees. Gaps may be site prepared and planted afterwards with Port-Orford-cedar seedlings for stand health and enhance structural and species diversity within a stand.

c. Timber Felling – Port Orford Cedar Root Disease (POC) Silvicultural Treatments (See Map 2)

Port Orford cedar root disease (*Phytophthora lateralis*) (PL) treatment consists of Wide Thin Gaps, roadside sanitation and tree planting resistant POC seedlings. Proposed activities would occur mostly in Riparian Reserves.

Wide-Thin Gap Treatments (WTG)

Fall all live POC within PL infection sites. Leave non-susceptible tree species on site. Thin out all live POC within 2 to 3 crown radii (50-100 feet) from last infected POC along the perimeter of infection sites to separate healthy POC from potential root contact with infected POC. Pile and burn all POC slash and follow-up underburn to potentially mitigate disease presence. Sites can be planted with non-susceptible tree seedlings. This treatment would likely be an understory treatment of infested POC seedlings, saplings and small poles and not result in creation of a gap in the overstory canopy.

Roadside Sanitation

The Roadside Sanitation is located on ridge top roads as shown on Map 2. Treatment would manage for non-susceptible tree species by removing all POC along road sides and high risk sites as follows:

- 100-feet each side of roads at stream crossings.
- 25 feet above roads and 50-feet below roads in areas with measurably contributing POC.

Only one headwater perennial stream crossing is located in a proposed new classified road construction (road _W') for accessing unit 327, which is approximately 4 miles above the CCH habitat. All other treatments if near stream crossings are on ephemeral or intermittent streams. Approximately 104 acres (.031%) of Roadside Sanitation would be treated out of the total project 3,300 acres.

Planting

POC would be restored within its natural range by planting non-PL infested areas with resistant POC seedlings. Also, laminated root rot pockets would be planted with resistant POC seedlings after treatments as described in the section on laminated root rot.

d. Timber Felling -- Non-Commercial Silvicultural Treatments for Instream Restoration

Removal or thinning of 150 non-commercial sized trees is proposed for 385 acres within the ER Planning Area. Treatment for non-commercial silvicultural treatments are the same as described for the commercial silvicultural treatments, including no-cut buffers as stated in Table 2. Most of the non-commercial trees would be in thinning units located in Riparian Reserves. The trees would be directional felled toward the creek for future instream restoration and left onsite. A few of the trees in Unit 345 or any other that are located near a road and outside of the Riparian Reserve may be removed via log truck and placed instream during a future instream restoration project.

The purpose of the non-commercial treatments is to improve the health and vigor of Riparian Reserves for future large wood instream recruitment within the South Fork Coquille 5th Field Watershed. The project acres with these stand conditions that would benefit from these treatments is shown on Map 2 and are located in Units 900, 901, 902, 903, 904, 905, 906 and 345. Portions of proposed units for non-commercial treatments have high height to diameter ratios on overstory trees and forest health issues with laminated root rot, shallow soils and potential windthrow. Approximately 50 trees per mile would be placed within approximately 3 miles of stream (150 trees total, approximately 22,650 cubic feet of wood). The proposed restoration is located in resident fish habitat ranging from two miles to seven miles upstream of CCH.

Figure 3. Example of Dense Stands Proposed for Non-Commercial Treatment – Unit 905



e. Timber Yarding

Logging systems projected to be utilized to harvest trees are also displayed in Table 2. Tractor, or ground-based systems, would be used on approximately 2,119 acres, or 64% of the treated area. Skyline systems would be used on approximately 1,190 acres, or 36% of the treated area. Helicopter systems are not proposed under this project but could be an option if economics were favorable. Some terrain would require partial suspension (or full suspension) systems on stands that had previously been cable logged without suspension in the past.

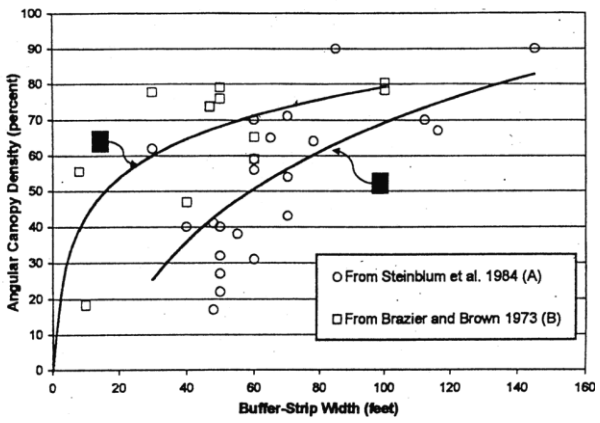
Design Criteria for Timber Felling and Yarding

Project Design Criteria for Riparian Reserves (PDCRR) (Park 2005) is used to prevent shade reduction in riparian areas at the same time as improving stand health with density management thinning treatments and/or commercial extraction while allowing attainment of or restoration of Aquatic Conservation Strategy (ACS) objectives under the Northwest Forest Plan. Table 2 summarizes PDCRR. Riparian buffers stated in Table 2 were adjusted slightly wider for ephemeral and intermittent non-fish bearing streams with medium and heavy thin buffers, a change from 25 feet to 35 feet and 40 feet respectively, as suggested by NMFS in order to facilitate an expeditious consultation. NMFS suggested that the buffer change would reflect their concern for addressing activities in riparian areas in relation to riparian buffer adequacy and loss in the short-term of small wood contribution to streams.

Exposure to direct solar radiation, as described in the PDCRR will often cause a dramatic increase in stream temperatures. When shaded throughout the entire day, far less heat energy would be transferred to the stream. The ability of riparian vegetation to shade the stream depends on vegetation height, density, stream width and position relative to the stream.

Thinning can affect stream temperature by removing shade trees. The amount of shade lost depends on stream width, tree height and stream orientation. The following Figure display thinning effects similar to those proposed under this project, for one mile of stream. Most daily solar radiation occurs between 10am and 2pm. Trees that provide stream shade during this time are considered "primary shade trees". Primary shade trees would not be removed. Figure 4 displays buffer width as a function of angular canopy density for mature trees. A mature tree is defined an individual tree that has reached most of its potential height growth. At a point the shade density increases very little as the sun's angle decreases or the sun gets lower in the sky. This is the secondary shade zone. The primary shade tree zone for mature trees varies from 50 to 60 feet in width. Very little additional shade is gained when the sun is low enough to intercept the secondary shade trees. Therefore, in dense stands such as the plantations proposed for treatment, trees outside the "primary shade zone" can be thinned with a neutral effect on stream shade.

Figure 4. Buffer widths and Angular Canopy Density



Riparian Reserve treatments and project design elements fall into three categories; **fish-bearing perennial streams, non-fish-bearing perennial streams, and intermittent and ephemeral streams** (see next sections).

General Design Criteria for Riparian Reserves

- **No density management treatment would reduce the existing overstory canopy within Riparian Reserve to less than 50% (on average at the stand level).**
- ***No commercial extraction of trees would occur within 25 ft. of stream course.***
- To reduce the risk of sediment delivery, soil compaction or the loss of soil infiltration capacity in the riparian area to the streams, yarding activities, **within 100 feet of stream courses, pre and post activity would not result in a loss of more than 10% of the soil infiltration capacity which reduces concerns for sediment reaching the stream**. This activity would include existing skid trails, which could be re-utilized as necessary and then be deep ripped (as feasible) to re-establish soil infiltration capacity.
- Ground based equipment would travel within 100 feet of a stream course. The only access in the Riparian Reserve that ground based equipment would be allowed is on designated and approved skid trails. When the access point is no longer needed they would then be deep ripped (as feasible) to re-establish soil infiltration capacity. The minimum distance of 100 feet would occur only if there is a ridge break and highly vegetative buffer. Use of long-lining (winch line) to remove from treatment areas is allowed where it is determined to be of benefit to Riparian Reserve conditions such as reducing the amount of skid trails needed.
- Yarding activities should achieve full suspension over the active channel[1]. To facilitate log suspension with skyline operations, corridors for cable rigging would be allowed to pass through Riparian Reserves. A maximum clearing width of 12 ft. is required and logs may be yarded through this corridor if necessary. Corridors must be spaced at a minimum of 200 feet apart if they pass through Riparian Reserves. Corridor —ub trees" within the Riparian Reserve, even if damaged, would either be left standing or felled and left in place.

D**esign Criteria for Perennial Streams**

This includes permanently flowing perennial fish-bearing and nonfish-bearing streams. The primary concern regarding yarding Riparian Reserves with fish bearing streams is prevention of sediment delivery to streams, prevention of concentrated overland flow, wood recruitment, and maintenance of stream temperatures. Project design features would follow direction provided in NWFP Temperature TMDL Implementation Strategies 2005[2]. This involves protection, maintenance and enhancement of existing stream shade, and maintenance of the existing micro-climate, ambient air temperature, and air movement.

The primary difference between fish-bearing and nonfish-bearing stream is the width of the entire Riparian Reserve (which is differentiated by fish-bearing status) as shown below:

> **Fish-bearing Riparian Reserve widths are two site potential tree heights each side of stream course (175 ft. X 2 = 350 ft. each side; total width 700 ft).**
>
> **Nonfish-bearing Riparian Reserve widths are one site potential tree height each side of stream course (175 ft. each side; total width 350 ft.).**

[1] Active channel is the bank full width of flowing perennial or intermittent streams.

[2] Northwest Forest Plan Temperature TMDL Implementation strategies - Evaluation of the Northwest Forest Plan Aquatic Conservation Strategy and Associated Tools to achieve and maintain stream temperature water quality standards. USFS and BLM; latest version September 9, 2005.

The **Stream Channel Protection Zone** is from the edge of stream course up to 25 feet. **No commercial extraction) would occur within 25 ft. of the active stream channel.**

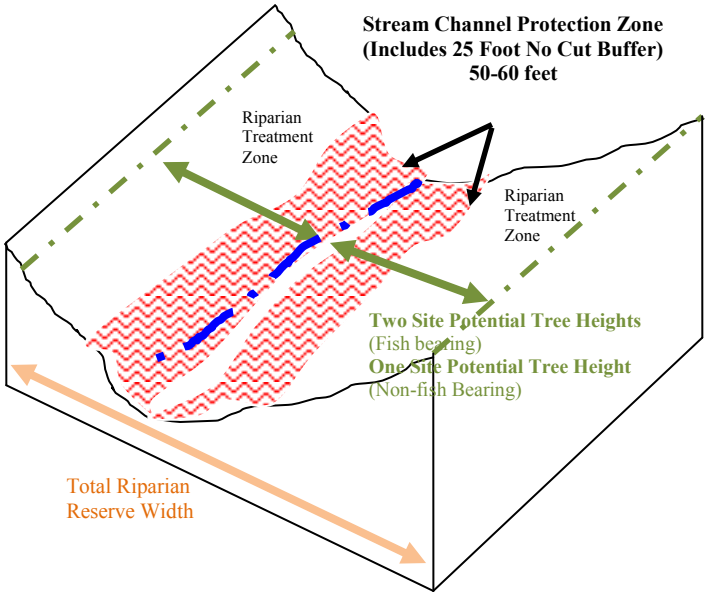
The **Riparian Treatment Zone (Primary Shade Zone)** is an area where canopy retention standards to meet TMDL Implementation Strategies, however some density management, fuels reduction or other restoration treatments could occur. The Primary Shade Zone is an area where no commercial extraction would occur (larger trees felled for skyline corridor clearing would be left), however some density management or other restoration treatments could occur. Distance from active stream channel varies according to height of existing overstory trees and hill slope in immediate area. The following table establishes the width of the Primary Shade Zone.

Table 3. Primary Shade Zone Width, Based on Adjacent Hill Slope within Perennial Streams

	Hill Slope <30%	Hill Slope 30% to 60%	Hill Slope >60%
Primary Shade Zone Width (slope distance)	50 ft.	55 ft.	60 ft.

The Temperature Implementation Strategies allow the distances in the above table to be less (but not less than 25 ft.) if the trees are located on a south facing slope (175-185 degree azimuth) and therefore do not provide stream shade. Note: no large wood, old residual trees (old growth; trees>80 years old), with a potential for instream recruitment would be cut).

Figure 5. Riparian Reserve Design Elements – *Perennial Fish & Non-Fish Bearing Streams*

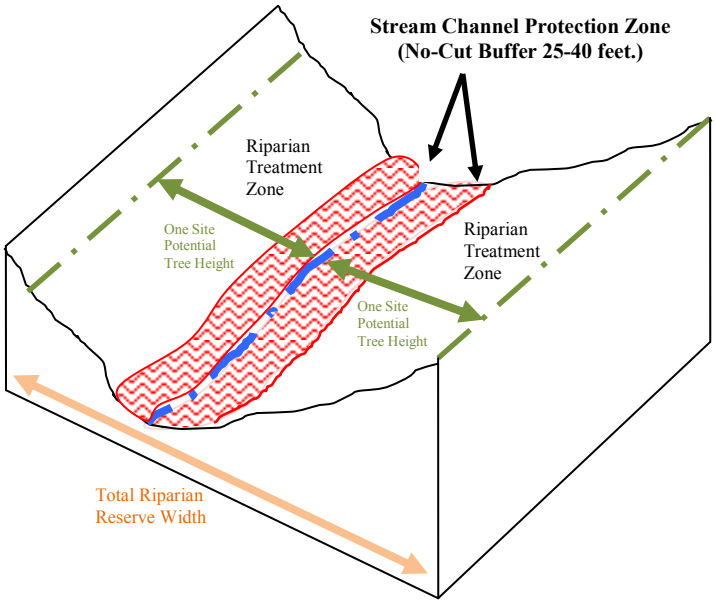


Design Criteria for Non Fish-bearing Intermittent and Ephemeral Streams

Seasonally flowing intermittent and ephemeral non-fish-bearing streams have buffers established for the prevention of sediment delivery to streams, prevention of concentrated overland flow, and maintenance of micro-climates, ambient air temperature and humidity. There are no fish-bearing ephemeral and intermittent stream channels.

The primary difference between perennial and intermittent/ephemeral stream are the buffers for no-cut, and density management and commercial extraction. The intermittent/ephemeral Riparian Reserves and non-fish bearing Riparian Reserves are the same, one site potential tree heights on each side of stream course (175 feet on each side; total is 350 feet); see Table 2.

Figure 6. Riparian Reserve Design Elements – *Ephemeral and Intermittent Stream Channels*



2. Timber Hauling

The only haul route segment adjacent to EFH with a gravel-surface is the remaining 200 feet of road NFSL 5000 with a 12 percent slope, which parallels Coal Creek. This section of road is crowned, has two ditch relief culverts which drains into an 80 feet vegetated buffer. The remaining road segment of haul route coming from the gravel-surface road is a 50 feet asphalt-surfaced segment, which drains around a corner into a well vegetative buffer before reaching the stream. Map 2 displays the haul route. The haul routes from the units are gravel surfaced roads down to the paved NFSL Road 3300 adjacent the South Fork Coquille River. Table 4 displays the amount of haul occurring over perennial stream crossings within the most impact being in the Coal Creek 6th Field. At the junction of the NFSL road 5000 Road and NFSL Road 200 the entire haul merges into the NFSL Road 5000 for approximately one mile. The timber haul would average about 14 truckloads daily from this location down the 5000 road.

Table 4. Summary of the Number of Perennial Stream Crossings That Would Occur during Haul

Watershed	Number of Perennial Stream Crossings
South Fork Coquille 5th Field ,Headwater South Fork 6th Field watershed	3
South Fork Coquille 5th Field, Coal Creek 6th Field watershed	22
South Fork Coquille 5th Field, Mill Creek 6th Field watershed	4
TOTAL	29

Design Criteria for Haul Route

OPERATIONS WITHIN THE NORMAL OPERATING SEASON: Project design features would be implemented to make it unlikely that sediment would reach stream channels.

- **Haul would occur June 1 to Oct 31st.**
- Road crown would be maintained.
- Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.
- If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service Timber Administer is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.

IF OPERATIONS OUTSIDE THE NORMAL OPERATING SEASON: November 1 through May 31st are allowed, the following rules must be applied to timber haul on gravel roads adjacent EFH or any stream type stream channels:

Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.

If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service Timber Administer is responsible to have the Timber Sale Purchaser place sediment filters to prevent this sediment from reaching any stream.

Road Rutting: No hauling down the gravel road surface if rutting is occurring, indicating the subsurface is wet.

Wet weather conditions must be monitored daily by the US Forest Service Timber Sale Administrator for the chance of precipitation, especially 1 inch of rain in 24 hours.

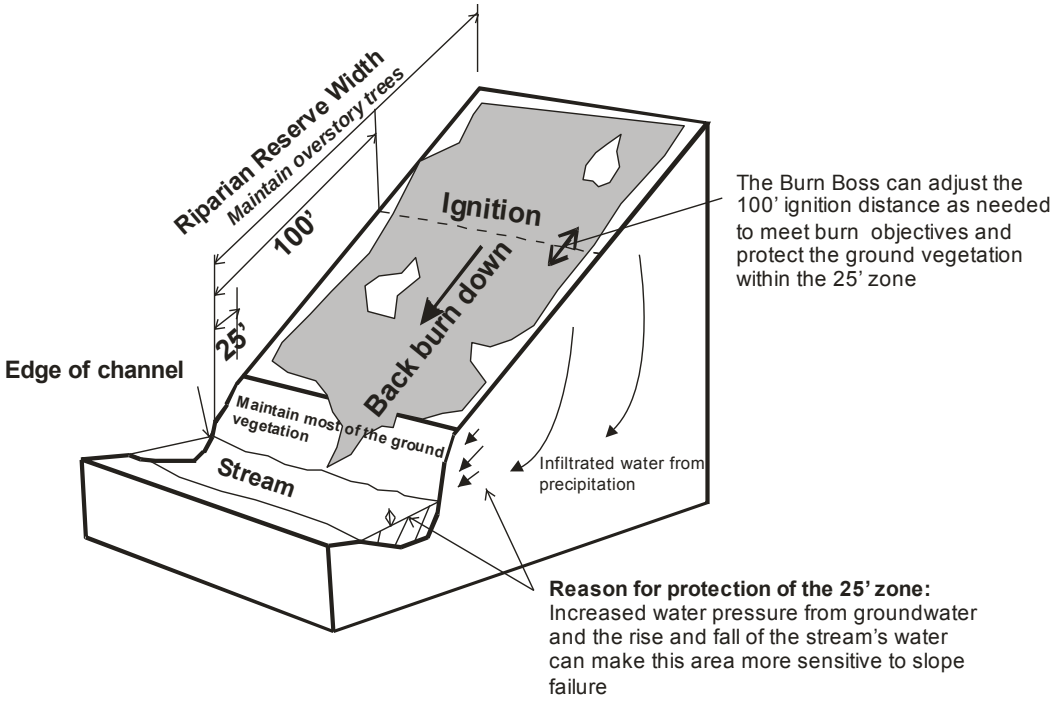
3. Fuels Treatment

Activity fuels treatment refers to the slash and accumulated fuel resulting from the proposed density management treatments. While there may be some slash from previous harvesting or from natural conditions, the majority of material would be generated through density management treatment and commercial removal. Activity fuels treatments proposed for this project include only those that are predicted to be necessary to obtain a resultant and acceptable fuels/fire risk. Several methods of activity fuels treatment are being proposed, and include the following: burning tree tops that were yarded to landing site, burning materials accumulated by harvest activity that is piled (by hand or mechanical equipment), chipping, and under burning.

Design Criteria for Fuels Treatment in Riparian Reserves

- The Stream Channel Protection Zone cited in the PDCRR is from the edge of the stream course up to 25 feet. No vegetation management would occur within 25 feet of the active stream channel.
- No hand piles would be located or burned within the channel.
- Prescribed fire would not be ignited within this zone but fire may be allowed to ~~–b~~ack down" to the stream channel. Specially designed criteria for prescribed burning within Riparian Reserves are show in Figure 7.

Figure 7. Riparian Reserve Design Elements - Prescribed Under Burning



4. Road Maintenance, Temporary Road Construction and Road Decommissioning, Road Reconstruction, Landing Construction, and New Road Construction

The Eden Ridge Planning Area currently has a minimal existing road network, because it has not been vegetatively managed for many decades, and when the logging that created the candidate stands of today were created, most of the area was logged by railroad systems. Most of the existing roads evolved from these early railroad grades but do not adequately serve the Planning Area for today‘s needs and systems. The current existing road system within Eden Ridge, overall, are currently managed and maintained. Refer to Table 5, Table 6 and Map 2 for the general locations of road use, proposed reconstruction/road decommissioning, road reconstruction and maintenance needs associated with the 6th field watershed. There would be 23 Intermittent/Ephemeral Non Fish bearing crossings built and 12 perennial crossings in the 3.19 miles of road activities that are occurring in the Riparian Reserve.

Table 5. Summary of All Road Activity in *Riparian Reserves*

Road System – By Road Type	Road Number or Unit	Number of Intermittent/Ephemeral Non-fish Bearing Road Crossings	Number of Perennial Road Crossings	Total Road Segments Miles	Distance from CCH/EFH
Temporary Road (Access) Construction – New Roads to be Built in Riparian, No Existing Template. Decommission Afterwards					
	Q4	1	1	0.21	9.3/2.3
	R	0	0	0.03	9.4/2.4
Total Crossings/Miles		**1**	**1**	**0.25**	**Total Miles**
Road Reconstruction					
	5000299	0	1	0.57	11.7/4.7
	5000442	1	0	0.25	11.0/4.0
	5000442.1	1	0	0.07	11.0/4/0
	5000443	2	0	0.28	11.7/4.7
	5000446	1	0	0.09	11.8/4.8
	5000451	2	0	0.11	4.2/5.2
Total Crossings/Miles		**7**	**1**	**1.36**	**Total Miles**
New Permanent Road Construction					
	B	2	0	0.16	8.8/8.8
	F	1	0	0.17	11.7/11.7
	J	0	1	0.05	23.6/4.6
	O4	4	0	0.10	14.5/7.5
	S1	0	1	0.06	9.8/2.8
	S3	0	1	0.06	9.7/2.7
	S5	0	1	0.05	10.3/3.3
	S6	1	0	0.06	10.3/3.3
	S7	0	2	0.11	11.0/4.0
	S8	1	0	0.04	10.3/3.3
	S9	3	0	0.05	12.0/5.0
	T	1	0	0.10	17.5/10.5
	U	0	1	0.12	14.5/7.5
	W	1	3	0.33	15.4/8.4
	Z	1	0	0.13	15.6/8.6
Total Crossings/Miles		**15**	**10**	**1.58**	**Total Miles**
Grand Total – Proposed Crossings and Miles of Roads to be Built in Riparian Reserves		**Intermittent/Ephemeral Crossings 23**	**Perennial Road Crossings 12**	**Total Miles 3.19**	

a. Road Maintenance

This activity includes several routine related activities which maintain drainage, cuts and fills and surfacing of the road prism to accommodate light and commercial road traffic; while maintaining the integrity of the road facility and minimizing effects to natural resources adjacent to the road. Much of this work is done with a motor grader, dump trucks and backhoe and includes travel way surface maintenance, drainage ditch maintenance, culvert cleaning, surface rock replacement, shaping of the roadway and ditches by blading, removal of slough materials, compacting and other mechanized and hand work.

It is estimated that road maintenance would be needed on the road system utilized for this project, over at least ten years. The FS Road 290 that access some of the timber sales is gated to prevent public access during periods when POC disease could spread.

b. Temporary Road (Access) Construction & Decommissioning

Approximately 0.29 miles of new temporary road is proposed, in two segments, not longer than 0.25 miles in length (Table 6 and Map 2). Temporary roads include those roads needed only for the purchaser‘s use, such as roads used to haul timber from landings to permanent National Forest System roads. The Eden Ridge Timber Sales Project may need other new temporary road construction for candidate stand access if it minimizes resource damage. These roads would be built and removed by the operator as part of the Forest Service timber sale or stewardship contract.

Table 6. Proposed *Temporary* Road (Access) Construction & Decommissioning

Road Segment Reference	Length (miles)	Notes	Distance to Coho Critical Habitat (Stream Miles)/EFH
Q4	0.25	No template, crosses a intermittent channel	9.3/2.3
R	0.03	Short spur; joins with existing road	9.4/2.4
TOTAL	**0.29**		

c. Road Reconstruction

Reconstruction involves maintenance and improvements to existing road or railroad template, to make them suitable for logging equipment and harvest treatment access. Reconstruction involves restoring a road to operational condition.

Road repairs could have one or more of the following work items: removing fallen trees, cleaning out culvert inlets, removing and disposing of small cut slope slides, falling danger trees, replacing minor amounts of road surfacing, replacing, adding additonal drainage structures, etc. Treatments could include grading, clearing, restoring road width loss, or stabilizing a cut or fill (embankment) slope that was lost due to storm damage, by placing riprap materials (large boulders) against existing slopes, and may include widening and surface rock replacement.

Table 7. Road Reconstruction in Relation to CCH/EFH

Road Numbers	Distance to CCH/EFH (miles)
5000291	8.9/1.9
5000298	10.0/3.0
5000299	26.8/19.8
5000299.1	9.9/2.9
5000442	18.5/11.5
5000442.1	11.4/4.4
5000443	11.8/4.8
5000446	23.8/4.8
5000447	4.6/4.6
5000448.1	10.7/3.7
5000451	4.2/4.2

d. Landing Construction/Reconstruction

Some of the areas associated with the candidate stands have an existing network of roads and landings from previous harvests. However, there would also be a need for some additional areas created for log landings. These would primarily occur in areas where no landing currently exist or where a change in logging systems (e.g., where skyline logging is now prescribed in areas previously railroad logged). Two existing landings are known to exist in the Riparian Reserve and outside of the primary shade zone, see Map 2 and Table 8.

Site L-13 is an existing landing with a primary road located within it. It is situated where 90% of the landing is upslope of the road and 10% of the landing is downslope of the road, approximately 100 feet above the stream channel above the break in slope. The 10% section of the landing is where the yarder would be located and in a well vegetated site.

Site L-14 is a new landing and is located adjacent to the main haul route road and would be situated completely above the road. The road is located approximately 80 to 100 feet above the stream channel. The riparian zone buffer consists of large trees and a brush and forbs well vegetative component. The yarder would be stored away from the stream on the upslope side of the road.

Design Criteria for landings in Riparian Reserve

- All landings, designated skid trails, staging or decking within Riparian Reserves would
  - Be of minimum size as possible to only allow operations;
  - Be located above the break in slope above the stream channel;
  - Have a well vegetated strip between the work site and the stream channel, which is a minimum or greater of the no-cut buffers;
- Landing slopes would be armored with logs or other woody material capable of protecting the slope surface.
- Landing surfaces would drain away from the stream channel during and after use, and, would be revegetated/mulched after use.
- All landings are subject to season of use restrictions.
- Landing site restoration would consist of :
  - Placement of slash on bare soils located on the downhill slope.
  - Loose material on the downslope side would be pulled back.
- All landings will be at least 100 feet away from stream channels.

Table 8. Landings in Riparian Reserves

Landing in Riparian	Distance to Coho Habitat/EFH	Existing or New	Perennial or Intermittent
L-13	9.0/2.0	Existing	Perennial, non-Fish Bearing
L-14 (unit 309)	9.4/2.4	New	Perennial, Fish Bearing (non CCH)

e. New Road Construction

In order to adequately and efficiently access the Planning Area for today‘s management systems, there is a need for additional classified roads. Given the current situation, these new access roads could not be developed without the need to cross some drainages designated as Riparian Reserve. A total of approximately 11.1 miles of new road construction (Table 9) is proposed. Of the 11.1 miles of road, 0.3 miles would be permenantly decommssioned. The remaining new road construction would include approximately 10.8 miles, in 43 segments, ranging from 0.11 miles to 1.93 miles. New roads would be managed as Maintenance Level 1 (Table 10, closed until further need). ***New permanent roads in Riparian Reserve total 1.58 miles.***

All proposed new system roads would be rocked as needed to minimize erosion and allow for extended use during wet conditions. All new roads (including those crossing Riparian Reserve) would be engineered and designed to minimize envornmental impacts. Designed roads constructed on NFSLwould be accompished to standards appropriate for the intended uses; considering safety, cost of transportation, and impacts on lands and resources. Designed roads would be constructed as stable and durable structures to facilitate maintenance during and after use and monitored every five years.

This design would include necessary drainage facilities, adequate erosion control, closure devices, and resource protection devices. Closure of all new construction of system roads would typically be accomplished via a road entrance closure of native materials (logs, earth, boulders) after timber sale activites had occurred, placing them into Maintenance Level 1 Status (Table 10).

Table 9. Proposed New Road Construction, Location and Distance to CCH

Road Segment Reference	Road Length (Contiguous - miles)	Notes	Distance to Coho Critical Habitat/EFH (Stream Miles)
A	0.23	Ridgetop road, skyline access, no grade	4.3/4.3
B	0.74	Crosses some riparian; some grade up to 10%	9.1/9.1
C	0.03	Begins on PVT; ties to road M for FS access	24.3/5.3
D	0.60	Ridgetop road, skyline access, no grade	28.5/9.5
E1	0.34	Ridgetop road, skyline and GB access, no grade	24.0/5.0
E2	0.22	Ridgetop road, skyline and GB access, no grade	24.05.0
E3	0.20	Ridgetop road, skyline access, no grade	24.05.0
F	0.39	Crosses riparian, minimal grade	7.9/7.9
G	0.15	Ridgetop road, skyline access, no grade	3.7/3.7
H	0.21	Ridgetop road, skyline access, no grade	3.33.3
I	0.09	Ties to existing route planned for reconstruction	23.9/4.9
J	0.08	Crosses riparian; provides GB access	23.8/4.8
K	0.36	Begins on PVT; for FS skyline access	23.3/4.3
L	0.01	Begins on PVT; for FS skyline access	23.5/4.5
M	0.81	Ties to road C for FS access, minimal grade	28.1/9.1
N	0.04	Begins on PVT for FS access	23.1/3.1
O1	0.28	First segment for skyline access; minimal grade	23.6/4.6
O2	0.23	Second segment for skyline access; minimal grade	23.5/4.5
O3	0.24	Third segment for skyline access; minimal grade	23.4/4.4
O4	0.18	Additional segment for skyline access; minimal grade	23.2/4.2
P1	0.06	Begins on PVT, ties to P2 for FS access	8.9/1.9
P2	0.08	Ties to P1 for FS access	9.0/2.0
P3	0.13	Ridgetop skyline access	9.3/2.3
P4	0.11	Ridgetop skyline access	9.4/2.4
Q1	0.11	Begins on PVT; ties to roads Q2 & Q3 for FS access	9.1/2.1
Q2	0.05	Second segment for GB access	9.1/2.1
Q3	0.10	Second segment for GB access	9.1/2.1
S1	0.09	Joins existing road with existing road planned for reconstruction	10.0/3.0
S2	0.12	Joins existing road with existing road planned for reconstruction	9.9/2.9
S3	0.06	Construction of old railroad grade trestle to classified road	10.0/3.0
S4	0.15	Additional segment for GB access	9.9/2.9
S5	0.05	Construction of old railroad grade trestle to classified road	10.0/2.0
S6	0.24	Additional segment for GB & skyline access	11.9/4.9
S7	0.11	Construction of old railroad grade trestle to classified road	10.2/3.2
S8	0.04	Construction of old railroad grade trestle to classified road	10.4/3.4
S9	0.06	Construction of old railroad grade trestle to classified road	10.8/3.8

Road Segment Reference	Road Length (Contiguous - miles)	Notes	Distance to Coho Critical Habitat/EFH (Stream Miles)
T	1.93	Crosses some riparian; some grade up to 10%	13.0/6.0
U	0.38	Crosses some riparian; minimal grades	14.6/7.6
V	0.14	Ridgetop road, skyline & GB access, no grade	11.3/4.3
W	0.61	Crosses some riparian; minimal grades	12.0/5.0
X	0.22	GB access; minimal grade	11.6/4.6
Y	0.18	GB access; minimal grade	12.0/5.0
Z	0.35	Crosses some riparian; some grade up to 10%	11.9/4.9
TOTAL	**10.81**		

Table 10. Road Maintenance Level Definitions

Level 1	Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. While being maintained at level 1, roads are closed to vehicular traffic. These areas will be monitored every five years to ensure any stream crossings are continuing to function properly during winter storms events.
Level 2	Assigned to roads open for use by high clearance vehicles. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses.

Design Criteria for Road Maintenance, Temporary Road Construction and Reconstruction, Road Decommissioning, and Landing Construction

General Design Criteria

- ***Minimize hydrologic connectivity and sediment delivery from roads.*** This includes roads inside and outside of Riparian Reserves. Road drainage will be routed away from potentially unstable channels, fills, and hillslopes.
- All exposed soils near streams will be mulched for erosion control measures.
- No side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in Riparian Reserves
- Minimize or avoid disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow when considering constructing or reconstructing roads or landings either inside or outside of Riparian Reserves.
- New or replaced permanent stream crossings would be designed to accommodate at least the 100-year flood, including associated bedload and debris.
- Where physically feasible, construction or reconstruction of stream crossings would avoid diversion of streamflow out of the channel and down the road
- All designated skid trails, staging or decking within Riparian Reserves would:
  - Be of minimum size as possible to only allow operations;
  - Be located above the break in slope above the stream channel;
  - Have a well vegetated strip between the work site and the stream channel, which is minimum or greater of the no-cut buffers;

Landing Design Criteria

- Landing slopes would be armored with logs or other woody material capable of protecting the slope surface.
- Landing surfaces would drain away from the stream channel during and after use, and, would be revegetated/mulched after use.
- All landings are subject to season of use restrictions.

- Landing site restoration would consist of :
  - Placement of slash on bare soils located on the downhill slope.
  - Loose material on the downslope side would be pulled back.
  - Be of minimum size as possible to only allow operations;
  - Be located above the break in slope above the stream channel;
  - Have a well vegetated strip between the work site and the stream channel, which is a minimum or greater of the no-cut buffers;

Temporary Road Construction and Decommissioning Design Criteria

Temporary Road Construction and Decommissioning would be managed in accordance with water quality Best Management Practices[3] (BMPs) R-23. In order to prevent continued low level casual use, and to minimize resource impacts, such roads and landings would be obliterated at the completion of their intended use. Effective obliteration is generally achieved through a combination of the following measures:

- Temporary culverts are removed and natural drainage configuration is re-established;
- Road surfaces are ripped;
- Sideslopes are reshaped and stabilized; road is effectively drained; and
- Road is blocked to further use, and road is returned to vegetation production through revegetation (seeding, planting browse species, or hardwood/conifer trees).
- Temporary roads built would be closed after the season of use of if kept open over winter would be winterized. Drainage work to winterize temporary roads would include water bars at suitable intervals and out sloping.

New Road Construction Project Design Criteria

Some of the new classified roads would cross Riparian Reserves under specially designed Project Design Criteria for Riparian Reserves (see below).

- ***No new road construction would be allowed to cross or disturb any fish bearing perennial stream,*** especially the banks of fish bearing portions/tributaries of Coal Creek and Wooden Rock Creek.
- New classified road construction would only be allowed to cross non fish bearing perennial streams or intermittent streams and would include engineering design as Operational Maintenance Level 2 roads during use and Maintenance Level 1 (Table 10) when not in use for harvest activities.
- Perennial channels will be dewatered or water will be rerouted during construction with manufactured or natural sediment filters will be placed within the channel to prevent sediment from discharging downstream.
- New permanent stream crossings would be designed to accommodate at least the 100-year flood, including associated bedload and debris.
- Relief ditch spacing would get spaced and the road sloped such that water does not channelize when leaving the relief culvert.
- Roads would be designed to minimize hydrologic connectivity and sediment delivery. This includes roads inside and outside of Riparian Reserves. Road drainage would be routed away from potentially unstable channels, fills, and hillslopes.
- No side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in Riparian Reserves

[3] *General Water Quality Best Management Practices,* Pacific Northwest Region, November 1988.

- Minimize or avoid disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow when considering constructing or reconstructing roads or landings either inside or outside of Riparian Reserves.
- Where physically feasible, construction of stream crossings would avoid diversion of streamflow out of the channel and down the road.

5. Other Restoration Activities

a. Snag/Down Wood Creation

In areas where past management has resulted in a lack of large snags needed for cavity nesting species, snags may be created from live trees left in stands. Creation can be through girdling, topping the trees with chain saws, blasting, or inoculation with heart rot fungi. These methods would open the trunk to development of a hollow core used by woodpeckers and a variety of other birds, mammals, and other wildlife. Whenever possible, creation of snags over 14" DBH within each plantation should be part of each prescription through top removal or girdling. Evaluations would occur after density management treatments to assess potential needs for snag/down wood creation. In areas lacking adequate amounts of down woody material (include snags in calculations), green trees may be felled.

b. Riparian Snags

Snags and down large coarse wood would be retained to support forest function. This project is planned for down logs to be retained and are considered excess only when all site considerations have met and in accordance with Forest Plan Standards and Guidelines.

Coarse woody material (CWM) fulfills a number of important ecological functions such as stabilizing surface soils, increasing organic content in soils over the long-term, providing habitat for the many organisms that depend on snags and down logs in various stages of decay, and ensuring adequate coarse woody material recruitment to meet the ecological needs of aquatic systems over time.

Within Riparian Reserve, prescriptions would account for future large woody material recruitment. If residual trees are felled (e.g., human safety or skyline corridors), provisions for replacement trees would be made during operations. Whenever possible, creation of snags over 20" DBH within riparian areas of each treatment unit should be part of each prescription through top removal, inoculation or girdling.

Throughout the Riparian Reserves, snags 10 inches diameter or greater are not considered a fuel or safety hazard. If felling is necessary leave snags on site above 10"on the large end. Below 10" diameter fuels may be hand piled from 2" on the large end four feet and greater. Site specific treatments such as hand piling would depend on specific fuel loading and wildlife recommendations.

There would be long term biological diversity beneficial effects from accelerating the development of late-successional conditions within Riparian Reserves to enhance the recovery of the northern spotted owl and marbled murrelet, improving stand conditions to reduce the likelihood of future stand replacement fires, restoring species diversity, adding snags and down wood, and reducing the effects of fragmentation in the long term.

Snag/Down Wood Creation Design Criteria

Following harvest operations, if funding is available, snags would be created by girdling, inoculation, or topping to increase snags to an average of 2.5 snags >10 inches DBH per acre representative of the dominant and co-dominant tree class.

c. Stream Enhancement

The Eden Ridge Project proposes to place 150 large trees in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Live and dead trees may be removed from riparian areas to provide wood for restoration projects, under special conditions described in the Design Criteria. This action would involve the use of log trucks and dump trucks for transport and excavator-type machinery, spyders, cable yarders, draft horses, or helicopters for placement. Plans and designs would be consistent with Forest Plan direction, K-V opportunities, and watershed restoration plans (e.g., USDA FS 2006). Approximately 1 Mile of upper Coal Creek tributaries within Units 905 and 906 would have trees felled toward the channel and approximately 1 mile of Wooden Rock would have stream restoration. Approximately 50 trees per mile would be placed within approximately 3 miles of stream (150 trees total, 22,650 cubic feet). The proposed restoration is located in resident fish habitat ranging from ten miles to twenty seven miles upstream of CCH and three to eight miles for EFH.

Stream Enhancement Design Criteria

- Place LW and boulders only in those areas where they would naturally occur and in patterns that closely mimic that which would naturally occur for that particular stream type.
- LW includes whole conifer and hardwood trees, logs, and root wads. LW size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5 x bankfull channel width, while logs without root wads should be a minimum of two times the bankfull width. Place wood in a manner that most closely mimics natural accumulations of LW for that particular stream type. Structures may partially or completely span stream channels or be positioned along streambanks.
- No conifers should be felled in the riparian area for in-channel large wood placement unless conifers are fully stocked and are consistent with project design criteria in vegetation treatment categories. Felled hazard trees can be used for in-channel wood placement.
- LW may be buried into the streambank or channel but shall not constitute the dominant placement method of LW.
- Tree Removal for LW Projects:
    - Trees may be removed by cable, ground based equipment, horses or helicopters, or felled directly into the stream. Felled trees may be stock-piled for later instream restoration projects.
    - Individual trees or small groups of trees (<5) should come from the periphery of permanent openings (roads etc) or from the periphery of non-permanent openings (e.g. plantations, along recent clear-cuts, etc.).
    - Trees selected for LW restoration projects must be spaced at least one site potential tree height apart and at least one crown width from any trees with potential nesting structure for ESA-listed bird species.
- Instream work would occur during the ODFW instream work period.

d. Native Grass/Forb Seeding

Exposed mineral soil (landings and temporary roads) may be seeded with native grass seed to restore and improve forage for wildlife that benefit from grasses and forbs; e.g., deer, elk, mice, rabbits and their predators. Seeding may also reduce the opportunity for non-native plants (including noxious weeds) to invade disturbed sites and reduce erosion.

e. Invasive Plant Treatments

Monitor and treat invasive plants within project area boundaries to reduce/eliminate current populations and reduce the future spread of non-native vegetation. Treatment would be completed in disturbed areas within the watersheds by hand pulling only.

B. ESA ACTION AREA

The Action Area, as defined by the Endangered Species Act (ESA), is all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action [50 CFR § 402.02]. The Action Area not only includes the immediate footprint of the harvest and road related activities, but any downstream reaches which may be affected indirectly.

The proposed action is located within portions of the South Fork Coquille River 5th field and the Middle Fork Coquille River 5th field. Timber harvest, timber hauling and new road construction would occur primarily in Coal Creek 6th Field watershed and in the upper headwaters of 6th Field Watersheds: Headwaters S. Fork Coquille River, Lower Rock Creek and Myrtle Creek. Only timber haul activities adjacent to units would occur within the headwaters of Mill Creek -South Fork Coquille 6th field watershed.

IV. DESCRIPTION OF AFFECTED SPECIES AND CRITICAL HABITAT

A. OREGON COAST COHO AND COHO CRITICAL HABITAT

Oregon Coast (OC) coho ESU was listed as threatened on August 10, 1998 (63 FR 42587). This listing was reevaluated and NMFS determined listing OC coho was not warranted on January 17, 2006. The listing was once again reevaluated and NMFS determined a listing of threatened was warranted on February 4, 2008 (73 FR 7816). OC coho salmon critical habitat was designated as threatened also on February 11, 2008 (73 FR 7816). Final protective regulations for OC coho salmon were issued on February 11, 2008 (73 FR 7816). On April 28, 2009, NMFS announced that it was initiating a status review of OC coho. On May 26, 2010, NMFS affirmed the listing of the OC coho salmon as Threatened (75 FR 29489). Table 11 lists streams with OC coho presence and/or EFH within the Action Area. The lateral extent of OC CCH is limited to the ordinary high water mark (i.e., bankfull elevation).

On the RRSNF, the South Fork Coquille River, though occupied by OC coho, is exempt from critical habitat designation due to economic benefits of exclusion outweighing the benefits of designation. Further, marine habitats are not included as critical habitat due to the difficulty in identifying specific areas critical to the species. CCH habitat ends at the town of Powers, six miles below the confluence of Coal Creek and the South Fork Coquille River.

B. ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), in accordance with the Sustainable Fisheries Act of 1996 (Public Law 104-267) designates EFH for coho and Chinook salmon (Federal Register, Vol. 67, No. 12). The MSA defines EFH as ―.those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Federal Register, Vol. 67, No. 12).” EFH closely mirrors the occupied and historic habitat of coho and Chinook salmon. Although Chinook salmon and its habitat are primarily located within the mainstem rivers and larger streams, coho salmon are located just below the Action Area. Table 11 describes Coal Creek and EFH within the Action Area. Table 11 does not list all the streams with EFH in the 6th field sub-watershed, rather only the streams with EFH within the Action Area.

The habitat indicators addressed in this BA that are pertinent to aquatic habitat health, also represents the primary constituent elements of EFH for OC coho salmon. Therefore, wherever EFH effects analysis is discussed in this BA is sufficient for consultation of OC coho in the South Fork Coquille River 5th field watershed.

Table 11. Coho EFH Description (StreamNet, 2003; 73 FR 7816)

6th Field Sub-Watershed	Stream Name	Tributary to:	Mile of Coho EFH within Coal Creek	EFH Endpoint Description
South Fork Coquille 5th Field Watershed				
Coal Creek	Coal Creek	South Fork Coquille River	1 Mile	Coho use: EFH is not currently used by Coho due to a barrier block (two culverts) at the confluence with the South Fork Coquille. The culverts are planned for replacement with a bridge during the next few years, when funding is available. EFH ends near where the haul route is adjacent Coal Creek.

C. PRIMARY CONSTITUENT ELEMENTS

NMFS developed a list of Primary Constituent Elements (PCEs) that are essential for the conservation of OC coho, and which are based on the life history of the coho salmon. These PCEs are: freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, nearshore marine areas, and offshore marine areas. These PCEs in concert with OC coho distribution data were used to delineate the spatial extent of the EFH. CCH ended seven miles downstream of the designation of EFH in Coal Creek located upstream. The lateral extent of this designation is limited to the ordinary high water mark (i.e. bankfull elevation). For the purposes of this BA, the PCEs are cross referenced with the respective Habitat Indicators in Table 12 below as this project would relate to EFH.

Table 12. OC Coho Critical Habitat Essential Habitat Features and Respective Habitat Indicators

PCEs of OC coho Critical Habitat	Habitat Indicator
Freshwater Spawning Sites	Change in Peak/Base Flows, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Substrate
Freshwater Rearing Sites	Change in Peak/Base Flows, Floodplain Connectivity, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Water Quality Indicators, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Off-channel Habitat, Streambank Condition
Freshwater Migration Corridors	Physical Barriers, Change in Peak/Base Flows, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Floodplain Connectivity, Off-channel Habitat, Streambank Condition
Estuarine Areas	Physical Barriers, Water Temperature, Sediment/Turbidity, Chemical Contamination/Nutrients, Change in Peak/Base Flows, Water Quality Indicators, Riparian Reserves, Substrate, Large Woody Debris, Pool Frequency, Pool Quality, Width/depth Ratio, Floodplain Connectivity, Off-channel Habitat, Streambank Condition
Nearshore Marine Areas	N/A to RRSNF Actions
Offshore Marine Areas	N/A to RRSNF Actions

V. DESCRIPTION OF ENVIRONMENTAL BASELINE AND POTENTIAL EFFECTS OF THE PROPOSED ACTIONS

Information used in this analysis includes Geographic Information System data, Aquatic Habitat Inventories (Forest Service 2010), Properly Functioning Condition ratings are based on the NOAA Table of Population and Habitat Indicators, as modified by the Rogue River/South Coast Level 1 Team for the Klamath Province/Siskiyou Mountains.

This analysis evaluates the direct and indirect potential effects of the proposed actions on Oregon Coast coho and EFH. There is no potential to affect CCH 8.8 miles downstream, while there is potential to affect EFH. EFH is located in the Action Area, so any potential effect to one (i.e., EFH) would obviously result in an effect to the other (OC coho).

The proposed activities under the ER Timber Sales were split into five project elements: 1) Timber Felling and Yarding, 2) Timber Hauling, 3) Fuels Treatment, 4) Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction and New Road Construction, and 5) Other Restoration Activities. Below is a table which displays proximity of project activities in relation to EFH.

Table 13. Proximity of Project Elements to EFH within Coal Creek 6th Field Watershed

Project Elements (PE)	Distance to EFH
Timber Felling and Yarding	1.8 miles > 10.5 miles
Timber Hauling (Gravel Roads)	*50 feet to100 feet > 10.5miles
Fuels Treatment	1.8 miles > 10.5 miles
Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction and New Road Construction	1.8 miles > 10.5 miles
Other Restoration Activities	1.8 miles > 10.5 miles

*** This section of road is about 200 feet long and immediately leaves the EFH and travels up the ridge where it normally is about 1.8 mile > 10.5 miles above EFH**

A. HABITAT INDICATORS

1. Water Quality

a. Temperature Baseline (ODEQ)

Coal Creek is listed under temperature on Oregon Department of Environmental Quality's 303(d) list (ODEQ 2008). The water quality temperature standard of 16°C (60.8°F) is designed to maintain core cold water habitat for salmon and steelhead rearing. The Oregon Dept. of Environmental Quality and its partners (including the Rogue River-Siskiyou NF) prepared a *Total Maximum Daily Load* assessment and *Water Quality Management Plan* (TMDL/WQMP) for the Upper South Fork Coquille watershed in 2001. The assessment addressed temperature in 303(d) listed streams (including Coal Creek), and concluded that ~~"n~~o thermal loads are available for allocation to anthropogenic sources in this system". For the purposes of the Action Area, this means that any increases in stream water temperature resulting from land management activities would be a violation of state water quality standards.

The main channel of Coal Creek is poorly shaded by trees (RAPID stream shade assessment, Hydrologic Report); the canopy cover is generally below 64% shade. The channel is well shaded by the steep and narrow canyon through which it flows. Streams within the proposed units and on NFS land in the Planning Area are generally well shaded by conifers and occasional hardwoods such as big leaf maple, myrtle, and alder. RAPID analysis indicates that stream shading on NFS land is dominantly 84 percent to 100 percent.

Baseline Rating: **Functioning At Risk**

b. Effects on Temperature Indicator

Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities

Proximity Causal mechanisms associated with the PEs are associated with canopy removal at temporary and permanent stream crossings. Canopy removal elsewhere on roads and for thinning outside the primary shade zone would not affect stream temperature since there is no surface water present. Only one temporary road occurs near the main channel of Coal Creek; the remaining permanent crossings are located on small upland tributaries. Temporary road construction associated with Unit 308 would include a crossing on a tributary approximately 1,140 feet above the confluence of Coal Creek. New road construction occurs mainly in the uppermost areas of the watershed where streams are first and second order. There are two known landings located inside the Riparian Reserves approximately 80 to 100 feet above perennial stream channels and located greater than two miles from EFH. The Roadside Sanitation is located on ridge top roads as shown on Map 2, all treatments are located on ephemeral or intermittent streams except one location is on a headwater perennial stream crossing located in Unit 327 which is approximately five miles above the EFH habitat.

Probability Trees and vegetation would be removed on the travel way and two stream crossings constructed—one ephemeral and one perennial associated with the temporary road construction in Unit 308. Water temperature increases would not occur in the ephemeral channel since no water is present during the summer months. Measureable water temperature increases resulting from the one temporary perennial crossing are not expected for the following reasons:

- The active channel for the temporary crossing is only a few feet wide and drains a surface area of approximately 10 acres at the proposed crossing. Stream discharge at the crossing is less than one cubic foot/second, particularly during the summer. Sun exposure at the crossing would occur only in the middle of the day when the sun is directly overhead. The crossing is surrounded by forest that would block sunlight coming in at an angle, and understory vegetation shades the channel effectively due to its narrow width.
- Sun exposure would be 100% blocked as the water flows through the culvert. Exposure upstream and downstream of the culvert would occur over a few linear feet and would be reduced by adjacent forest canopy; this limited exposure is not enough to cause a measureable change in water temperature.
- Removal of the temporary crossing would occur in September when the cooler temperatures exist and sun exposure is low (due to position of sun nearer to horizon). Placement of slash material would provide temporary cover and allow understory vegetation to re-establish along the travel way during the fall and following spring. This would quickly reestablish shade capable of shading a channel width of a few feet or less.
- Stream shade assessment modeling (RAPID) shows that streams on NFS land in the Planning Area are at or above target levels of 82% forest canopy (target levels established in S.F. Coquille TMDL assessment; ODEQ, 2001). Removal of vegetation in scattered areas to accommodate road crossings would not decrease shade enough to increase water temperature.

New road construction occurs mainly in the uppermost areas of the watershed where streams are first and second order. During the summer months, surface discharge from these channels drops to less than a few gallons per minute and may be intermittently subsurface. Constructed stream crossings within the Coal Creek subwatershed would occur on proposed new permanent roads and on an existing railroad grade proposed for conversion to a permanent road. Six perennial crossings would be constructed for new roads. These roads and crossings would not be anticipated to result in measureable increases to water temperature for the following reasons:

- All of the crossings are located on first and second order streams. These channels are only a few feet wide and have small discharges (refer to discussion under temporary roads, above).
- The largest watershed area above these crossings totals approximately 60 acres. Others are 30 acres or less. This presents very little drainage area to collect surface water to these crossings. Stream discharge from such small drainage basins is low, especially during the summer when ground water levels are lowest.
- Crossings would have minimal sun exposure for the same reasons as described above for the temporary road crossing. Since these crossings would be permanent, there would be no sun exposure associated with removal of the crossing. Any loss of shade above/below the culvert would be short term and would be balanced by the complete blockage of light as water flows through the culvert.

Five perennial stream crossings are associated with conversion of the existing railroad grade to permanent system road. Originally the railroad grade utilized elevated trestles at crossings to avoid the extra distance and tight turns involved in following the natural contour. The proposed actions would construct new stream crossings and road approaches that closely follow the contour. These segments of new road construction would not result in measureable increases to water temperature for the following reasons:

- All of the crossings are located on first and second order streams. Although the old railroad grade crossed Coal Creek, the permanent road does not include this crossing. Water discharges at the proposed crossings are low; barely at the point of initiation, carry minimal water.
- Stream discharges would be low in these channels, especially during the summer when sun exposure is greatest and groundwater levels are at their lowest, i.e., estimated at <1 cfs. Therefore, an increase in stream temperature is nonexistent.
- Stream shade assessment modeling (RAPID) shows that streams on NFS land in the Planning Area are at or above target levels of 82% forest canopy (target levels established in S.F. Coquille TMDL assessment; ODEQ, 2001). Streams are well shaded by existing forest canopy and understory at the crossings.

There are two known landing that would be located inside the Riparian Reserves. The *Landing Reconstruction* for Landing L13 is located on both sides on NFSF Road 290. The east side of the road is where the yarder would sit, this makes up about 10 % of the landing. The yarder would be located about 80 feet from a 10 feet wide perennial stream. This portion of the landing does not affect the primary shade zone of 60 feet; it is an additional 20 feet out. The other 90% of the landing sits on the west side of the road and is part of a different drainage and the landing is several hundred feet above a stream identified as a modeled stream channel. These design features in addition to the two mile+ distance from EFH ensure that no stream shade trees would be removed that would affect stream temperature that would reach EFH.

The closest road work to EFH in Riparian Reserves is 1.9 miles upstream (See Table 1). The proposed landing constructions in the Riparian Reserve are not within the Primary Shade Zone and would be located greater than two miles upstream of EFH.

Element Summary: *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities* would not result in any removal of Riparian Reserve vegetation that would cause measurable increases in water temperature that would reach EFH habitat. Therefore, a **neutral (0) effect** to stream temperature would occur from these activities.

Timber Felling and Yarding

Proximity *Timber Felling and Yarding* of trees proximity is described in the PE and displayed in Table 2 below.

Same table displayed earlier in document. **Table 2. Overall Design Criteria for Riparian Reserves**

Channel	Project Activities	Buffer	Riparian Reserve	PDCRR Name	Range of Commercial Prescriptions Outside of Buffer (TPA)
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 25 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Light Thin = 150-225,
	Density management and commercial extraction allowed.	25 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Light Thin = 150-225,
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 35 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Medium Thin = 90-150
	Density management and commercial extraction allowed.	35 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Medium Thin = 90-150,
Ephemeral and Intermittent ***Non-fish*** **Bearing Streams**	*No-cut buffer* except for hazard trees, corridor or anchor trees (for skyline cable yarding) may be felled and left at site, no commercial removal.	Stream side to 40 feet along both sides of channel.	**One** site potential tree height each side of stream (175 feet each side; total width 350 feet)	**Stream Channel Protection Zone**	Heavy Thin = 50-90.
	Density management and commercial extraction allowed.	40 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on one site potential tree height.		**Riparian Treatment Zone**	Heavy Thin = 50-90.
Perennial ***Non-fish*** **Bearing Stream**	*No-cut buffer* (same as Ephemeral and Intermittent	Streamside to 50-60 feet along both sides of channel	**Same as above.**	**Primary Shade Zone** (includes Stream Channel Protection Zone)	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
	Density management and commercial extraction allowed (same as Ephemeral and Intermittent).	50-60 feet from stream side to edge of Riparian Reserve, along both sides of channel, based on *one size potential tree height*.		**Riparian Treatment Zone**	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
Perennial ***Fish*** **Bearing Streams**	*No-cut buffer* (same as Ephemeral and Intermittent	Same as Perennial ***Non-fish*** Bearing Stream	**Two** site potential tree height each side of stream (350 feet each side; total width 700 feet)	Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.
	Density management and commercial extraction allowed (same as Ephemeral and Intermittent).	Same as Perennial ***Non-fish*** Bearing Stream, except Riparian Treatment Zone extends from 50-60‘ buffer limit to edge of *two site-potential tree buffer*		Same as Perennial ***Non-fish*** Bearing Stream	Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90.

Timber Felling would occur on 584 acres within RRs in the Coal Creek Drainage. Felling would occur adjacent to perennial and intermittent streams outside of a 25-foot no-harvest buffer or outside the primary shade zone depending on the stream classification and the range of commercial prescription designed for the given unit at layout. Table 1 lists the proximity of each unit to EFH. The closest units to EFH that would yard through a non fish bearing perennial streams outside the unit area are Unit 302 and 304. Both of these units are a mile upstream of EFH. Table 13 displays 11 units that may have yarding corridor through the 50-foot no-harvest buffers near perennial streams channels. These units are in the range of 1.8 miles to 10.5 miles above EFH.

Table 13. Units with Yarding Corridors through Streams by Hydrographic Category

Unit Number	Flow Classification
301	Perennial
312	Perennial
314	Perennial
323	Perennial
324	Perennial
326	Perennial
327	Perennial
329	Perennial
331	Perennial
338	Perennial
342	Perennial

Probability There is **no causal** mechanism for the proposed *Timber Felling* to affect water temperature in intermittent streams. Intermittent streams have little or no surface flow during the summer when elevated water temperature can occur.

Timber harvest would have no measureable effect on stream temperature because: 1) existing shade provided in the primary shade zone (50 to 60-foot no-harvest buffer) would be retained, 2) streams in the proposed units receive topographic shade, 3) 60% canopy closure or greater would exist post thinning outside of the 50-foot no-harvest buffer, and 4) units are not in proximity to EFH, greater than 0.8 miles. There is no probability that *Timber Felling* would affect EFH due to stream temperatures in perennial streams from the proposed actions. The average wetted widths of perennial streams within the units are typically two to three feet. The 50 to 60-foot no-harvest buffer would maintain existing canopy closure directly over perennial stream channels. The canopy closure outside the 50-foot no-harvest buffer would be given the prescriptions of TPA: Light Thin = 150-225, Medium Thin = 90-150, Heavy Thin = 50-90. The perennial streams in the proposed units are small streams which receive shade from the adjacent young, dense stands as well as topographic shade.

Constructing *Yarding* corridors across the perennial stream outside of Units 302 and 304 and within 11 of the units would not result in an increase in stream temperature because the corridors would be 12 feet in width at a maximum and trees adjacent to the corridors would continue to provide shade. The possibility of constructing corridors in nine of the units across intermittent channels would not result in an increase in stream temperatures because intermittent streams have little or no surface flow during the summer and the corridors would be 12 feet in width at a maximum and spaced at least 200 feet apart.

Element Summary: *Timber Felling and Yarding* of trees may occur within the Riparian Reserve, but not generally within the Primary Shade Zone. The canopy closure outside the 50-foot no-harvest buffer would be given the prescriptions of TPA: Light Thin = 150-225, Medium Thin = 90-155, Heavy Thin = 50-90. No-harvest buffers and other design measures within the Primary Shade Zone are specifically designed to protect and maintain stream shade. *Yarding* corridors within the Riparian Reserve would occur, but would not result in an increase in stream temperature because the corridors would be 12 feet in width at a maximum and trees adjacent to the corridors would continue to provide shade (Park 2005).

There is no probability that stream temperature or EFH would be affected from implementation of these Project Elements due to the considerable distance of EFH (> 1.8 miles) and because only a nominal amount of tree removal could occur. Therefore, the effects to water temperature from *Timber Felling and Yarding* activities would result in a **neutral (0) effect** to stream temperature

Indicator Summary: *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities* would not affect shade to the extent to causes changes in stream temperature to EFH >0.8 miles away. The proposed action would result in a **neutral (0) effect** to the temperature indicator.

2. Chemical Contamination/Nutrient Baseline (WA USFS)

The South Fork Coquille River or Coal Creek is not listed on the 303(d) list for contaminants or excessive nutrients. Downstream on agriculture and residential lands some contamination may occur from agriculture runoff or effluent from septic tanks, lawns and other sources. In the Action Area on National Forest Lands, the watershed is properly functioning and it is assumed that the entire watershed is properly functioning.

Baseline Rating: **Properly Functioning**

a. Effects on Chemical Contaminants/Nutrients Indicator

Timber Felling and Yarding, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities*

Proximity *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities* would occur within 25 feet from perennial streams within the Riparian Reserves approximately two miles to eleven miles above EFH. The stream restoration component of *Other Restoration Activities* would occur within Coal Creek approximately two to seven miles upstream of EFH. *New Road Construction* closest perennial crossing is over two miles above EFH. This crossing is on a small channel that is approximately two feet wide and flows intermittently in various locations below the road crossing for approximately 1,500 feet before flowing into Coal Creek approximately two miles above EFH. *Timber Hauling and Road Maintenance* would occur adjacent to EFH for two hundred feet. The remaining 11 miles of the haul route are not in proximity with EFH. No dust abatement would occur.

There is **no causal** mechanism for new road construction or road activities to affect the chemical contaminants/nutrients baseline since these activities would occur during the dry season. There is **no causal** mechanism for hazardous materials (particularly petroleum products) since they would be stored in durable containers and located so that any accidental spill would be contained and not drained into riparian areas. All landing trash and logging materials would be removed. Building roads and instream restoration within stream channels would have **no causal** potential to deliver petroleum products to downstream critical habitats due to guidelines and design criteria set forth here where equipment would be required to be clean to prevent spread of *P. lateralis*, free of leaks and drips to prevent fuels, oils and other contaminants from entering stream courses.

Element/Indicator Summary: *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities w*ould have a **neutral (0) effect** since there is **no causal** mechanism on the Chemical Contamination/Nutrients indicator.

3. Physical Barriers Baseline (WA, USFS)

Coal Creek culvert restricts some adult passage and all juvenile passage near the confluence of the South Fork Coquille at this time. NEPA and some of the pre-work are already completed for the removal of the two culverts and installation of a bridge will occur when funding is available. The Coal Creek Bridge project is not connected to this action. There are no other known human-made structures on NFSL within the Action Area that block passage of coho salmon at any life stage from upstream and downstream migration. The 2010 Level II Stream Survey observed no coho above the culvert barriers during the survey.

Baseline Rating for Physical Barriers: **Not Properly Functioning**

a. Effects on Physical Barriers Indicator

Timber Felling and Yarding, Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities

Proximity There is **no causal** mechanism for *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities* to affect this indicator since no culverts would be installed or replace on any fish bearing streams as a result of these timber sales.

Element/Indicator Summary: There is **no causal** mechanism for *Timber Felling and Yarding*, *Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction, and Other Restoration Activities* to affect this indicator because no culverts would be installed or replaced on any fish bearing streams as a result of these timber sales. Because no PEs would create or remove barriers for fish, these timber sales would result in **neutral (0) effect** to the physical barrier indicator.

4. Sediment & Pool Character & Quality Baseline (ODEQ, WA USFS, Stream Survey USFS))

a. Sediment Baseline

There are no streams in the Action Area currently listed for sedimentation or dissolved oxygen on DEQ's 303(d) list (ODEQ 2008).

The Coal Creek watershed is located in the Coast Range Physiographic Province and is comprised largely of sandstones from the Tyee Formation. The Tyee Formation is characterized by steep slopes (cliffs), fine textured soils derived from sandstone parent rock, and bedrock confined stream channels. Stream morphology along Coal Creek is dictated primarily by the bedrock of the canyon walls and bottom. The 2010 Stream Survey reports Coal Creek is steep and dominated by coarse gravel, boulders and bedrock in confined reaches.

Over the years, many wood jams were removed for merchantable timber and firewood, or to aid fish passage. A debris flow that swept down the channel from a debris avalanche in the gorge was triggered by a 1974 storm, a 25-year storm event. The channel was scoured down to bedrock in many places. This event destroyed riparian vegetation up to 200 feet laterally along the channel, allowing alder to become established and dominate the riparian area.

The absence of historical stream survey records make it difficult to determine how the channel has changed as the result of the debris flow; however, the channel appears to have recovered from both the natural and human disturbances. The debris flow may have altered the channel shape and substrate composition by creating more bedrock reaches. The relatively steep, confined character of the channel has high energy and debris transport capabilities and is very stable.

Little or no future source of medium and large class LWM are currently available from the Riparian Reserve along Coal Creek due to past logging activities and the road system, therefore confined portions of Coal Creek will remain high gradient, bedrock channels that transport sediment and small wood to the S.F. Coquille River. The alluvial fan at the mouth of Coal Creek bears witness to this mode of sediment transport and deposition. Functionally, Coal Creek would be considered in degraded condition since its ability to trap and retain sediment has been compromised by the loss of both in-stream and recruitable large wood (Stream Survey 2010).

Baseline Rating: **Functioning at Risk**

b. Pool Character & Quality Baseline

The lower reach of Coal Creek flows through a narrow confined canyon with substrates dominated by bedrock with boulders. The lower gradient, variety of habitat types, density of juveniles, and deep holding pools indicate this section is key spawning and rearing area for winter steelhead. The gradient increases approximately one mile upstream from the mouth and designated to be the extent of EFH. A series of falls at the 1.4 river mile mark create an anadromous barrier for salmonids (Stream Surveys, 1989, 1992). Resident cutthroat and rainbow are present above this barrier. The gradient for the most part is steep, exceeding 4 percent. Deep plunge pools, cascades, and high gradient riffles are abundant. Cover for fish is provided in the way of depth, surface turbulence, and bed roughness elements (Chen 1991).

In the upper portion of the surveyed lower reach, Coal Creek enters a wider valley floor which changes the gradient, wood accumulations, and habitat composition. There are deep pools created by large wood, cascades, low gradient glides, slower riffle habitat, and complex side channels (Chen, 1991). Channel substrate is dominated by boulder, bedrock and cobble but pool area tend to have the most amounts of fine sediment. The fines represent roughly 10 to 15 % of substrate particles in Coal Creek according to the 2010 Stream Survey. The upper watershed has a broad upper flat and is steeply incised into the Tyee sandstones.

Baseline Rating: **Functioning at Risk**

c. Effects on Sediment & Pool Character & Quality Indicators

Fuels Treatment

Proximity Fuel treatments could generate sediment by removing vegetation that protects the soil surface from erosion resulting from storm events. Surface erosion in the form of rilling or gullies could develop and carry sediment into streams. This type of erosion is unlikely with this project and has **no causal** mechanism for the following reasons:

- Field examinations found that rill and gully erosion on the soils in the Planning Area are rare, even on burned regeneration harvests on private land.
- Pile burning leaves small, non-continuous burn patches that are surrounded by vegetation that filter sediment movement.
- Overstory forest canopy of at least 50% in the riparian treatment zone would be present to attenuate both rain and snowfall/snowmelt.

- Broadcast burning is conducted at a low intensity that leaves some slash for groundcover and allows understory vegetation to regrow readily.
- Project design criteria ensure that broadcast burning is ignited 100 feet from stream channels (except in special cases) so that fire can back down slopes in Riparian Reserves. This leaves a highly diverse, low intensity burn pattern that favors sediment retention and filtration.

Element Summary: There would be a **neutral (0) effect** to the Sediment and Pool Character and Quality Habitat indicators from *Fuels Treatment*. *Fuel Treatment* would not generate sediment that would reach or affect EFH.

Timber Felling and Yarding

Proximity There is a causal mechanism at the unit scale since *Timber Felling and Yarding* of trees is occurring within the Riparian Reserve. However, there is **no causal** mechanism at the EFH scale as the units are 1.8 to 10.5 miles downstream in Coal Creek where the activities would not affect EFH. There are 2,203 acres, 66.8% of the total acres of timber units are mostly located on ridge tops or nearby and without a stream channel. Timber unit acres located on ridge top/mid-slope and have ephemeral, intermittent, and perennial streams account for <1,097 acres, <32.2% of total unit acres. There are two types of stream channel buffers in this project: 1) Stream Channel Protection Zone, which has a 25‘ wide no cut zone on either side of a ephemeral and intermittent channel or a buffer using the natural slope break of the ephemeral and intermittent channel may be utilized, which provides a natural gradient break as well as a natural vegetative buffer to filter in the case of potential overland flow; and 2) Primary Shade Zone buffers (50 to 60 feet no cut zone on either side of perennial channel), both of these buffers are discussed in the Temperature section above and displayed in Table 2.

Probability Heavy equipment access, log skidding, and yarding can cause surface disturbance that result in erosion and sediment transport, particularly on steep slopes. The proposed actions use a variety of Best Management Practices and PDC to minimize surface disturbance and avoid sediment transport into streams. Proposed *Timber Felling and Yarding* is expected to generate nominal sediment that could reach adjacent streams, but not to EFH 1.8 miles downstream for the following reasons:

- The majority of units are located high in the watershed adjacent to first and second order channels. Three tractor units are located less than 500 feet from the mainstem of Coal Creek above EFH (Units 307, 308 and 309). All of the remaining units are in the headwaters where discharge rates are very low, or, adjacent to tributaries. This provides substantial distance between project activities and EFH (1.8 minimum distance; 10.5 miles maximum distance).
- Project Design Criteria provide a 50 to 60 foot no-cut buffer for all perennial streams. This provides an undisturbed zone of sediment capture and retention between equipment activity and flowing water. Forest canopy in this zone would continue to intercept rain and snow at existing levels.
- Project Design Criteria include additional protection in the form of a 100 foot infiltration protection zone for all stream channels. Additionally, the 10% soil compaction limit prevents most heavy equipment use near streams.
- Full suspension is required when yarding across streams, preventing gouging of the stream bottom or banks.
- Intermittent and perennial streams have large wood located through the harvest reaches. Field examination of first and second order streams on NFS land indicate that clean out activities did not occur in these areas since large wood was present as partially buried material in streams and as free material on adjacent slopes. This material is typically well decayed and often includes cull logs left by railroad logging. Small and medium wood that is not decayed is provided in abundance by the surrounding Forest such that walking demands nearly constant climbing over fallen trees. These wood pieces dissipate water energy and lengthen sediment routing rates by storing sediments in the stream channel. This prevents any sediment from reaching EFH.

Element Summary: There would be a **neutral (0) effect** to the sediment and pool character & quality habitat indicators from the *Timber Felling and Yarding*. The project design features for activities in the Riparian Reserves would provide adequate vegetative buffers to filter sediment, distance from EFH, location of units in stable terrain and ridge top/midslope and no ground based machinery in the RR, would ensure that the sediment would not be delivered to EFH.

Timber Hauling and Road Maintenance

Proximity There is a causal mechanism for *Timber Hauling and Road Maintenance* since these activities would occur near EFH. Specifically, along the haul road (NFSL 5000) where two relief culverts are located along a rocked road that parallels EFH for about 200 feet. There are no stream crossings or bridges along the haul route in proximity of EFH. The haul route does cross perennial streams that flow into Coal Creek; which are well over two miles upstream of EFH if sediment from haul was to reach the stream the sediment would not move downstream to EFH. The remaining 11 miles of the haul route are not in proximity with EFH. There is approximately 40 million board feet of timber that could be removed with proposed sales. On average, one truckload of timber could contain as much as 5,000 board feet. This would equate to approximately 11,000 truckloads of timber to be hauled over the haul route that exits along Coal Creek over the ten year sale period; approximately 14 truckloads daily.

Probability The activities of *Timber Hauling* and *Road Maintenance* are extremely unlikely to deliver sediment to EFH. The main haul route for the project consists of maintained, gravel surfaced roads with an engineered drainage system. These roads are designed for all-weather use and carry year-round truck traffic generated by private timber harvest. The Forest Service is currently implementing the Coastal Healthy Forest Treatments Project 2007 along this same haul route. Existing traffic levels have resulted in no known detrimental sediment contributions to Coal Creek. Haul traffic in support of the proposed actions is well within the design limits of the haul route.

Approximately 200 feet of NFSL road 5000 is adjacent to EFH. This section of road is relatively steep, well maintained gravel surfaced road, with a crown. Approximately 800 feet of the road in this section (which contains a tight switchback) receives surface water from itself and about six acres of adjacent hillside. Drainage of this area is provided by the two relief culverts onto naturally vegetated slopes adjacent to Coal Creek. These relief culverts on the crowned road, partially drain to vegetative buffers (50-80 feet), while the other part of the road crown drain onto steeply sloped dissipater transporting onto a steep slope that ends at the channel. Sediment delivery could occur from runoff during rain events and deliver to EFH. At this time, there is no indication that sediment is being delivered to the stream in the 200 feet of the haul route that is adjacent Coal Creek. Project design features would minimize road generated sediment entering EFH as follows:

- Season of operation requirement; hauling would be allowed only under dry conditions.

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  TIMBER HAUL OPERATING SEASON: June 1 through October 31.

- IF OPERATIONS OUTSIDE THE NORMAL OPERATING SEASON: November 1 through May 31st are allowed, the following rules must be applied to timber haul on gravel roads adjacent EFH stream channels:

  Operations shall cease at any time when the travel way of the road is wet and turbid water or fines are observed moving off the road surface to ditch lines that deliver to EFH or any stream type.

  If fine sediment is observed to be moving off the road surface to ditch lines or streams due to timber sale activities, the Forest Service Timber Administer is responsible to have the purchaser place sediment filters to prevent this sediment from reaching any stream.

Road Rutting: No hauling down the gravel road surface if rutting is occurring, indicating the subsurface is wet.

Wet weather conditions must be monitored daily by the US Forest Service Timber Sale Administrator for the chance of precipitation, especially 1 inch of rain in 24 hours.

- Adding additional rock to the road where needed to ensure that hauling occurs on a durable surface.
- Restricting grading/cleanout in ditches that delivery water to EFH; this will retain vegetation that captures fine sediment.
- Road crown will be maintained.
- If a cross drain or relief culvert is determined to contribute sediment to EFH, then appropriate sediment controls will be installed to prevent sediment delivery.
- The road maintenance that will occur with this project will upgrade the road by placing new rock on the surface of this road and improving drainage along the road. In the long term the road maintenance will reduce the amount of sediment coming off the road by preventing erosion of the native substrate, and by preventing saturation and failure of the travel way and associated drainage system

Magnitude The amount of sediment which could reach EFH would be insignificant and indistinguishable from background levels. Sediment derived from *Timber Haul* would be primarily directed to ditch lines and then out of the ditch lines via ditch relief culverts to the forest floor with little to no sediment above existing levels. Sediment could be transported to stream channels along the two hundred feet of road adjacent Coal Creek where the road and ditch line are connected to streams. *Road Maintenance* work completed prior to haul and *Road Maintenance* work conducted after haul would further reduce the amount of off-site sediment movement after hauling. Any sediment generated as a result of the proposed haul would be immeasurable. Lastly, a restriction on when log haul can occur would minimize sediment generation on the surface of the road where it could wash into the ditch lines.

Timber Hauling and Road Maintenance PDFs in conjunction with the distance from EFH would minimize sediment effects to OC coho. The PDFs have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek from *Timber Hauling and Road Maintenance* under the proposed actions would be undetectable from the small amounts already generated at this location, and therefore insignificant.

Element Summary: There would be a **discountable insignificant negative (-) effect** to the sediment and pool character & quality habitat indicators from the *Timber Hauling and Road Maintenance.* These PDFs in conjunction with the distance from EFH would minimize sediment effects to OC coho. The PDFs have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek from hauling under the proposed actions would be undetectable from the small amounts already generated at this location. This element would have a **discountable insignificant negative (-) effect**.

Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities

Proximity There is a causal mechanism for sediment generation on units since *Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities* are occurring near perennial streams approximately two miles to 11 miles above EFH. The stream restoration component of *Other Restoration Activities* would occur within Coal Creek approximately three to eight miles upstream of EFH.

New Road Construction would consist of 12 perennial crossings and at least 23 intermittent channels crossings in the Coal Creek subwatershed. The closest perennial crossing associated with a proposed activity unit is over two miles above EFH. This crossing is on a small channel that is approximately two feet wide and flows intermittently below the road crossing for approximately 1,500 feet before flowing into Coal Creek approximately two miles above EFH. The remaining crossings are approximately three miles above EFH and the remaining nine perennial crossings are over two miles upstream from EFH and will not be further analyzed.

Landing Construction/Reconstruction would occur within Riparian Reserves at two locations, L-13 and L-14. L-13 is an existing landing site located mostly uphill (90%) of the main haul road, approximately 50 feet from a non-fish bearing perennial stream and two miles from EFH. HL-14 is new landing located immediately uphill of the main haul route road. Downhill of the main haul route is a resident fish bearing section of Coal Creek approximately 80 to 100 feet downslope, and 2.4 miles from EFH.

Probability The activities of *Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities* are extremely unlikely to deliver sediment to EFH approximately two miles to 10.5 miles downstream to EFH in Coal Creek. The closest perennial crossing associated with a proposed road activity unit is over two miles above EFH. The next two closest crossings are approximately two miles above EFH and the remaining nine perennial crossings are over two miles upstream. There is no probability construction of roads would modify peak or base flows, because openings created by new roads would be of insufficient size to affect flows.

All but two landings are located outside of the Riparian Reserves. *Landing Construction/Reconstruction* would have adequate vegetative cover or mulch material to prevent erosion and retain local sediment. The two landings located inside of the Riparian Reserve have been field reviewed by a hydrologist and an engineer. These landings are not within areas occupied by flowing water or riparian-dependent vegetation. Trees yarded to the landings could disturb slopes of the landing and generate sediment that would wash into stream channels. In order to prevent this, landing slopes would be armored with logs or other woody material capable of protecting the slope surface. Landing surfaces would drain away from the stream channel during and after use, and, would be revegetated and mulched after use. All landings are subject to season of use restrictions. These design features in addition to the two mile+ distance from EFH ensure that sediment would not be delivered to EFH.

Magnitude *Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities* PDFs in conjunction with the distance from EFH would minimize sediment effects to EFH. The PDFs have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek from *Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities* under the proposed actions would be undetectable from the small amounts already generated at this location, and therefore insignificant.

Element Summary: There would be a **discountable insignificant negative (-) effect** to the sediment and pool character & quality habitat indicators from the *Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities*. These PDFs in conjunction with the distance from EFH would minimize sediment effects to OC coho or critical habitat. The PDFs have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek these project elements under the proposed actions would be undetectable from the small amounts already generated at this location. This element would have a **discountable insignificant negative (-) effect**.

Indicator Summary: There would be a **neutral (0) effect** to the Sediment and Pool Character & Quality Habitat indicators from *Timber Felling and Yarding*. The project design features for activities in the Riparian Reserves would provide adequate vegetative buffers to filter sediment, distance from EFH, location of units in stable terrain and ridge top/midslope and no ground based machinery in the RR, would ensure that the sediment would not be delivered to EFH.

There would be a **neutral (0) effect** to the sediment and pool character & quality habitat indicators from the *Fuel Treatment.* The PDCs for *Fuel Treatment* activities in the Riparian Reserves would provide adequate vegetative buffers to filter sediment and distance from EFH would ensure that the sediment would not be delivered to EFH.

The proposed activities would have a **discountable insignificant negative (-) effect** on the effects of Sediment and Pool Character and Quality Indicators from Project Elements *Timber Hauling, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities.* Some short-term immeasurable amounts of sediment would be produced from haul and road maintenance of the haul route after the first rain event. Over the long term the road condition would be improved, reducing future sediment delivery into EFH. Sediment from Project Elements activities during the first rain would be difficult to differentiate above background levels within EFH. This would collectively produce a **discountable insignificant negative (-) effect** to EFH.

5. Large Wood Baseline (Stream Surveys Monitoring)

The Forest Service contracted a Level II Stream Survey to be conducted on Coal Creek in 2010. The entire reach surveyed was undesirable for key pieces of large wood and total pieces of wood. The two upper reaches of Coal Creek were found to have abundant amounts of small wood (12 inch in diameter by 25 feet in length); the highest one at 77 pieces per mile and the next one down was at 42 pieces per mile. On portions flowing across private timberlands, instream LWM is not common. Likewise, the riparian forest on publicly owned land is generally in a mid seral stage, regenerating from past logging but in most areas had matured to the point of providing small class LWM. Conversely, the riparian forest on private corporate land is in an early and pioneer seral stage and incapable of providing instream LWM.

Baseline Rating for Large Wood: **Not Properly Functioning**

a. Effects on Large Wood (LWD) Indicator

Timber Felling and Yarding

Proximity There is **no causal** mechanism for *Timber Felling and Yarding* because:

- Treatments in Riparian Reserves are a considerable distance from EFH 1.8 miles in Coal Creek. These activities would not be in proximity to EFH;
- The size of the wood material being removed in the Riparian Reserves is over 100 feet in length. The stream channel width that the adjacent trees are being extracted from ranges in size from 2 feet to 5 feet in width. The tree lengths being removed are approximately 10 times or more than the average bankfull width of the nearby channel. Normal high flows in these small channels could not move material with these large wood dimension and weight, a nominal distance;
- Riparian roughness of standing trees, along with wood lengths >100 feet would prevent large wood movement from transporting downstream more than a nominal distance, if at all;
- The majority of the large wood material delivery system in these watersheds is through landslides;

- The NFSL 5000 road for example, runs down slope, below the majority of the thinning units in the project area. This road would prevent any large wood in the channel from reaching EFH downstream of the road, as LWD would not likely pass through any existing bridges or culverts in these roads. All potential harvest areas that may occur within potential landslide areas have been removed (see the Landslide and Erosion Rates section for more details; and
- *Timber Felling and Timber Yarding* would occur in 66.87% of the upland timber acres and outside of the large wood contribution zone.

Element Summary: Effects of *timber felling and yarding* in the large wood contribution zones would have a **neutral (0) effect** to the large wood indicator. Thinning prescriptions are designed to create a large tree forest within Riparian Reserves. These effects occur from 1.8 miles to 12.7 miles in distance away from EFH and based on the topography, size of the stream channels, and distance from EFH, trees in the Riparian Reserve would not affect EFH downstream.

Timber Hauling, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities

Proximity There is **no causal** mechanism for *Timber Hauling, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities* as the activities associated with these Project Elements would occur away from the wood contribution zone of stream channels and would have no effect on future wood contribution.

Element Summary: *Timber Hauling, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities* would result in a **neutral (0) effect** to the large woody debris indicator. None of the activities associated with these Project Elements would be removing trees from the Riparian Reserve.

Indicator Summary: *Timber Hauling, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities* would have a **neutral (0) effect** on Large Woody Debris. Thinning prescriptions are designed to create a large tree forest within Riparian Reserves. These effects occur from 0.8 miles to 11.7 miles in distance away from EFH and based on the topography, size of the stream channels, and distance from EFH, trees in the Riparian Reserve are not expected to affect EFH downstream.

6. Off-channel Habitat, Width: Depth Ratio by Channel Type, Streambank Condition, and Floodplain Connectivity Baseline (WA, USFS)

Off Channel Habitat

Off-channel habitats are naturally rare in the constrained stream valley. The Coal Creek Watershed was determined by the 2010 stream survey to be not consistent with off channel habitat classification because it was classified to be a colluvial canyon with a valley form is narrow and V-shaped. The side channel habitat that was present provides for some slow water for summer rearing and winter high water refuge but mainly is like that of the main channel rapids.

Baseline Rating: **Functioning At Risk**

Width: Depth Ratio by Channel Type

The Coal Creek watershed is a constrained stream valley within a middle range of width and depth.

Baseline Rating: Functioning at Risk

Streambank Condition

The majority of headwater streams in the Action Area within the units have stable well vegetated streambanks.

Baseline Rating for Streambank Condition: **Properly Functioning**

Floodplain Connectivity

Floodplain connectivity in Coal Creek, in the Action Area is limited due to confinement from roads, naturally confined streams in narrow canyons, stream down cutting, and perhaps past practices of removing large wood from stream channels.

Baseline Rating: **Not Properly Functioning**

a. Effects on Off-channel Habitat, Width: Depth Ratio by Channel Type, Streambank Condition, and Floodplain Connectivity Indicators

Timber Felling and Yarding, Timber Hauling, Fuels Treatment, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction and Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities.

Proximity There are **no causal** mechanisms between any proposed PEs and the Off-channel Habitat, Width: Depth Ratio by Channel Type, Stream bank Condition, and Floodplain Connectivity indicators since no activities are occurring within any stream channels. The PEs for this project would not occur within stream channels. The activities are 1.8 miles to 121.7 miles upstream of EFH. These activities are not occurring in a location that would have no effect on EFH.

Element and Indicator Summary: The elements would have a **neutral (0) effect** on Off-channel Habitat, Width: Depth Ratio by Channel Type, Stream bank Condition, and Floodplain Connectivity because the PEs for this project would not occur within stream channels. The activities are 1.8 miles to 12.7 miles upstream of EFH. These activities are not occurring in a location that would affect coho salmon or EFH.

7. Peak and Base Flows Baseline

Annual precipitation ranges from 50 to 110 inches per year, with very little snow pack. Thus, 90% of the mean annual discharge of the Coquille occurs from November to April, with less than 1% occurring during August and September. Although snow is common in the Planning Area, a persistent snowpack is unusual. The Planning Area is generally in a weather zone referred to as the "transient snow zone" (TSZ), characterized by both rain and snow.

Timber harvest took place principally during the late 1930s and 1940s in the Coal Creek watershed. About 40% of the Coal Creek watershed is public land (Forest Service) and most of this area had vegetative management for regeneration harvest on it. Most of these plantations have rapidly recovered with tree growth very fast in the wet coastal forests, and current peak flows are unaffected from this past harvest.

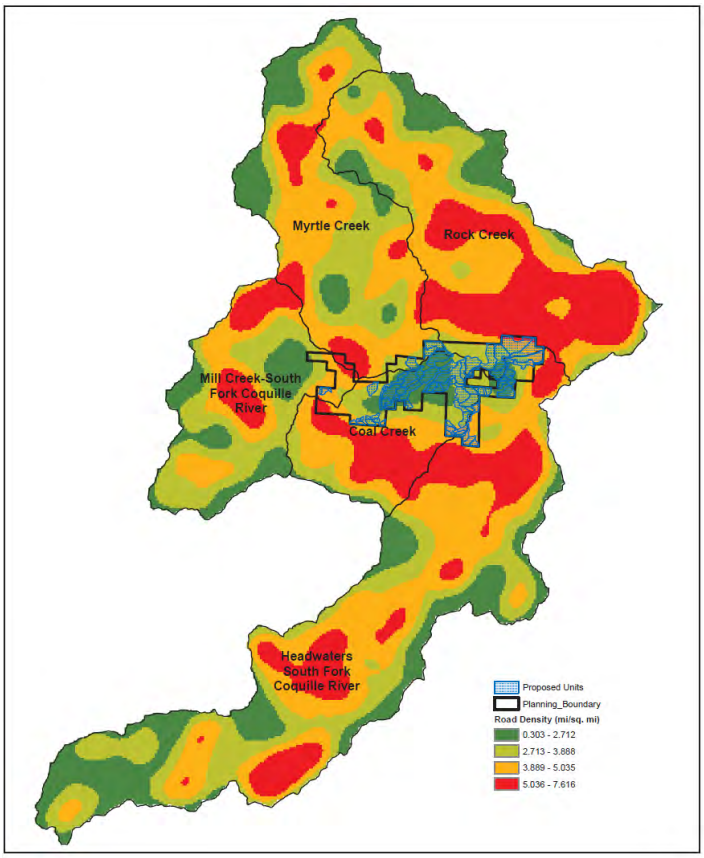
The remaining 60% of the watershed is under private ownership. Private harvest in the last 30 years has occurred on 41% of the subwatershed. About 19% of the subwatershed, that is privately owned, has not yet been harvested.

Grant et al. (2008) places the upper limit of detection for changes in peak flow at the six year recurrence interval. Study data consistently shows that as storm events become larger, the increase in peak flow change decreases and the significance of the change becomes undetectable. Storm events become increasingly rare as magnitude increases; there are practical limits to the length of time stream flow has been recorded and to the accuracy of measurement of very large events. All of these factors contribute to the six year detection limit. With these limitations in mind, Grant et al. displayed how peak flow change measured within the rain-on-snow regime changes with the percent of area harvested. There is a general trend for peak flow increases to decline as harvest area drops.

Grant et al. (2008) provide thresholds for detectable increases in peak flows that can be attributed to harvest within a watershed. For rain-dominated areas, the threshold is 29% of the drainage basin in regeneration harvest. For rain-on-snow dominated areas, the threshold is 15% of the drainage in regeneration harvest. Regeneration harvest has occurred over 41% of the Coal Creek subwatershed; therefore peak flow increases have certainly occurred in the transient snow zone, and are likely to have occurred in the rain-dominated elevations of the subwatershed.

Grant proposed two classes of stream channel that are most susceptible to peak flow changes resulting from flows in the one to five year range of recurrence interval: gravel bed channels and sand bed channels. These are generally higher order streams (3rd order and up). **In the Planning Area, these would be Coal Creek and Wooden Rock Creek.** First and second order mountain streams typically are shaped by storm events with 10+ year recurrence intervals. Proposed roads would cross first and second order streams.

Figure 9. Road Density wtihin South Fork Coquille 5th Field Watershed



Baseline Rating: **Not Properly Functioning**

a. Effects on Peak and Base Flows

Timber Hauling, Fuels Treatment, and Road Maintenance and Other Restoration Activities

Proximity These PEs have **no causal** mechanism to impact peak or base flows because these activities do not increase road density or creating openings that would allow more rain/snow events that would change flow regimes in any channels.

Temporary Road Construction and Decommissioning, Road Reconstruction and Landing Construction/Reconstruction, and New Road Construction

Proximity Causal mechanisms associated with these PE are associated with creating openings and increased road densities. The planned road activities would not be creating openings or increasing road densities that would change flow regimes in any channels.

Road density for the Coal Creek analysis area is high at 4.19 mi. /sq. mi. (Table 15); proposed road activities account for an increase of 0.43 mi. /square mile. The National Forest Land currently has a low road density; therefore adding these additional roads has a low risk of roads affecting peak flows because they affect only about 40 acres which amounts to less than 1% of the watershed. The proposed roads to be built in general are short segments to access units. Only 3.9 miles of road would occur in Riparian Reserve. None of these roads are adjacent streams or valley bottom roads.

Table 15. Road Density within Coal Creek 6th Field Watershed

Road Type	Miles of Road	Area of Watershed (Sq. Miles)	Road Density (miles per sq. mile)
Forest Service	9.76	15.58	0.63
Other Roads	55.52	15.58	3.56
All Roads	65.28	15.58	4.19

Element Summary: *Temporary Road Construction and Decommissioning, Road Reconstruction and Landing Construction/Reconstruction, and New Road Construction* would have a causal mechanism to impact peak or base flows but would not be creating openings that would cause more rain/snow events that would change flow regimes in any channels or increasing road densities that would have a measurable amount of change for the entire watershed in peak or base flow.

In the Primary Shade Zone the canopy cover would be left in its current condition except at stream crossings. Peak flows in the Coal Creek subwatershed are likely to be elevated over natural conditions as a result of the high levels of regeneration harvest (over 41% in the last 30 years), instream wood removal, and the high road densities on private lands. NFS lands in the analysis area exhibit much lower road density (less than 3.9 mi. /sq. mi. NFS lands have also experienced dramatically lower harvest levels since they have not been regeneration harvested since the railroad entries occurring in the 1940s. Retention of the forest canopy and placement of roads to avoid high order streams would prevent contribution to peak flow increases from NFS lands. This element would have a **neutral (0) effect** on peak or base flows in Coal Creek.

Timber Falling and Yarding

Proximity There is a causal mechanism for *Timber Felling and Yarding* to affect Peak and Base flows, since trees are being felled, yarded, and in turn being removed from the landscape. Most of these activities would occur away from stream channels and outside of one site tree distance from streams and/or outside the near surface water delivery zone of stream systems. Buffers within the Riparian Reserve are included in prescriptions for all streams to prevent accelerating delivery mechanisms to channels. These include no cut buffers within 25 feet of ephemeral channels for light thin, 35 feet buffers for medium thinning and 40 feet buffers for heavy thins and buffers of within 50-60 feet on perennial channels. A 100 feet buffer limits ground disturbance and compaction adjacent to all stream channels. Following PDCs, little ground disturbance would occur within 100 feet of stream channels to prevent acceleration of water delivery and loss of soil porosity. No more than 10% of soil infiltration capacity would be lost within 100 feet of streams as a preventative measure to prevent soil and rapid water delivery. This mitigation measure is to prevent creation of new and efficient delivery pathways, providing a protection zone near streams.

Variable Density Thinning leaves variable canopy retention from 40% to 60% in uplands (Matrix) and equal or greater than 50% in riparian zones, with the exception of Port Orford Cedar Root Disease Silvicultural treatments (POC). POC would be treated with Gap Development Treatment to treat portions of stands infected with laminated root rot. Treatment would have irregular shape openings ¼ to 2 acres. No more than ten percent of the acres within each unit would be treated for POC. Approximately 330 acres (0.1%) of Gap Development Treatment would be scattered throughout the total 3,385 project acres and are located within Coal Creek 6th field watershed. The total amount of openings created from the POC treatment within Coal Creek 6th field watershed (9,952 acres) would be .003%. Therefore, .30 acres of small openings from POC treatments, scattered throughout the project, would occur in.003% of the Coal Creek 6th field watershed. Any openings <1% would not impact a rain on snow event within this watershed (Joplin 2011).

Coal Creek subwatershed has no potential for measureable peak flow increases because the percent of the subwatershed that would be affected is nominal. Coal Creek subwatershed (9,952 acres) has 2,016 acres of proposed commercial thin harvest. Coal Creek subwatershed would have variable density thinning on 20% of the watershed; however this figure does not represent the same magnitude of impacts as regeneration harvest. Currently there is little peak flow data specific to thinning activities. Grant et al. (2008) indicate that harvest levels may be quite high (over 80%) without peak flow increases as long as roads are not involved. Roads and compaction associated with ground based equipment are the primary mechanism for concentrating surface runoff and more rapidly delivering it to streams. The proposed action would utilize ground based equipment only on slopes less than 35%, affecting 21% of the subwatershed. Management of NFS lands utilizing thinning, combined with careful placement of the needed road construction and use of ground based equipment is expected to reduce the risk of measureable peak flow increases.

Given the small amount of additional compaction, the RR would be left between all units and stream channels (reducing the potential hydrological connectivity from a unit to a stream), Variable Density Thinning leaves a variable retention from 40% to 60% in uplands (Matrix) and equal or greater than 50% in riparian zones, with the exception of Port Orford Cedar Root Disease Silvicultural treatments (POC), and 330 acres of nominal openings from POC treatments, scattered throughout the project , would occur in nominal 0.1% of the Coal Creek 6th field watershed, any openings <1% would not impact a rain on snow event, therefore, there is no probability that timber felling and yarding would modify the peak or base flow indicator affecting downstream critical habitat.

Element Summary: The proposed project would have a **neutral (0) effect** on Changes in Peak and Base Flows for the following reasons:

- Proposed actions would occur over small, scattered areas of each subwatershed.
- Proposed harvest units contribute fractional runoff to the receiving mainstem channels.
- Impact thresholds are based on regeneration harvest leaving a wide margin of safety for impact assessment resulting from proposed thinning.
- Surface disturbance is slight in the Riparian Reserve (see Riparian Project Design Criteria in PE section.
- Direct surface disturbance resulting from tractor yarding is limited to gentle slopes and ridgeline units.
- Variable Density Thinning leaves variable canopy retention from 40% to 60% in uplands (Matrix) and equal or greater than 50% in riparian zones, with the exception of Port Orford Cedar Root Disease Silvicultural treatments (POC). POC would be treated with Gap Development Treatment to treat portions of stands infected with laminated root rot. The total amount of openings created from the POC treatment within Coal Creek 6th field watershed (9,952 acres) would be .003%. Therefore, 330 acres of small openings from POC treatments, scattered throughout the project, would only occur in 0.1% of the Coal Creek 6th field watershed.

Indicator Summary: There would be a **neutral (0) effect** to Peak and base Flows from the ER project. There would be no effect to peak and base flows from *Timber Hauling, Fuels Treatment, and Road Maintenance.* These PE's have **no causal** mechanism to impact peak or base flows as they are not creating openings that would increase runoff from rain events nor changing flow regimes in any channels or increasing road densities. *Temporary Road Construction and Decommissioning, Road Reconstruction and Landing Construction/Reconstruction, New Road Construction* would have a **discountable insignificant negative (-) effect** on peak or base flows in Coal Creek due to increased road densities.

The *Timber Felling and Yarding of trees and Other Restoration* activities would have a **neutral (0) effect** on changes in peak and base flows for the following reasons:

- The action alternatives would occur over small, scattered areas of each subwatershed.
- Proposed harvest units contribute fractional runoff to the receiving mainstem channels.
- Impact thresholds are based on regeneration harvest leaving a wide margin of safety for impact assessment resulting from proposed thinning.
- NFS lands are hydrologically recovered.
- Surface disturbance is slight in the Riparian Reserve (see Riparian Project Design Criteria in PE section.
- Direct surface disturbance resulting from tractor yarding is limited to gentle slopes and ridgeline units.
- Variable Density Thinning leaves variable canopy retention from 40% to 60% in uplands (Matrix) and equal or greater than 50% in riparian zones, with the exception of Port Orford Cedar Root Disease Silvicultural treatments (POC). POC would be treated with Gap Development Treatment to treat portions of stands infected with laminated root rot. The total amount of openings created from the POC treatment within Coal Creek 6th field watershed (9,952 acres) would be 0.1%. Therefore, 330 acres of small openings from POC treatments, scattered throughout the project, would only occur in 0.003% of the Coal Creek 6th field watershed.

B. WATERSHED CONDITION INDICATORS (WCI)

1. Road Density/Location Baseline (USFS)

The road density (roads per square mile) for the Coal Creek 6th field watershed is high; approximately 4.9 miles per square mile of roads for both private timberlands and NFSL. The roads are located on ridge tops, mid-slopes, and valley bottoms. The watershed is comprised of steep valley walls and a heavily dissected stream network. Road density greater than 3 mile per mile square is considered to be not properly functioning.

Baseline Rating: **Not Properly Functioning**

a. Effects of the PEs on the Road Density/Location Indicator

The PEs that would affect the road density/location indicator is *Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, and New Road Construction*. No other PEs would change road density or locations.

Two short temporary spur roads totaling less than 1,500 feet are proposed for construction within the units followed by decommissioning. These spurs (Q4 and R) would be located in Riparian Reserves within the Coal Creek 6th field watershed. Spur Q4 crosses one intermittent channel and one perennial channel. Spur R does not cross any stream channels. After harvest operations are completed, the spurs would be decommissioned, mulched, reseeded, and allowed to revegetate. Because the roads would exist on the landscape for only a short period and would not yield any meaningful effects to the watershed, the temporary spur roads would not impart a lasting change to the road density/location indicator.

Reconstructed roads are proposed within Coal Creek, Lower Rock Creek and Headwaters of the South Fork Coquille watersheds and would total approximately 6.1 miles in length, including 1.36 miles within Riparian Reserves. This action would lead to a net increase of 4.75 miles of permanent road in the Coal Creek watershed, 1.1 mile of permanent road in the Headwater of South Fork of Coquille watershed, and 0.25 mile of permanent road in the Lower Rock Creek watershed.

New Road Construction roads are proposed within the 6th field watersheds: Coal Creek, Lower Rock Creek and Headwaters of the South Fork Coquille and Myrtle Creek; total approximately 11 miles in length, including 1.58 miles within Riparian Reserves. This action would lead to a net increase of 7.4 miles of permanent road in the Coal Creek watershed, of 1.9 mile of permanent road in the Headwater of South Fork of Coquille watershed, .75 mile of permanent road in the Myrtle Creek watershed and 1 mile of permanent road in the Lower Rock Creek watershed.

Road construction would cause localized impacts associated with vegetation removal and surface disturbance within the road construction zone. For proposed system roads, this loss of vegetation would be permanent, as would the routing of streams through culverts and modification of both surface and subsurface slope runoff water flow. Field examinations along the railroad grades proposed for conversion indicate that subsurface slope flows in the area are minimal. The railroad grade to be converted to system road exposes up to 15 vertical feet of cutbank along its route. Few seeps were observed and the grade retains water at only a few locations within its 3.5 mile length.

Proposed system road construction would occur primarily along watershed divides and secondary ridgelines. Perennial channels are less than 10 feet wide (three feet or less of active channel is typical) except for the unnamed tributary bordering Unit 338. This tributary contains a channel with a relatively wide and saturated valley bottom of about 40 feet in the proposed crossing location.

Proposed roads located in Tractor Units 303, 307, 308 and 309 are also exceptions to the description above in that they are located at the midpoint of the Coal Creek watershed near the main channel. Road Q1 crosses approximately 0.11 miles of private land and would require a steep gradient road constructed (estimated at about 20% slope) for approximately 500 feet. Units 303, 307, 308, and 309 are located in an area that is considered sensitive to hydrologic impacts: slope position and distance to Coal Creek are low.

The following mitigating measures are recommended for these units:

- Unit 309: Harvest treatment should be excluded from the zone between the south bank of Coal Creek and the slope break. This would avoid disturbance of over steepened slopes that would shed sediment directly into Coal Creek.
- Units 303, 307, 308 and 309: Sediment transport should be monitored by the sale administrator. Any visible sediment input to Coal Creek originating from these units would require implementation of mitigating measures that would capture/prevent sediment transport recommended by a soil scientist, hydrologist, or engineer.

The haul route for the proposed project would utilize existing NFSL and private system roads. Hauling to support the proposed sales would occur only during the dry season and during dry conditions. Haul roads would all be engineered for effective drainage and armored with rock to provide an all-weather surface. It is unlikely that sediment generated from use of haul roads under these conditions would exceed background levels. Field examination of the haul route indicates that fine sand and silt originate mainly from road cuts and ditches. Slope failures, visible rills and gullies are rare; occurring sporadically on over steepened colluvial slopes or fills. Best Management Practices for road maintenance listed below would be sufficient to capture sediment that may be generated by proposed hauling project:

- Adding additional rock to the road surface, when needed;
- Keeping the road crowned; and
- Season of operation.

Due to the minimal impacts (as described under previous indicators in this BA) anticipated within the watershed resulting from these roads, this increase in road densities would be insignificant to aquatic habitat. Therefore, this project would have an insignificant negative effect to the road density/location indicator in the Coal Creek watershed. Overall, road construction in the Coal Creek subwatershed (6.6 miles) would increase road densities by 0.43 sq. /mile/mile, 0.9 percent, (from 4.19 to 4.62 mile/square mile) and would include 23 intermittent/ephemeral nonfish bearing crossing, and 12 new stream crossings in the 3.19 miles of road activities that are occurring in the Riparian Reserve. This road work would represent a change (Increase) in road densities of less than 0.9 of one percent, and in particular riparian road densities.

*S*hade would not be affected from these PEs to the extent to causes changes in stream temperature to EFH greater than 0.8 miles away. The proposed action would result in a **neutral (0) effect** to the temperature indicator from these PEs.

The PEs would have a discountable insignificant negative effect to the sediment and pool character & quality habitat indicators. Adding additional rock to the road surface, when needed; keeping the road crowned; and season of operation in conjunction with the distance from EFH would minimize sediment effects from the PEs to the Riparian Reserve and OC coho or critical habitat and would be undetectable from the small amounts already generated at this location.

In summary, due to the small magnitude of road density increase (0.9 percent), a neutral effect to temperature, and a discountable insignificant negative effect to the sediment and pool character & quality habitat indicators from these PEs, the Eden Ridge Timber Sales project would have an insignificant negative effect to the road density/location indicator in the Coal Creek 6th field watershed.

2. Human Disturbance History

a. History Baseline (WA, Forest Service records)

About 60% of the Coal Creek watershed is private lands and 40% of this area is managed by the Forest Service. The Forest Service land has had vegetative management in the way of regeneration harvest, commercial thinning, and or select cuts occurring in the 1960s to throughout the 1980s. Downstream of National Forest, it is assumed that most of the forested lands will be in early or mid-seral conditions to maximize timber production.

The majority of the Action Area is networked with roads. Road densities are high in the Action Area in general, as well as in each of the watersheds.

Baseline Rating: **Functioning-At-Risk**

b. Effects to Human Disturbance Indicator

Timber Felling and Yarding are proposed on 3,300 acres. The *Timber Felling and Yarding* are not concentrated in unstable areas and are occurring on previously logged areas. The road activities occurring in Riparian Reserves are log hauling, and road and landing construction and were determined to have **insignificant negative effects.** The analysis of effects to the peak flow indicator determined the proposed timber harvest would not result in measurable changes in peak and base flow volumes and timing from the existing condition to EFH. Consequently, there would be an **insignificant negative** effect to the human disturbance history.

In summary, the proposed elements would have an **insignificant (0) effect** on Disturbance History. The proposed project is a density management treatment plan that would enhance development of the mid-seral age stands to late successional habitat conditions. Thinning prescriptions would retain trees outside of the no-harvest buffers where landslides or debris flows are most likely to initiate, particularly those that could impact streams, ponds, and wetlands. Roads and landing constructed and other activities near streams would be localized, minor and not affect overall watershed conditions.

3. Riparian Reserves Baseline

Port Orford Cedar is an important riparian component and is suffering from root disease in some drainages within the Coal Creek Watershed. As a result, the riparian vegetation in some locations is now primarily in an early seral stage.

Plantations are concentrated within lower Coal Creek. Overall riparian conditions are good in the upper watershed on public lands. It is assumed, as previously mentioned, that on private lands much of riparian areas will remain in early and mid-seral conditions to maximize timber production.

Baseline Rating: **Not Properly Functioning**

a. Effects of the PEs on Riparian Reserve Indicator

Portions of all activities proposed with this project would occur within the Riparian Reserve. However, the Eden Ridge Timber Sales project is proposing to harvest 389 acres within the Riparian Treatment Zone located within the 584 acres of Riparian Reserve scattered throughout the Coal Creek watershed. The ER project is proposing felling and yarding within these Riparian Reserves but it provides a non-treatment buffer on the stream channels, and only removes trees from these areas in a manner to reduce impacts to the Riparian Reserve.

In some localized and scattered instances a yarding corridor with a maximum width of twelve feet would facilitate reaching thinning areas at inaccessible locations within the stand. All other activities such as road building and landings in the Riparian Reserve would be placed well above stream channels and are very minimal.

The PEs would not affect shade in the Riparian Reserve to the extent to causes changes in stream temperature to EFH >1.8 miles away. The proposed actions would result in a **neutral (0) effect** to the temperature indicator from the PEs.

The amount of sediment which could reach EFH would be insignificant and indistinguishable from background levels. Sediment derived from *Timber Haul* would be primarily directed to ditch lines and then out of the ditch lines via ditch relief culverts to the forest floor with little to no sediment above existing levels. Sediment could be transported to stream channels along the two hundred feet of road adjacent Coal Creek where the road and ditch line are connected to streams. *Road Maintenance* work completed prior to haul and *Road Maintenance* work conducted after haul would further reduce the amount of off-site sediment movement after hauling. Any sediment generated as a result of the proposed haul would be immeasurable. Lastly, a restriction on when log haul can occur would minimize sediment generation on the surface of the road where it could wash into the ditch lines.

Timber Hauling and Road Maintenance PDFs in conjunction with the distance from EFH would minimize sediment effects to OC coho or EFH. The PDFs have been designed to minimize sediment delivery to EFH, however there is a chance during the first major storm event after operations have ceased there would be an initial input of sediment. Any sediment yield to Coal Creek from *Timber Hauling and Road Maintenance* under the proposed actions would be undetectable from the small amounts already generated at this location, and therefore insignificant.

Timber Hauling, Road Maintenance, Temporary Road Construction and Decommissioning, Road Reconstruction, Landing Construction/Reconstruction, New Road Construction and Other Restoration Activities would have a **neutral (0) effect** on Large Woody Debris. Thinning prescriptions are designed to create a large tree forest within Riparian Reserves. These effects occur from 1.8 miles to 11.7 miles in distance away from EFH and based on the topography, size of the stream channels, and distance from EFH, trees in the Riparian Reserve are not expected to affect EFH downstream.

In summary, due to the Sediment indicator, Temperature indicator, and Large Wood indicator were either **insignificant or neutral (0) effect**, a small amount of riparian treatments, the PDFs established for this project, and the lack of meaningful impacts, the reduction in functioning riparian area would be insignificant at the sub-watershed scale and thus the effects to the Riparian Reserves would be a **neutral (0) effect**.

4. Landslide and Erosion Rates Baseline

The Planning Area is underlain by a geologic unit called the Tyee Formation, composed of poorly consolidated sandstones with fewer durable cliff-forming beds of sandstone. In the main canyon of Coal Creek and along its larger tributaries, slopes may be as high as 70% to vertical, supported by the more durable sandstone beds. Weaker parts of the formation exposed on steep slopes can fail as loose talis and debris flows in response to storm events. In general, the formation exhibits no mass wasting (deep seated failures that affect entire slopes). Weathering of exposed surfaces results in erosion products of fine gravel, sand, silt and clay that are easily mobilized by runoff and stream flow. Little of this material is stored within the main stem of Coal Creek since the middle and lower channel reaches are dominated by confined bedrock and boulder substrates with no floodplain. A substantial alluvial fan is located at the mouth of Coal Creek and extends into the S.F. Coquille River; this is the first major opportunity for sediment loads from Coal Creek to deposit.

Past road construction and timber harvest have caused a few shallow slope failures into Coal Creek. Field examination indicates that the haul route and proposed roads are, or would be, stable. Expected erosion products would be sand, silt, and clay primarily from weathering of road cuts and loose material on fill slopes. Downstream on private lands it is assumed that some aggravation of unstable areas may occur to maximize timber production. Fires occurred infrequently, Table 16, and were of moderate to high severity.

Table 16. South Fork Coquille River Watershed - Historical Fire in 6th-Field Watersheds (acres)

6th –Field Watershed	Year	Total acres burned
Coal Creek	1959	202
Coal Creek	1964	608
Total		809

Baseline Rating: **functioning at risk**

a. Effects of the PEs on the landslide and Erosion Rates Baseline

All PEs for this project are over two miles above EFH. No activities are occurring on unstable grounds, or areas with a high erosion hazard rating. All these areas were removed during the project design. All PEs for this activity occur outside of areas that would be prone to landslide or accelerated erosion by design of the project. Effects to landslides and erosion rates from the PEs are entirely discountable. The proposed elements would have a **neutral (0) effect** on the Landslide and Erosion Rates indicator.

VI. ESA AND EFH DETERMINATION

A. DETERMINATION OF EFFECTS ON OC COHO SALMON AND OC COHO CRITICAL HABITAT

The effects from the PEs are expected to only affect sediment levels in EFH from log hauling and permanent new road construction. Much of the discussion of possible effects to EFH centers on fine and coarse sediment delivery to the stream system and transport to critical habitat downstream. Riparian Reserves left intact at delivery zones would buffer ground disturbance from the stream system. The distance of the haul route and other road related activities from Coal Creek would allow small amounts of sediment to be delivered to EFH. This sediment delivery would be of short duration and an amount that would not be detectable beyond background levels. Coal Creek, where the potential for sediment could deliver to EFH, naturally transports very large sediment loads and has high peak flow values during storm periods. As a result the haul of logs along Coal Creek is immeasurable and has been determined to have **a may affect not likely to adversely affect** determination on individual coho salmon and **will not adversely affect** essential fish habitat (EFH) for coho and Chinook salmon and will have **no affect** on CCH.

Sediment – Project components that could produce sediment within the stream network include timber haul over roads, temporary road construction and decommissioning, road reconstruction, landing construction/reconstruction and new road construction. Though sediment is produced, the amount delivered to EFH would be immeasurable and occur for a short duration, during the rainy season. Additionally, restricting timber hauling to dry roadbed conditions would impede sediment mobilization. The amount of sediment which could reach EFH would be insignificant and indistinguishable from background levels. Sediment derived from Timber Haul would be primarily directed to ditch lines and then out of the ditch lines via ditch relief culverts to the forest floor with little to no sediment above existing levels.

Sediment could be transported to stream channels along the two hundred feet of road adjacent Coal Creek where the road and ditch line are connected to streams. Road Maintenance work completed prior to haul and Road Maintenance work conducted after haul would further reduce the amount of off-site sediment movement after hauling. Adequate project design features would be in place to limit the amount of sediment to levels within the range of natural variability for the season of impact. Therefore, this increase in sediment would not likely render EFH unsuitable or affect coho salmon productivity, survival, or mortality.

Determination and Conclusions - The **Eden Ridge Timber Sales project** would result in effects to coho salmon and EFH in Coal Creek Watershed. Thus, **May Affect Not Likely to Adversely Affect** determination is rendered for coho salmon and **No Effect** for coho salmon critical habitat. The project **Will Not Adversely Affect** Essential Fish Habitat for coho salmon or Chinook salmon. These determinations are based on the activity having immeasurable amounts of sediment being delivered to stream channels. The quantities are immeasurable and would be of short duration primarily from the activity of log haul and road maintenance over gravel surfaced roads adjacent to essential fish habitat.

B. DICHOTOMOUS KEY FOR SECTION 7 DETERMINATION OF EFFECTS

Location: Rogue River-Siskiyou National Forest, Powers Ranger District
Project Name: **Eden Ridge Timber Sales Project**
Species: **OC coho salmon**
Watersheds within Project Area: Lower South Fork Coquille River and Middle Fork Coquille River

1. Do any of the indicator summaries have a positive (+) or negative (-) conclusion?
   A. NO..... No effect
   B. **YES**..... **May Affect, Go to 2**

2. Are the indicator summary results only positive?
   A. **NO**..... **Go to 3**
   B. YES..... NLAA

3. If any of the indicator summary results are negative, are the effects insignificant or discountable?
   A. NO..... LAA, fill out Adverse Effects Form
   B. **YES**..... **NLAA**

Essential Fish Habitat
Based on the analysis of affects from the proposed action, the Eden Ridge EIS would not adversely affect EFH. The proposed action would **Not Adversely Affect** EFH for coho or Chinook salmon.

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APPENDIX I

TRANSPORTATION AND LOGGING SYTEMS REPORT

APPENDIX I

TRANSPORTATION AND LOGGING SYSTEMS REPORT
(Project Specific Roads Analysis)
(Economic Analysis)

Eden Ridge Timber Sales

Rogue River-Siskiyou National Forest
January 2011

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TRANSPORTATION AND LOGGING SYSTEMS REPORT
(Project Specific Roads Analysis)
(Economic Analysis)

Eden Ridge Timber Sales

The Eden Ridge Planning Area currently has a minimal existing road network and when the logging that created the candidate stands of today were created, the area was logged by historical railroad systems. Most of the existing roads evolved from early railroad grades but do not adequately serve the Planning Area for today's needs and systems. This report documents the basis for application of potential logging systems and provides the basis for road use and proposed new road construction. Current policy requires the Forest Service to undertake a scientifically-based road analysis procedure, at an appropriate scale and coordinated with other ecosystem analysis, in order to make better decisions regarding road management. This report is prepared as a project-specific Roads Analysis. Road mileage within designated Key Watershed under the Northwest Forest Plan in relation to Standards and Guidelines is also analyzed.

This report also includes an economic analysis of the alternatives considered in detail for the proposed timber sales projects. Proposed road related activities that serve the proposed logging systems are primary elements of costs associated with these alternatives.

I. INTRODUCTION

A. Who Worked on this Analysis and Report?

Transportation and logging systems planning for the Eden Ridge Planning Area and Timber Sales Project was conducted by several individuals. There were two preliminary logging plans including road needs done via an analytical or "paper planning" process. One plan was done by Pat Murphy (previous Powers RD presale forester), the other by Mike Dearborn (Pacific Zone Environmental Coordinator – now retired). Both of these individuals possessed extensive experience in logging systems and/or road design, or timber sale administration. These plans were done with different objectives regarding use of existing roads on adjacent Plum Creek lands. Since both of these people left before completion of this project, a logging and transportation plan was contracted with a Forest Service Enterprise Team (Steve Rheinberger, forester, logging engineer) for further logging systems/transportation planning input. Steve Rheinberger developed an extensive preliminary paper plan in February of 2010.

These initial plans were primarily based on a set of potential treatment units (those developed for scoping under NEPA). Further silvilcultural and field verification of candidate stands required a revised paper transportation and logging system plan, including more of an interdisciplinary approach for resource protection. In the spring of 2010, Ken Grigsby (former Forest Service presale specialist with extensive logging system and transportation planning experience) developed an updated paper plan based on the previous plans and the current configuration of candidate stands. This planning was done with assistance from Maureen Joplin, Hydrologist.

To this point, these plans were not extensively reviewed for applicability or feasibility in the field. In the fall of 2010, Wesley Crum (Powers presale forester with extensive logging systems and timber experience) took over the transportation and logging system development responsibilities. Wes spent considerable time in the field verifying the feasibility of stand treatments and the application of the transportation and logging system planning.

Wes field verified all the proposed roads (both existing and proposed). Later, a core Interdisciplinary Team documented all candidate stands and the associated roads needs utilizing a GIS Analyst. Road reconstruction and maintenance needs were identified and reviewed by Robin McAlpin, Powers Operations Manager. Final documentation of this report was prepared by Ken Grigsby (NEPA contractor) and Wesley Crum.

B. Background and History of Planning Area

The building of the Coos Bay, Roseburg and Eastern Railroad from Coos Bay to Myrtle Point in the 1890ís created a transportation system which eventually opened up the timber of the Coquille Valley. Between 1912 and 1915, the Smith-Powers Logging Company extended this line up the South Fork of the Coquille to the billions of board feet of timber which the firm owned in „the vicinity of Rural, Oregon. Re-naming the post office Powers in 1915, the company platted a town and created a booming logging activity in the region (Beckman 1978). Although C. A. Smith went bankrupt in 1919, the successor firm, the Coos Bay Lumber Company, continued work in the area through the 1920s to the early 1950s. Branch rail lines extended up, Salmon Creek, up the Coquille to Land Creek, and to the southeast up Eden Ridge. The logging operations in the region passed to the Georgia-Pacific Corporation when that firm purchased the Coos Bay Lumber Company in 1952 (Beckham and Hartmann 1977).

The Eden Ridge area was extensively railroad logged as the lines were constructed through the area. Back then, future forest management was not a concern, so stands were left to regenerate naturally. Most of the area was covered in slash, or burned as the fire hazard was very high. Most likely, brush was a major component for 15 to 20 years. Eventually, conifer and hardwoods overtopped the brush and the shrubs died back. Today the stands are still in transition to fewer hardwoods and the dominant conifers are out competing other conifers. Management records (that were found) show assessments of stocking/planting needs during WWII, or from 1939 to 1942. This is the time when the "Bill Rider" caused the adjacent lands to be transferred to private ownership. It is assumed that the private timber companies did not want the cutover area which is now referred to as the Planning Area for the Eden Ridge Timber Sales. The stands that have been examined as well as the sampling of tree ages indicate that the trees are currently around 60 to 70 years old (Crum, pers. com.)

Eden Ridge Planning Area falls within the South Fork Coquille River and the Middle Fork Coquille River 5th-Field watersheds, and the Lower Rock Creek, Myrtle Creek, Headwaters South Fork Coquille River, Coal Creek, and Mill Creek 6th field watersheds. Watershed Analyses have been conducted within these drainages and contain a synthesis of scientific knowledge about watershed trends and conditions at 5th field watershed scales as well as by smaller 6th field sub-watersheds.

C. Summary of Proposed Action and Alternatives

The Powers Ranger District of the Rogue River-Siskiyou National Forest is proposing variable density thinning and other silvilcultural treatments designed to control stocking and maintain or improve overall forest health and resiliency within the Eden Ridge Planning Area.

Stand inventory records and walk-thru examinations have identified thousands of acres of regenerated conifer stands within the Eden Ridge Planning Area that were initiated by natural or artificial regeneration following clear-cut timber harvest in the 1930s through 1940s.

Currently, dense tree stocking conditions have developed in many stands as a result of stand growth leading to increased inter-tree competition for site resources essential for tree health, vigor, growth and development. Limited availability of site resources within these dense stands is resulting in environmentally stressed trees and vegetation. Additionally, there are two forest pathogens; Port-Orford-Cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*) affecting forest health in small portions of the Planning Area.

The action proposed by the Forest Service to meet the Purpose and Need is variable density thinning and other silvicultural treatments designed to control stocking and maintain or improve overall forest vigor and resiliency from within the 6,516-acre Eden Ridge Planning Area. Commercial timber harvested from stand treatments would contribute to the Forest‟s Probable Sale Quantity.

The Project Area for the Proposed Action includes approximately 3,300 acres and is located approximately 4 air miles southeast of the city of Powers, Oregon at the closest point, with a legal description of: Township 31 South, Range 10 West, Sections 9, 15, 16, 17, 18, 19, 20, 21, 29 and 30; and Township 31 South, Range 11 West, Sections 21, 22, 23, 24, 25, 26, and 27; Willamette Meridian; Coos County, Oregon. Elevations range from 2,500 to 3,500 feet.

There are four alternatives considered in detail in the Eden Ridge Timber Sales EIS. These include Alternative 1 (No-Action), Alternative 2 (Proposed Action), Alternative 3 and Alternative 4.

Alternative 1 is the No-Action alternative. It represents the current condition and is the basis for comparison of effects from implementation of the three Action Alternatives (Alternatives 2, 3 and 4).

Alternative 2, the Proposed Action, is designed to address and maximize attainment of the Purpose and Need outlined in EIS Chapter I. Alternative 2 also represents the maximum extent of proposed treatments and connected actions (e.g., harvest systems and roads).

Alternative 3 is similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only “high-moderate benefit/low risk” new roads. In relation to Alternative 2, this modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative proposes helicopter logging systems, based on the change in access for conventional systems.

Alternative 4 is also similar to and is based on the Proposed Action, but differs from the candidate stands and opportunities associated with the Proposed Action, with modifications that include only the use (with some reconstruction and maintenance) of existing roads for treatment access. This alternative also excludes some of the higher risk treatments within Riparian Reserves (primarily those associated with perennial streams). In relation to Alternative 2 and Alternative 3, these modification would reduce the treated area on some units resulting in a change in configuration, or in some cases, units would be combined or dropped. This alternative also proposes helicopter logging systems, based on the change in access for conventional systems.

II. MANAGEMENT DIRECTION

A. Planning Area Land Allocations

For this portion of the Rogue River-Siskiyou National Forest (RRSNF), land management direction is contained in the Siskiyou National Forest (SNF) Land and Resource Management Plan (USDA Forest Service 1989) as amended by the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management, 1994).

The Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, is now commonly known as the **Northwest Forest Plan** (NWFP). This ROD, jointly signed by the Secretaries of Agriculture and Interior, amended the Siskiyou National Forest Land and Resource Management Plan (**LRMP or Forest Plan**) and other existing plans within the range of the northern spotted owl.

This amendment, which became effective on May 20, 1994, provided additional goals, objectives, standards, and guidelines for resource management. It added several new land allocations, each with its own set of Standards and Guidelines. These land allocations overlay and merge with the allocations from the 1989 SNF LRMP.

The direction in the Northwest Forest Plan supersedes the SNF LRMP allocations where it is more restrictive or provides greater benefits to late-successional ecosystems. Direction from the SNF Forest Plan is retained where it is more restrictive or is unaffected by the Northwest Forest Plan.

The Eden Ridge Planning Area contains two Management Allocations/Prescriptions that would be affected by proposed actions. A brief description of applicable Management Allocations/Prescriptions is provided below. More detailed descriptions can be found in the Northwest Forest Plan, and the Siskiyou National Forest Land and Resource Management Plan.

Matrix
This allocation emphasizes obtaining a full yield of timber within the capability of the land. Most scheduled timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands (NWFP, page C-39). Matrix lands allocated under the NWFP that include all areas not otherwise designated to a more protective status under the LRMP. The Eden Ridge Planning Area primarily includes lands allocated to Matrix, as carried forward from the 1989 LRMP as General Forest Prescription (Management Area 14).

Riparian Reserve
An estimated 2,600 acres of the Eden Ridge Timber Sales Planning Area are managed as Riparian Reserves. As allocated under the NWFP, Riparian Reserve includes lands along all streams, lakes, ponds, wetlands, unstable areas, and potentially unstable areas that are subject to special Standards and Guidelines designed to conserve aquatic and riparian-dependent species. The NWFP establishes a minimum protection buffer equal to the height of one site-potential tree, along each side of the riparian feature, which in the case of the Eden Ridge Timber Sales Project, is 175 feet. For perennial fish-bearing streams this distance is two site-potential trees (or 350 feet).

B. Management Direction for Roads

Current direction for road management is found in the Land and Resource Management Plans (LRMP) for the Siskiyou National Forest (1989). The SNF LRMP states, in part, to "Plan, design, operate and maintain a safe and economic transportation system to provide efficient access for the movement of people and materials involved in the use and protection of National forest Lands." (Forest Management Goal 15; LRMP Page IV-2. Within the Forest Plan, specific Forest-Wide Standards and Guidelines for the Transportation System are summarized below:

FACILITIES: TRANSPORTATION SYSTEM

TRANSPORTATION PLANNING

11 -1 (LRMP page IV-56)
Transportation planning analysis shall be conducted to compare feasible alternatives where choices that maximize net public benefits are not obvious from environmental and resource considerations. Direction for transportation planning is found in FSM 771 0, Transportation Planning, and the Transportation Planning Handbook, FSH 7709 55.

The analysis for transportation alternatives should:

1. Identify viable alternative routes from the planning area to available access points.
2. Identify the long- and short-term needs for each road (service life).
3. Determine the traffic criteria for each route.
4. Evaluate existing and potential mineral material sources considering site development and rehabilitation as described under Minerals.
5. Estimate development, maintenance, and user costs for economic comparison of alternatives.
6. Recommend the road system and standards to meet the needs identified.
7. Document the analysis, decisions, and management direction for preferred routes.

CONSTRUCTION AND RECONSTRUCTION

11-2 (LRMP page IV-57)
The Road Development Plan includes the multiyear Capital Investment Program, the multiyear Timber Sale Program, and the Transportation information System (TIS).

Design standards shall be based on resource management objectives, environmental constraints, user safety, environmental factors, traffic requirements, vehicle characteristics, road user, and economics.

New and reconstructed roads shall be planned, constructed, and managed to carry the anticipated traffic safely with a minimum impact to the land and other resources. In coordination with project interdisciplinary teams, specified construction methods shall Include provisions for reducing environmental Impacts, with emphasis to:

1. Minimize impacts to soil and water values.
2. Establish or protect native vegetation on cut and fill slopes and other disturbed sites off the roadway.
3. Limit the spread of Port-Orford-cedar root disease where risk is present, and
4. Limit the spread of noxious weeds where risk is present.
5. Protect other resource values.

TEMPORARY ROADS

11-3 (LRMP page IV-57)
Construction of Temporary roads' should normally be discouraged. Roads planned and constructed as Temporary roads should be Obliterated as part of the project work. Methods used, timing, and mitigation and designed to re-establish vegetative cover on the disturbed area within a reasonable period of time, not to exceed 10 years after the termination of contract, lease or permit (36 CFR 219.27(a)(II)). Those roads which subsequently are determined to be needed for additional use, or those not Obliterated as planned, shall be entered into TIS with appropriate road management objectives developed.

C. Transportation Planning

Current Agency direction for transportation planning is found in Forest Service Handbook (FSH) 2409.18 -Timber Sale Preparation Handbook; Chapter 30 - Project Analysis and Design - Gate 2:

33 - TRANSPORTATION PLANNING

33.1 - Transportation Planning in Project Design
Plan integrated transportation and logging systems for the analysis area. Ensure that the requirements for construction, operation, and maintenance of roads for commercial timber sale use are consistent with harvesting procedures and with the Forest plan, and that they are likely to achieve resource management objectives. Apply the following rules:

1. Integrate the transportation planning process with other resource analyses to ensure that the road system requirements meet documented resource management objectives.
2. Consider alternative road systems and timber harvest methods in the transportation planning process.
3. Document National Forest System roads selected in planning on the transportation atlas as long-term or short-term facilities.
4. Analyze existing National Forest System roads to ensure that, before timber sale use, the roads meet the requirements of FSM 7720.
5. Justify recommendations for exclusions of commercial use on National Forest System roads by a statement of the reasons for exclusion, other alternatives considered, and the costs involved.

6. Consider using low-standard or controlled temporary road construction when salvaging timber resulting from catastrophic damage.

33.2 - Planned Capacity
Plan for timber sale haul roads with the capacity to safely handle the scheduled traffic. Apply the following rules:

1. Permit no road use if the use would cause irreparable damage to the road or unacceptable impacts to adjacent resources. Damage does not include normal wear and tear correctable by maintenance activities.
2. If the additional traffic generated by an individual sale exceeds the operational limits of a road, authorize the additional use only if one or more of the following conditions apply:
   a. Road construction occurs in advance of the sale.
   b. Traffic management controls can be implemented within the limits of the facility. For public safety, restrict public access in situations where low-standard or temporary roads are used for quick access to salvage.
   c. Road reconstruction occurs as a requirement of the sale.
3. Use appropriated funds to finance that portion of the reconstruction needed to accommodate the traffic on the road prior to the sale.
4. Design roads constructed on National Forest System lands to standards appropriate for the intended uses; consider safety, cost of transportation, and impacts on lands and resources. Design and construct roads as stable and durable structures to facilitate maintenance during and after use. Include necessary drainage facilities, adequate erosion control, gates or other closure devices, and resource protection devices.

33.3 - Specified Roads (Classified permanent system)
Use specified roads when:

1. Road requirements are necessary to minimize temporary impacts on resources, especially, land, water, wildlife, and air.
2. Construction is required to maintain a quality that permits future use without need to re-accomplish or replace work that is currently in satisfactory condition. Construction should minimize repeated impacts and avoid unacceptable risks to resources. It should not result in higher future capital expenditures that could be required if, for example, roads had to be rebuilt or relocated for each sale.
3. Pavement structures are needed for structural support or to prevent erosion from traffic or natural elements, with sufficient depth for wear and maintenance during and at the termination of the sale.
4. Construction requirements result in the lowest total transportation cost (construction, hauling, and maintenance) for the sale, while ensuring safety and minimizing temporary or extended resource impacts.

D. Roads Analysis

Forest Service Manual Chapter 7710 provides direction to conduct transportation system planning and analysis using the best available science at the appropriate scale and in conjunction with other analyses to inform transportation management decisions. Ensure that road construction, reconstruction, and maintenance standards or criteria are guided by Roads Analysis and documented through the use of road management objectives.

When proposed road management activities (road construction, reconstruction, and decommissioning) would result in changes in access, such as changes in current use, traffic patterns, and road standards, or where there may be adverse effects on soil and water resources, ecological processes, or biological communities, those decisions must be informed by Roads Analysis.

Current policy requires the Forest Service to undertake a “scientifically-based” Road Analysis procedure, at appropriate scales and coordinated with other ecosystem analyses, in order to make better decisions regarding road management. Roads Analysis at the forest-scale will generally provide a broad context for informing road management decisions. Site-specific projects may be informed by a project-scale Roads Analysis.

Forest Service Responsible Officials are directed to use a Roads Analysis process to ensure that road management decisions are based on identification and consideration of social and ecological effects. *Roads Analysis: Informing Decisions About Managing the National Forest Transportation System* (FS-643) has been provided as guidance for conducting a science-based roads analysis.

This document describes the process that was used to evaluate the current road system for current and future needs associated with the Eden Ridge Timber Sales and its Planning Area. The goal of this project scale analysis is to compare the need for roads to access the Planning Area, with the effects roads have on natural resources.

This Roads Analysis is not a decision document. It is designed to provide a site-specific assessment of existing conditions within its analysis area and aid land managers in making more informed decisions in managing National Forest lands for multiple uses.

At the Forest scale and in conformance of the Roads Management Policy, a more general assessment of roads in the northwestern portion of the Rogue River-Siskiyou National Forest was conducted and compiled in 2004 (*Rogue River-Siskiyou National Forest Roads Analysis*). The guidance provided in this document was used to assist is project-specific analysis for Eden Ridge Timber Sales.

III. CURRENT ROAD INFORMATION

The following discussion includes the basis for use of existing roads. These roads are organized into four types; existing Forest Service Classified (or permanent system) roads, existing unclassified roads on National Forest System Lands (NFSL), existing roads currently under a Cost Share Agreement with adjacent private landowner interests, and roads that are private roads (not inventoried or managed by the Forest Service. The Eden Ridge Planning Area currently has a minimal existing road network and when the logging that created the candidate stands of today were created, the area was logged by historical railroad systems. Contemporary forest and road management has included Doe Swamp Thin, Skinny Doe thin, 4 Does Thin, Silver Doe Thin, Backwoods Thin and Lookout Partner Timber Sales.

Considerable effort was made during this planning effort to correctly locate and inventory existing roads systems discussed in this section. In many cases, roads appearing on maps or in database inventories were determined to be incorrect based on field examination. These anomalies occurring in several ways, e.g., some roads being tracked and mapped as existing Classified roads were in fact not correct.

In other cases, roads existed and are being used that were not being tracked as Classified roads. Unclassified roads likewise were found to be in error, either existing as Classified roads or not existing but were being tracked as unclassified roads. In order to facilitate use, existing Cost Share roads and the inventory of adjacent privately managed roads was updated for this project.

A. Definitions of Roads

The following definitions are from Forest Service Manual (FSM) 7705 and are pertinent to this roads analysis process.

> Forest Roads. As defined in Title 23, Section 101 of the United States Code (23 U.S.C. 101), any road wholly or partly within, or adjacent to, and serving the National Forest System and which is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

Roads are further defined:

> Road.
> A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail (36 CFR 212.1). For this analysis, a road may be classified, unclassified, or temporary.
>
> a. Classified Roads.
> Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service.
>
> b. Temporary Roads.
> Roads authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management.
>
> c. Unclassified Roads.
> Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.
>
> Transportation Facility Jurisdiction. The legal right to control or regulate use of a transportation facility derived from fee title, an easement, an agreement, or other similar method. While jurisdiction requires authority, it does not necessarily reflect ownership.

It is important to note that roads occurring on Forest Service managed lands are not public roads in the same sense as roads under the jurisdiction of public road agencies, such as State or Counties. Forest Service roads are not intended to meet the transportation needs of the public at large. Instead, they are authorized only for the administration and utilization of National Forest System Lands (NFSL). Although generally open and available for public use, such use is at the discretion of the Secretary of Agriculture. Through authorities delegated by the Secretary, the Forest Service may restrict or control use to meet specific management direction.

B. Current Road Inventory – Eden Ridge Planning Area

The Roads Analysis process starts with an inventory of all roads in the Planning Area. There are various scales that can be used when assessing road systems. This Roads Analysis utilizes a project-scale roads analysis area. The Analysis Area for this assessment includes those roads that access or are proposed to be used in conjunction with Eden Ridge Timber Sale activities (see Table I-2). A database was developed to inventory all roads that are within the Analysis Area.

Digital files representing road locations were secured from the Forest Service Geographic Information Systems (GIS) for the Rogue River-Siskiyou National Forest. A review of aerial photos was completed to locate and add any additional roads that were not displayed on the digital maps in order to include as much of the existing road system as possible.

The entire Analysis Area was then ground verified and road needs determined for use. Existing roads are recommended for use where attainment of the Purpose and Need would be accomplished; roads not meeting this objective would not. These files were combined and edited to create one set of roads within the Analysis Area.

Classified Road Systems
The following discussion includes the basis for use of (Classified or permanent system) roads. Forest System Roads are under the jurisdiction of the Forest Service and are deemed necessary for protection, administration, and use of NFSL. These roads are inventoried, maintained, and managed by the Forest Service. Generally, these NFS roads are identified as Maintenance Level 1, 2, 3, 4, or 5, under the following definitions.

Table I-1. Road Maintenance Level Definitions

Level 1	Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. While being maintained at level 1, roads are closed to vehicular traffic.
Level 2	Assigned to roads open for use by high clearance vehicles. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses.
Level 3	Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.
Level 4	Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.
Level 5	These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.

Most of the currently existing Classified road system within Eden Ridge is currently managed as Maintenance Level 1 or 2.

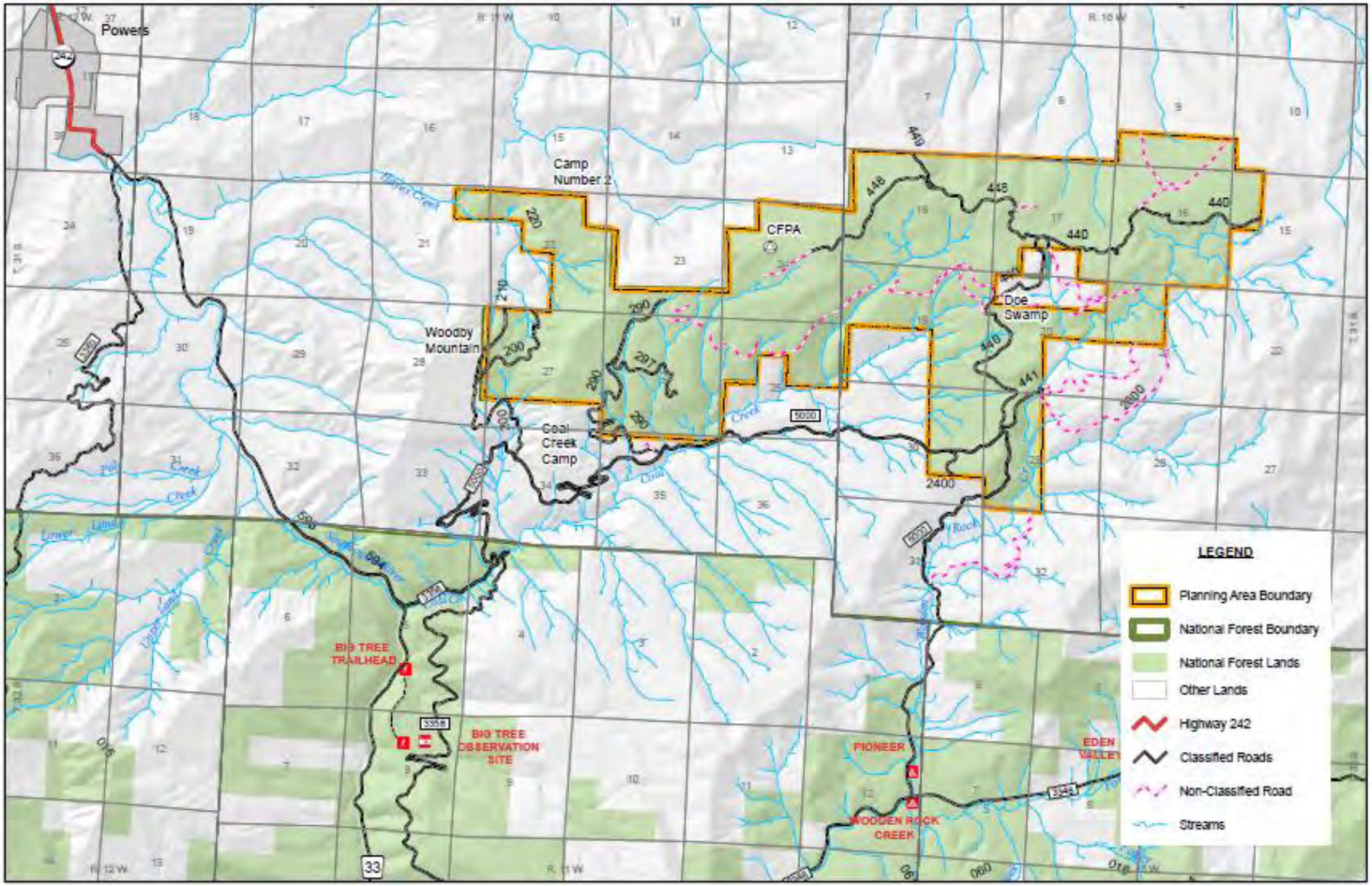
Unclassified Roads
The Eden Ridge Planning Area contains additional roads, trails or grades that are not inventoried, maintained, or currently managed by the Forest Service. As noted above, some unclassified roads were found to be in error, either existing as Classified roads or not existing but were being tracked as unclassified roads. Further use of correctly inventoried unclassified roads is discussed below under proposals for construction, reconstruction or use as part of the Eden Ridge Timber Sales Project.

Cost Share Roads
The Eden Ridge Planning Area is completely surrounded by private lands owned and managed for timber production. There is an extensive network of existing roads to facilitate access to these lands. In the past, some of these roads also facilitated access to NFSL and cooperative Cost Share Agreements were put in place.

These agreements require a proportionate share of use, maintenance and reconstruction of roads that serve mutual benefit. The intent of the cost share agreement is to eliminate the need for duplicate road systems and share in the cost and maintenance of these facilities that benefit both parties. While some cost share roads currently exist, construction, reconstruction and/or use of additional cost share roads is discussed in the next section. Some existing roads on private lands are also being proposed to be added to existing Cost Share agreements to minimize the need for construction of new roads.

There are approximately 17.35 miles of roads within the Analysis Area. Figure I-1 shows the Planning Area and its current condition regarding roads.

Figure I-1. Eden Ridge Planning Area - Current Roads



C. Existing Uses

COMMERCIAL - *Usually non-Forest Service employees conducting commerce activities, such as delivering goods and services in, adjacent to, or out of the National Forest.* Commercial use of the roads within this Roads Analysis is primarily related to delivery of goods and services e.g., hauling of commercial timber to attain timber commodity output goals.

RECREATION – *Typically members of the public who use Forest Service roads to access trails, campsites, hiking, hunting, sightseeing and other similar activities.* These roads also allow public use of firewood and special forest products.

ADMINISTRATIVE - *Forest Service or other agency employees acting in official capacity conducting day-to-day work activities.* Administrative access needs include, but are not limited to, law enforcement, fire prevention and control, resource surveys, road maintenance, and other activities associated with managing land, vegetation, water, fish, and wildlife.

D. Analysis of Existing Roads

This analysis utilizes a project-scale roads analysis area. The Analysis Area for this assessment includes those roads that access or are proposed to be used in conjunction with Eden Ridge Timber Sale activities (see Table I-2 and I-3). A database was developed to inventory all roads that are within the Analysis Area.

Roads Analysis identified a need for all existing roads for long-term management of the Forest, and for access to recreation opportunities. Most of the existing roads are typically open to the public and maintained for vehicular traffic. These existing roads provide the long-term transportation network necessary to meet forest management objectives.

The existing road system is programmed to receive annual maintenance in accordance with established road management objectives. However, over the last decade, a limitation on road maintenance funds on the Forest has resulted in a backlog of maintenance work to reduce brush, clean out drainages, and repair road surfaces on many of the existing roads in the Eden Ridge Planning Area. There are drainage improvements which would need to be implemented prior to commercial haul, in order to protect water quality. Many of the culverts on the roads are in poor condition or undersized, and in need of replacement. Many of the roads are becoming brushed in.

Table I-2. Proposed Classified Road Use

Classified Road Use	Reference	Miles
	3300000	1.21
	3358000	1.01
	5000000	10.36
	5000200	4.25
	5000210	0.75
	5000290	3.00
	5000297	1.10
	5000420	0.34
	5000440	5.06
	5000441	0.56
	5000445	0.11
	5000448	2.90
	5000449	0.38
Classified Road Use Total		31.03

Table I-3. Proposed Classified Road Use with Maintenance and Reconstruction

Classified Use & Maintenance	Reference	Miles
	2000	0.76
	2600100	0.26
	5000444	0.42
	5000445	0.89
	5000446	0.35
	5000450	1.01
	5000670	1.75
	5000671	0.06
Classified Use & Maintenance Total		5.50
Classified Use W/Reconstruction	5000291	0.10
	5000298	0.18
	5000299	2.02
	5000299.1	0.03
	5000442	1.24
	5000442.1	0.18
	5000443	0.72
	5000446	0.31
	5000447	0.19
	5000448.1	0.45
	5000451	0.65
Classified Use W/Reconstruct Total		6.07

South Fork Coquille Watershed

The 2004 Forest-level Roads Analysis document did not present data specific to the South Fork Coquille watershed. However, GIS data was developed for the South Fork Coquille Aquatic Restoration Plan USDA August 2007) in support of Roads Analysis.

Issues regarding management of the roads within the Analysis Area were divided between those relating to potential or actual environmental effects (termed "environmental costs") and those issues related to the ways that the roads are utilized (termed "road benefit"). To model these issues, factors were developed and analyzed using GIS software programs.

The values for each of the access need categories were summed to get a composite benefit rating for each road segment. These composite scores were broken down into three categories to get an overall road benefit rating of High, Medium, or Low. However, if any of the roads received a rating of a 3 for any category, then the overall road benefit rating would be High due to the high need for access.

The overall environmental cost and road benefit ratings were applied to the matrix shown in Figure I-2. This matrix is a tool (from the Forest-level Roads Analysis) to aid in developing site-specific recommendations for Forest road management decisions.

The following is an explanation of terms used in this matrix**:**

Consider decommission: Generally, roads with a low road benefit rating would be candidates to decommission. Decommissioning includes treatments that range from blocking the entrance, scattering limbs on the roadbed, revegetating, water barring, removing road fills, re-establishing drainage-ways, and pulling back unstable road shoulders; to full obliteration by re-contouring slopes.

Keep: Roads that have a high or medium road benefit would generally be kept on the system. There may be opportunities to change maintenance levels to help decrease maintenance costs.

Keep road and review for further analysis and/or mitigation: Roads in this category have a need to maintain access but also have environmental concerns. Further analysis that is more site-specific may be necessary to determine how to best mitigate the environmental effects. Measures such as resurfacing, improving drainage structures, gating to reduce use but still allow access, or even reconstruction may be employed to mitigate the environmental effects.

Figure I-2. Roads Analysis Matrix

Environmental Cost \ Road Benefit	Low	Medium	High
Low	Consider decommission	Keep	Keep
Medium	Consider decommission	Keep	Keep
High	Consider decommission	Keep road and review for further analysis and/or mitigation	Keep road and review for further analysis and/or mitigation

Figure 9 in the South Fork Coquille Aquatic Restoration Plan shows the road system in the South Fork Coquille watershed rated from a low to a high environmental concern. Road segments within each sub-watershed (6th field HUC) were rated for several factors, generally receiving a higher score if the road segment was near streams within riparian zones for much of its length. A sub-watershed rating was also developed to assist with restoration planning. The factors that were used to develop the environmental concern ratings were:

(1) Percent of sub-watershed stream network with roads within one site tree height.
(2) Stream crossing frequency within the sub-watershed and on a per mile basis for each road segment.
(3) Number of miles of road in high erosion potential by sub-watershed and percentage of road segment in high erosion areas.
(4) Percent of road segment within one site tree height.
(5) Percent of sub-watershed stream system with roads within one site tree height.
(6) The presence of road crossings in streams containing coho salmon, coho salmon critical habitat, or coastal cutthroat trout within a sub-watershed and per each road segment.
(7) Whether or not it is a NWFP Key Watershed.

Factors (1), (2), and (3) were used to develop low, medium, and high ratings for road erosion potential. Factors (4) and (5) were used to develop low, medium, and high ratings for the potential of roads to impact the delivery of large wood to channels. Factor (6) was used to develop low, medium, and high ratings for the potential of roads to impact coho salmon and cutthroat trout. For factor (7), a watershed or sub-watershed was given a low rating if it was not in a Key Watershed and a high rating if it was.

For each road segment, the ratings for erosion potential, potential to block delivery of large wood, potential to impact coho salmon and cutthroat trout, and Key Watershed were summed to give the summary rating shown in Figure 9. Those roads identified as of high and medium resource concern in this first iteration of Roads Analysis should be considered candidates for field checks to assess the impacts on aquatic habitats.

In Figure 9, roads segments shown in Red are where the Roads Analysis indicates the greatest benefit would be achieved for reduction in sediment delivery to streams and provide large wood contributions to streams.

For the Roads Analysis, data was also developed to rate the need for keeping roads for access (road benefit). This data was developed in a manner similar to that used for the environmental concern ratings. The factors that went into the access ratings were recreation needs, fire needs, vegetation management needs, special uses (mining), and road maintenance facilities (quarries, water sources, borrow sources, waste areas, access to private lands, access to public agency lands, and road maintenance condition).

Within the Eden Ridge Planning Area, Roads analysis performed for the Aquatic Restoration Plan rated the **3358 and 5000 Roads as a high environmental concern** based on the environmental factors identified above. However, these roads also have a **high benefit potential** in regard to the potential commercial and administrative needs associated with the Eden Ridge Timber Sales Project. This suggests that based on need, keep roads and review for further analysis and/or mitigation.

Middle Fork Coquille
The 2004 Forest-level Roads Analysis document did not present data specific to the Middle Fork Coquille watershed. There has been no detailed analysis within the watershed in support of Roads Analysis. This primarily due to the fact that there is minimal acreage of NFSL within this watershed; most of the area is owned by private timber management companies. It is apparent that roads may be rated as **moderate to high environmental concern** based on the environmental factors identified above. **Middle Fork Coquille is not a NWFP Key Watershed**. The few roads on NFSL within this watershed are primarily located on moderate to flat topography on stable soils. These roads also have a **high benefit potential** in regard to the potential commercial and administrative needs associated with the Eden Ridge Timber Sales Project. This suggests that based on need, keep roads and review for further analysis and/or mitigation.

Although road segments may fall into certain categories**, no decision** is inferred by this document. Management direction and objectives from other relevant documents need to be reviewed and considered before final recommendations for action are made. Decisions to implement new road facilities or road improvement activities would be made following analysis under the National Environmental Policy Act (NEPA). Because Roads Analysis is a dynamic process, changed conditions may make it necessary to supplement this document. Future analysis should build from this document and/or other Roads Analysis documents.

Further discussion is contained within this document regarding proposed new access needs, based on proposed logging system needs for management of the Eden Ridge Planning Area Matrix lands.

IV. LOGGING SYSTEMS

As noted above, in the fall of 2010, Wesley Crum (the current Powers Forester) assumed the transportation and logging system development responsibilities. Considerable time was spent the field determining the feasibility of stand treatments and the application of the transportation and logging system planning. Both existing and proposed transportation and logging systems were ground verified. Later, a core Interdisciplinary Team documented all candidate stands and the associated roads needs utilizing a GIS Analyst.

Field work was accomplished per FSH 2409.18 – Timber Sale Preparation handbook; Chapter 30 – Project Analysis and Design, Gate 2:

31.1 - Field Reconnaissance

Conduct field reconnaissance to develop sale designs. Since the most critical decisions involving funding and resource expenditures are required at Gate 2, conduct a more intensive field reconnaissance at Gate 2 than at Gate 1. Leave adequate flagging, stakes, marks, or other tracks in the field to ensure that sale preparation activities can continue in the most cost-effective manner practicable. FSM 2361 includes techniques for obtaining required archaeological resource clearances and FSM 2672.4 provides guidance on preparing biological evaluations.

In salvage situations, use existing data and professional judgment to hasten the analysis process. The Land and Resource Management Planning Handbook, FSH 1909.12 and 36 CFR 219.27(d)(2)(iii) direct that unit size limitations must not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm. Follow Regional guidelines for exceptions to unit size limitations in these situations.

31.2 - Documentation

In timber sale project design documents include sufficient site-specific information, preliminary sale design, and appropriate management guidance to facilitate sale plan implementation at
Gate 3. A timber sale project plan may include one or more timber sales or permit areas and must include the following:

1. Approximate cutting unit location and size.
2. Nature and condition of timber stands proposed for harvest.
3. Silvicultural prescriptions.
4. Selected logging systems information.
5. Locations and standards of local, collector, and specified roads.
6. Planned fuel treatments.
7. Location of key resource values.
8. Preliminary design for resource improvements.
9. Zones or areas with specific management requirements, constraints, or mitigation requirements.
10. Financial and economic information as described in section 32.

A. Analysis Process (paper and field)

Considerations for Application of Logging Systems
All candidate stands have all been previously logged, with the majority of the Eden Ridge Planning Area being previously logged via historical railroad systems. Past treatments had different (and typically less) consideration for sensitive slopes, sensitive soils and sensitive riparian areas. The entire area was logged with “steam donkey” cable systems. Past cable yarding systems, as associated with railroad transport, employed “high lead” or systems that did not require or utilize log suspension (as would be required today). Some terrain would today require partial suspension (or full suspension) systems on stands that had previously been cable logged without suspension in the past.

The proposal of system(s) to be used in any given stand is based on existing classified road access, new system or temporary road construction needs, as well as economic and technical feasibility identified for each treatment unit. The two primary concerns involved with use of the various logging systems is the potential detrimental effects to soils and the construction of new roads. New classified or temporary roads may be necessary due to the need for a change in the logging system design or to access areas that retain no access, reflecting an adherence to current standards and guidelines set forth in the Forest Plan. Soil concerns elevate when ground based equipment is considered for use on steeper slopes, sensitive riparian areas, sensitive soil types, or unstable areas.

Conversely, there is an operational concern for economics between the various systems being considered, i.e., ground based systems are most economic from an operational cost viewpoint, skyline systems increase in operational costs, and aerial (full suspension or helicopter) systems are the most costly. Road access and landing accessibility and construction costs are also factors to consider.

Considerations in Logging Systems and Transportation Access Planning
The Analysis Area for logging systems and transportation access planning includes those roads that access or are proposed to be used in conjunction with Eden Ridge Timber Sale activities. Potential units were proposed considering logical and economic access for these systems. Planning then further segregated and rearranged systems and potential logging settings considering:

-Logical 6th field watersheds within the two 5th fields
-Refined silvicultural opportunities (exclusion of too young or not overly dense)
-Consideration of "inner gorges" as defined by hydrology
-Exclusion of clearly unsuitable areas
-Exclusion of stands clearly representing late-successional habitat
-Logical road access considering existing and proposed roads (including segments)
-Logging systems (separate each unit not mixing logging systems)
-Consideration of logical operational setting size

See Attachment A for an example of the detailed "paper planning" accomplished for the Eden Ridge Timber Sales Project.

B. Logging System Options

Within the Eden Ridge Timber Sales Project, logging system options for stands that provide opportunities for commercial extraction include ground-based systems, skyline cable systems, and aerial (helicopter) systems.

Ground Based Systems

This term refers to a group of logging methods that are considered ground-based, and may also include mechanized harvesting equipment. Typically, logs are harvested using mechanized heavy equipment to skid the logs to a landing area, where they would be loaded onto a truck. These ground-based systems are usually utilized on terrain where slopes are less than 25-35 percent. The maximum percent slope for ground based systems, as designed for the Eden Ridge Planning Area is 35%.

In all cases, all proposed skid trails should be pre-designated by the operator and approved by the Forest Service before felling and skidding. Skid trails should not be allowed to cross specified stream channels or only at Forest Service approved locations. In general, skid trail spacing should average 100 feet apart and located on the fall line, especially if using harvester-forwarder (cut-to-length [CTL]) systems due to the forwarder"s high center of gravity. It is estimated that an average skid trail spacing of 100 feet apart would result in approximately 12% to 15% of the area being covered with skid trails.

Landings for units with ground based systems can generally be located on gentle ground. If the project specifies that tops be left attached to the top log in ground based units, some log processing would be needed on the landings (i.e., the whole tree system, see below). This need would require slightly larger landings in order to accommodate the residual slash from the top log and residual limbs. Log processing can be accomplished by a relatively small and inexpensive "pull-thru" log processor or a more expensive and more efficient mechanical processor.

The following table displays several examples of equipment configurations for the ground based systems.

Table I-4. Examples of Equipment Configurations

GB System	Equipment configuration	Notes
Whole tree	Feller/buncher, grapple skidder, processor, loader, (mechanized felling)	Logs processed on landing. Manual felling may be required in some units for oversized trees, i.e., greater than 24".
CTL	Harvester, forwarder, loader (mechanized felling)	Logs processed in woods. Manual felling may be required in some units for oversized trees, i.e. greater than 24".
Conventional	Manual felling, grapple or cable skidder, loader	Process logs in woods or at landing (if at landing add processor in equipment).

Tractor - In this conventional system, a cutter will fall to lead toward designated skid trails, then limb and buck the tree in the bed where it landed when it was felled. Three methods of skidding can then be utilized, loader or shovel yarding, grapple or choker skidding. Shovel yarding consists of a heal boom loader grabbing the logs and swinging them towards the landing in stages. Grapple skidding uses swing grapples attached to the rear of the tractor. The clamps pick up one end of the log and the operator positions the log for skidding. When several logs are bunched, the grapple can pick up several ends at one time and skid the turn to the landing. The third method involves chokers that are attached to the logs and a tractor equipped with a winch pulls the logs from their beds into the skid trail. When a group of logs are assembled into a turn, the chokers are gathered together, the leading ends of the logs are suspended above the ground behind the tractor by way of an integrated arch or similar apparatus, and the trailing end of the logs drag along the ground on the way back to the landing. At the landing, a front-end or a knuckle-boom loader is used to sort and load logs decked at the landing onto log trucks.

"Winch/line" Some areas of timber harvest where slopes generally exceed 35% slope but are relatively small – usually less than 250 feet wide –can be reached by a winch line from a ground based machine or reached from a road by a winch line or loader. The tractor uses a "bull line" to pull the logs to the skid trail or road. These areas are usually inside larger ground based inclusions and are considered part of the ground based system.

Rubber-tired Skidder - This system is essentially the same as tractor logging in technique, although the skidding equipment has some operational and functional differences. While most tractors have steel tracks with cleats that run along a rigid rail and tend to churn up some soil when it turns, rubber-tired skidders are often articulated in their middle instead of a rigid frame, and they displace somewhat less topsoil than a tractor would when it turns. Both types of equipment can have advantages, depending on the situation.

Typically, tractors can work on somewhat steeper slopes, while skidders are faster and average skidding distances can be somewhat longer. By virtue of the fact that both tractors and skidders bear the weight of one end of the logs being skidded, the weight of the machine skidding logs is not evenly distributed, but is instead concentrated near the back of the machine. This configuration can create disproportionately higher ground pressure on the soils being skidded upon than the machines rated or calculated pressure (in pounds per square inch) would indicate.

Harvester-Forwarder - A harvester and forwarder are two separate pieces of equipment. The harvester (while traveling on pre-designated harvester trails) reaches its boom out to cut the tree, and lays it on its side approximately perpendicular to the axis of the skid trail. Rollers on the cutting head then pull the tree through delimbing knives which drops the limbs in the harvester trailing front of the harvester as they are severed.

As each pre-determined length of log has been fed through the harvester head, logs are cut to length and allowed to fall into a stack of uniform length logs alongside the harvester trail. As the harvester travels through the stand, it rides on the layer of limbs that act as a cushion to help minimize soil compaction.

Later, a forwarder uses the same trails to pick up the logs, load them onto its bunk, and transport the logs to the landing, completely free of the ground instead of dragging them behind the machine. Because the logs are transported free of the ground, the weight is evenly distributed over all of its wheels, so the resultant ground pressure is less than with other ground based systems. This method not only minimizes soil compaction, but it virtually eliminates any exposure of subsoil so there is rarely any detrimental displacement or erosion. Because of the specialized equipment, there is a slightly higher cost, compared to tractor or rubber-tired skidder.

Skyline

Is a system that transports logs from stumps to landings using a wire rope cable that is suspended between a tower and a tail tree. This cable (or skyline) functions as an overhead track for a load-carrying carriage. Logs are lifted by cables or other devices attached to the carriage and pulled into a skyline corridor. The carriage is then pulled to the landing by a mainline powered by a yarder. The skyline provides vertical lift so that the logs have their leading end suspended above the ground during inhaul. In some cases, the entire log may be suspended above the ground.

Skyline logging is generally specified where road access is suitable, on slopes greater than 35%, and/or where soil or water conditions are a concern. Typical skyline systems can effectively yard logs out to 1,000 to 1,200 feet. This capability inherently affects road locations where the yarder is positioned.

In all cases, one-end log suspension would be required in all skyline units. Where logs are to be yarded across specified stream channels or wet areas, full log suspension would be required over the designated stream channel. In order to get adequate deflection in some units, the skyline may have to be rigged across major streams and/or existing roads.

Guyline anchors are needed and within the Eden Ridge Planning Area, should be adequate in most areas. However, in some locations multiple stump anchors, machine anchors, and/or “deadman” anchors may be needed. Guyline anchors should generally be green Douglas-fir 15” to 26” DBH and 40+ years of age. Guy trees would have to be felled before being used. Tail tree and tail tree anchors would be needed on most skyline corridors. Tree sizes should be from 15” to 26”+ in most locations (Douglas-fir). Tail tree rigging heights may be up to 50 feet. Tree sizes and rigging heights should be guided by OR-OSHA Chapter 437, Division 6.

Skyline landings would mostly be located in the road prism. Landing orientation would utilize both parallel and centralized (radial) configurations. In some cases, landings would need to be placed on narrow roads, therefore, a swing boom type yarder would be necessary. If the project specifies that tops be left attached to the top log in skyline units, some log processing may be needed on the landings (i.e., the whole tree system). This would require slightly larger landings and/or the back-haul of slash in order to accommodate the residual slash from the top log and residual limbs. Log processing could be accomplished by a relatively small and inexpensive “pull-thru” log processor or a more expensive and more efficient mechanical processor.

Examples of the skyline equipment considered are displayed in the table below. The yarders in the table can be found in the local area (southern Oregon, northern California) and are currently in use. Skyline equipment would consist of a yarder/tower combination (see below), log loader, landing cat (D6 type), pull-thru or mechanical processor (if needed), mechanical slack pulling carriage, and radio. Labor would generally consist of the following: yarder engineer (1), loader operator (1), chaser (1), hooktender (1), rigging slinger (1), choker setter (1), and processor operator (1, if needed).

The left-hand table is the configuration that could typically be used. Where guyline anchors are inadequate (i.e., machine anchors are not feasible) and average external yarding distances are less than 1,000 feet, the right-hand table (converted loader) could also be used.

Table I-5. Examples of Skyline Yarders

Attribute	Value	Notes
Make	Diamond	
Model	D2000	
Type	Swing boom	Can operate on narrow roads
Tower height	42	Feet
Skyline	0.875	Diameter
Skyline	2,000	Length
Mainline	0.625	Diameter
Mainline	1,900	Length
Haulback	0.500	Diameter
Haulback	3,200	Length
# guylines	3	
Horsepower	216	

Attribute	Value	Notes
Make	Yoader	Conv. loader
Model	Tri winch	
Type	Swing boom	Can operate on narrow roads
Tower ht	40	Feet
Skyline dia	0.750	Diameter
Skyline	1,000	Length
Mainline	0.625	Diameter
Mainline	1,500	Length
Haulback	0.5625	Diameter
Haulback	1,900	Length
# guylines	0	
Horsepower	230	

The following carriage is in widespread use in the local area and could match-up with the yarders displayed above.

Table I-6. Example of Skyline Carriages

Attribute	Value	Notes
Make	Eagle	
Model	Eaglet	Radio controlled
Weight	1,200	Pounds
Skyline min diameter	0.625	Swaged
Skyline max diameter	1.125	Swaged
Mainline min diameter	0.500	Swaged
Mainline max diameter	0.625	Swaged
Dropline diameter	0.625	Mainline
Slackpulling method	Carriage	Mainline off yarder
Multi-span capability	Yes	Open sided
Skyline clamp	Yes	
Yarder drums required	2	Minimum
Horsepower	14	

Helicopter

This logging system utilizes medium or heavy-lift helicopters to transfer the logs from where they are cut to a landing where they are loaded on trucks for haul to a mill. Helicopters are divided into three classes, depending on their lift capabilities. Helicopters have high operating costs and are usually utilized where there are concerns for ground disturbance or where road building is not desired. Aerial systems (e.g., helicopters) would be a system used to accomplish commercial density management where existing access systems are not available or would cause extensive resource damage if utilized.

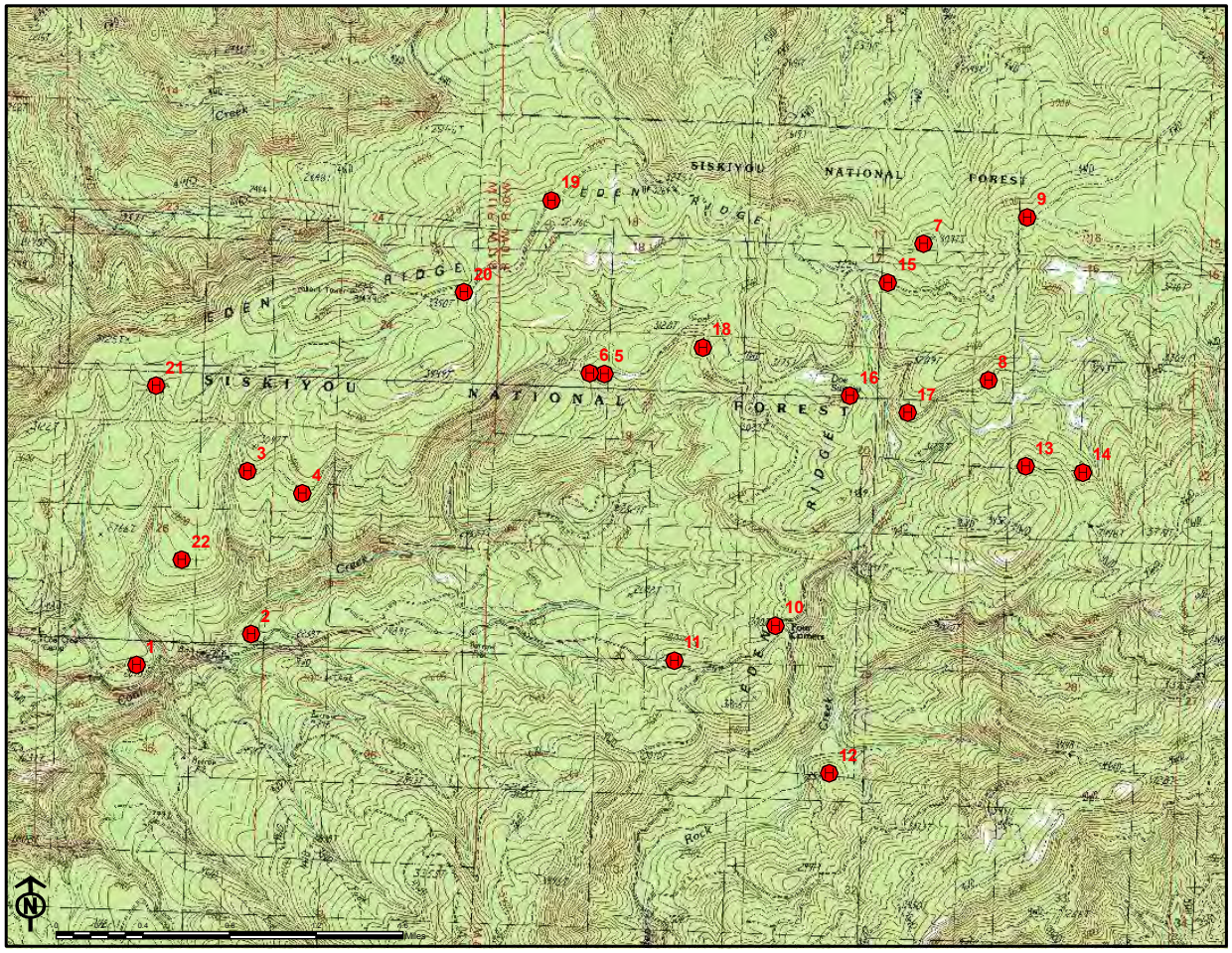
Helicopters can be used to move material from the treatment area sites, and move them to processing areas (i.e., landings). From the landings, material can then be removed from the forest by trucks, utilizing existing classified roads suitable for such use. The use of helicopters allows for full suspension of trees or material from the treatment area to the landing area and does not create excessive ground disturbance via skid trails or skyline corridors.

This system (helicopter) can be utilized where there is no directly adjacent road access. There are limitations however on the flight distance and elevation change from the landing to the stand where material would be transported. Landings must be within a distance of approximately 1 mile from the treated stand. There are also other factors to consider regarding helicopter systems and economic feasibility, including turn size, maintenance and fuel storage landings, etc.

Within the Eden Ridge Planning Area, numerous potential log and service landings are available (see Figure I-3, below). Helicopter landings, in general, have an average size of about 80 feet by 200 feet and be located as close as possible to the harvest units they serve. However, the actual landing size and location can vary widely depending on terrain, slope, volume flown per acre, and flight direction. In general, landings should be cleared of trees and stumps and leveled as much as possible. In some cases, some surrounding green tree might have to be removed to facilitate flight direction. Some of the landings associated with the Eden Ridge Planning Area may be located on private land or private roads. These locations would need approval from the private land holder if used. Service landing(s) need to be no more than 1 mile from the harvest units (less if possible) and accessible by highway fuel trucks.

The recommended equipment for this system would consist of a medium lift or light lift helicopter (sea level payload of 4,500 pound to 8,000 pounds). In addition, at least two loaders and various support vehicles would also be needed. Labor would consist of about 10 woods and landing crew personnel as well as pilots, support labor, and service labor.

Figure I-3. Potential Helicopter Landing Sites



Prebunching
This system can be subordinate to any of the above systems. It typically involves machine cutting, weighing, and bundling logs to make log transport more efficient. A tracked, self-leveling machine can typically work on ground up to 40% slope gradient, with no adverse effect to soils (minimal additional detrimental soil effects within soils Standards and Guidelines). By making one pass through the stand and walking on slash and compacting and dispersing it, slash treatment costs can be bypassed and fire danger lessened.

Use of this equipment can make all phases of the ground based, skyline, and helicopter logging considerably more economical and can also treat the slash at the same time. While pre-bunching could be used in any systems (where slopes allow), it is especially applicable to helicopter systems. The biggest cost factor in helicopter logging is the aircraft cost per hour; anything that can boost the volume per hour produced can bring down unit costs. Pre-bunching timber in a thinning into flyable bundles with a "cut-to-length" processing machine has been proven to maximize volume flown per hour. Production can be increased as the turns fly faster, loading is consistent, no excess weight (slash) is flown, landing impact and size are minimized, and labor and loading costs are cheaper. The estimated savings from this type of operation is estimated to be about 20% to 25%.

C. Mitigation Measures and Potential Contract Language

Note: Other methods and equipment may be identified during sale preparation and/or field verification.

C(T)6.42# - Special Yarding/Skidding Methods. (1/93) Methods other than those specified may be approved. When appropriate, such approval shall include changes in Current Contract Rates and Sale Area Map shall be revised.

	YARDING/SKIDDING METHODS	UNITS
1.	All skyline logging will be done with equipment capable of suspending one end of the log; up to 150 foot lateral yarding required to skyline corridors	all skyline areas
2.	The carriage shall be positioned such that during lateral yarding, logs are yarded away from stream courses	
3.	Yarding corridors shall target a spacing of no closer than 150 feet as much as possible	all skyline areas
4	Skyline corridors shall be only wide enough to allow free passage of the carriage and turn of logs. Corridors shall normally not exceed 12 feet in width	
5.	A carriage capable of a means of pulling slack and maintaining a fixed position on the skyline during lateral in-hauls is required	all skyline areas
6	Location of all skyline roads and tail trees shall be agreed upon by the Forest Service prior to felling	all skyline areas
7.	Tail trees and intermediate supports may be necessary to achieve suspension requirements	all skyline areas
8.	All yarding across designated stream courses and within 50 feet slope distance of designated streams must be done with the logs suspended free of the ground	all skyline areas

9.	All yarding across wet areas must be done with the logs suspended free of the ground	all skyline areas
10.	Helicopter yarding specified. Logs must be broken free of their beds vertically and totally suspended during the in-haul except that during log pick-up, logs may move up to 50 ft. in any direction from their original lay when required by local conditions or circumstances	all helicopter areas
11.	Trees shall be felled, insofar as safety permits, to angle in the direction of skidding	all ground based areas
12.	Tractor or forwarder skid roads shall be located and approved by the Forest Service prior to felling	all ground based areas
13.	Skid trails shall be located, as much as possible on skid trails used in previous logging operations	all ground based areas
14.	Skidders will stay on approved skid trails and landings at all times. Skid trails will be on average 100 ft. apart	all ground based areas
15.	Skidders equipped with an integral arch and winch system capable of elevating the leading ends	all ground based areas
16.	Ground based skidding equipment shall not operate on slopes greater than 35 percent unless otherwise approved by the Forest Service	all ground based areas

YARDING/SKIDDING EQUIPMENT		PAYMENT UNITS
1.	The carriage must be capable of lateral yarding up to 150 feet perpendicular from the skyline (either side)	all skyline areas
2.	A yarding system (helicopter) capable of lifting and transporting logs fully suspended at least 3,000 ft.	all helicopter areas

Potential Prospectus Language:

Note: Other prospectus statements may be identified during field verification and/or sale preparation.

1. Payload analysis calculations for skyline equipment were based on a 7/8 inch diameter skyline, 42-foot tower, 40-foot log length, and motorized carriage. One end log suspension and full log suspension was analyzed using the above configuration.

2. In order to get adequate skyline deflection for payloads, tail trees may be necessary in some skyline units and skyline settings.

3. In order to get adequate skyline deflection for payloads, intermediate supports may be necessary in some skyline units and skyline settings (multi-span skyline system).

4. Multiple stump guyline anchors or machine anchors may be needed on some landings.

5. A helicopter yarding system capable of lifting 4,500 pounds at an elevation of 3,500 feet above sea level at 69 degrees F, and transporting logs fully suspended at least 3,000feet uphill and downhill.

6. Prebunching may be allowed in helicopter units on slopes less than 50% upon approval by the Forest Service.

7. Ground skidding on slopes greater than 35% by use of winch lines or loaders may be allowed in small, localized areas upon approval by the Forest Service.

V. ROAD ACCESS NEEDS

Since the majority of the area being previously logged via historical railroad systems, the proposal of system(s) to be used in any given stand is based on existing classified road access, new system or temporary road construction needs, as well as economic and technical feasibility identified for each treatment unit.

The two primary concerns involved with use of the various logging systems is the potential detrimental effects to soils and the construction of new roads. New classified or temporary roads may be necessary due to the need for a change in the logging system design or to access areas that retain no access, reflecting an adherence to current standards and guidelines set forth in the Forest Plan. Soil concerns elevate when ground based equipment is considered for use on steeper slopes, sensitive riparian areas, sensitive soil types, or unstable areas.

In some cases, other concerns regarding engineering, logging systems, cultural protection etc. required new roads to be considered in lieu of the existing templates.

Conversely, there is an operational concern for economics between the various systems being considered, i.e., ground based systems are most economic from an operational cost viewpoint, skyline systems increase in operational costs, and aerial (full suspension or helicopter) systems are the most costly. Road access and landing accessibility and construction costs are also factors to consider.

A. Existing Road (Access) Systems

Product Transport or Haul
Hauling involves loading and transporting logs or other products on log trucks along roads associated with the harvest activity areas. These roads need to be in a safe and acceptable condition for this purpose, and could require reconstruction or maintenance prior to this use. Hauling occurs on all road surface types including asphalt, aggregate gravel, and native-surfaced.

Classified Road Maintenance
This activity includes several related activities which maintain drainage, cuts and fills and surfacing of the road prism to accommodate light and commercial road traffic; while maintaining the integrity of the road facility and minimizing effects to natural resources adjacent to the road. Much of this work is done with a motor grader, dump trucks and backhoe.

Road maintenance includes travel way surface maintenance, drainage ditch maintenance, culvert cleaning, surface rock replacement, shaping of the roadway and ditches by blading, removal of slough materials, compacting and other mechanized and hand work. Classified road maintenance involves activities of a lesser scale and effect than Classified road reconstruction. Note that some items associated with routine road maintenance are sometimes included in contracts and identified as road reconstruction.

It is estimated that road maintenance would be needed on the road system utilized for this project, over a number of years. This would vary according to the Actions Alternatives due to stand treatment locations, the proposed harvest access and logging system, and the conditions preceding the need for the road. Road maintenance renders the road durable and useable, and when not further needed, allows it to be in a storage condition that minimizes effects on soil, water and other resources.

Road maintenance includes use of rock quarries and water sources, roadside brushing, grading, ditching, rocking of perennial stream crossings on native surface roads and other activities needed to maintain the road facility in good condition. Maintenance work is usually performed commensurate to the use of the road and the condition of the road.

Classified Road Reconstruction
Reconstruction involves maintenance and improvements to existing Classified (system) roads, to make them suitable for logging equipment and harvest treatment access. Reconstruction involves restoring a Classified system road to its previous operational condition. Road repairs could have one or more of the following work items: removing fallen trees, cleaning out culvert inlets, removing and disposing of small cut slope slides, falling danger trees, replacing minor amounts of road surfacing etc. Treatments could include grading, clearing, restoring road width loss, or stabilizing a cut or fill (embankment) slope that was lost due to storm damage, by placing riprap materials (large boulders) against existing slopes, and may include widening and surface rock replacement.

Previously existing spur roads, skid roads, or old railroad grades could be reconstructed and utilized for development of Classified road access. This would place the impacts on areas already affected and lessen the environmental impact associated with new road construction in undeveloped areas. A reconstructed Classified road is often more environmentally sound than a temporary road because it is designed to a higher standard. When closed for a long period of time, a Classified road can be a more stable facility when left in a storage condition.

It is estimated that road reconstruction would be needed on portions of the road system utilized for this project, over a number of years and projects. This would vary according to the Actions Alternatives due to stand treatment locations, the proposed harvest access and logging system, and the conditions preceding the need for the road. Performing road repairs could also be accomplished by future commercial timber sales or stewardship contracts that would include requirements to perform minor road reconstruction work and applicable road maintenance work.

Culvert replacement may occur in some stream channels and drains that relieve road ditches. Many culverts in channels are determined to be undersized to handle the water and sediment from areas above the structure. Culverts have a lifespan and effectiveness that diminishes as rust and corrosion decrease the strength and integrity of the structure. These culverts would be replaced as necessary. This project provides the opportunity to upgrade culverts for additional resource protection and enhancement.

Work would entail excavating the fill covering the current culvert and removing the culvert. Fills placed over the new pipe would be compacted and the road prism shaped to provide good drainage in and around the new culvert. Project Design Criteria and preventive mitigation measures would be used to minimize stream channel disturbance at the site and reduce the amount of unconsolidated material remaining in the channel after installation of the new culvert is completed.

B. Proposed New Classified Road Access

New Classified roads were determined to be necessary to minimize temporary impacts on resources, especially, land, water, wildlife, and air. These new Classified roads are necessary to maintain a quality that permits future use without need to re-accomplish or replace work that is currently in satisfactory condition. Construction should minimize repeated impacts and avoid unacceptable risks to resources. It should not result in higher future capital expenditures that could be required if, for example, roads had to be rebuilt or relocated for each sale or entry.

New Classified road construction is designed to result in the lowest total transportation cost (construction, hauling, and maintenance) for the intended management use, while ensuring safety and minimizing temporary or extended resource impacts (FSM 2432.34 and FSM 7700). Timber sale contracts may authorize construction of both specified Classified roads and temporary roads.

All proposed new Classified roads would be created and managed as Maintenance Level 1. System roads are for long-term, multiple management needs, often with some potential for future use every five-to-ten years. At this time, the critical vehicle has been identified as a skyline yarder, and the design vehicle has been identified as a log truck. The traveled-way width would be 12 feet plus curve widening, fill widening, and turnouts, unless the critical vehicle dictates otherwise.

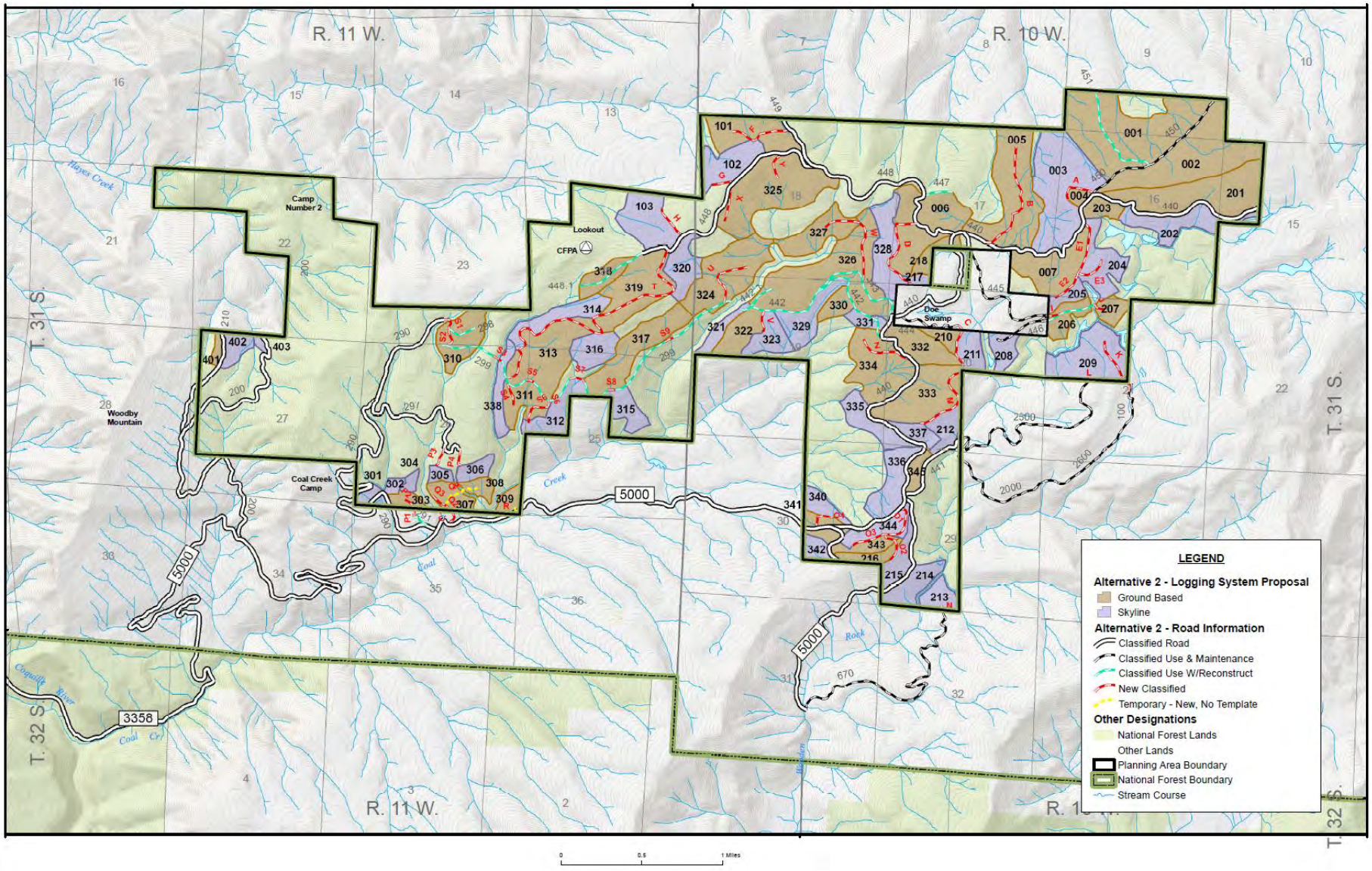
All proposed new system roads would be rocked to minimize erosion and allow for extended use during wet conditions. The more complex new roads (and those crossing Riparian Reserve) would be engineered and designed to minimize environmental impacts. Closure of all new construction of system roads would be accomplished via a road entrance closure of native materials (logs, earth, boulders) after timber sale activities had occurred, placing them into Maintenance Level 1 Status. Armored drain dips would be installed on all new roads (instead of ditch relief culverts) to reduce long-term maintenance costs.

Some new Classified roads would cross Riparian Reserves, under specially designed Project Design Criteria (see Section 3, Project Design Criteria For Riparian Reserves, EIS Chapter II).

In addition, some of these proposed new Classified roads would potentially be constructed under terms of existing or new Cost Share Agreement (subject to discretion of private landowners).

Figure I-4 shows the results of transportation and logging systems planning and analysis, as portrayed by the Proposed Action.

Figure I-4. Eden Ridge Timber Sales Proposed Logging Systems and Access Needs



C. Temporary Road (Access) Systems and Landings

Temporary Roads
A temporary road is a road necessary for emergency operations or authorized by contract, permit, lease or other written authorization that is not a Forest road and that is not included in a Forest transportation atlas (36 CFR 212.1). Some new temporary road construction may be needed for candidate stand access. Temporary roads include those roads needed only for the purchaser"s use for a given timber sale(s), such as roads used to haul timber from landings to permanent National Forest System roads. The Forest Service and the purchaser must agree upon the location, resource protection requirements for road construction, clearing widths, and closure or rehabilitation requirements. Temporary roads are not constructed to serve long-term future uses and must be closed prior to closure of the timber sale (FSM 2432.34b).

Temporary roads are proposed where it is likely that a one-time access is needed as part of a contract, for access to harvest units. They typically have a lower planning, design, and initial development cost than permanent system roads. Forest Service regulations (36 CFR 223.37) require temporary roads to be revegetated within ten years. These roads cannot be compared to engineered roads (permanent system roads) as they are not designed for multiple uses or long-term resource protection (e.g., all-weather maintenance).

In this analysis, a temporary road is defined as a created travel way, for the purpose of transporting logs that is built, utilized, and decommissioned (obliterated) over the course of the treatment/harvest operation. These temporary roads would not be surfaced (rocked) and would be used during dry conditions only. They would be built and removed by the operator as part of the Forest Service timber sale or stewardship contract.

In constructing these temporary roads, no large diameter trees (e.g., late-seral or "old growth" type trees would be felled for road clearing. In many cases, these temporary roads are essentially access to or an extension of a landing (a few hundred feet), or could actually be a travel way of several hundred feet. Temporary roads are considered as part of the affected (detrimental) soil conditions under the Soil Quality Standards and Guidelines. Maximum percent of area for detrimental soil conditions would be 15 percent for an activity area (including roads and landings: SNF LRMP Standards and Guidelines for Soils; 7-2).

Temporary roads would be managed in accordance with water quality Best Management Practices[1] (BMPs) R-23. In order to prevent continued low level casual use, and to minimize resource impacts, such roads and landings would be obliterated at the completion of their intended use. Effective obliteration is generally achieved through a combination of the following measures:

- Temporary culverts are removed and natural drainage configuration is re-established;
- Road surfaces are ripped;
- Sideslopes are reshaped and stabilized; road is effectively drained; and
- Road is blocked to further use, and road is returned to vegetation production through revegetation (seeding, planting browse species, or hardwood/conifer trees).

Landings
Some of the areas associated with the candidate stands have an existing network of roads and landings from previous harvests. However, there would also be a need for some additional areas created for log landings. These would primarily occur in areas where no landing currently exist or where a change in logging systems (e.g., where skyline logging is now prescribed in areas previously ground based or railroad logged).

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1 *General Water Quality Best Management Practices,* Pacific Northwest Region, November 1988.

These additional landings are highly variable by Action Alternative and the selected logging system. For example, helicopter systems typically require larger (up to 1 acre) landing areas, whereas a tractor system could utilize areas barely larger than a road-width, although tractor and skyline systems would typically require many more landings.

Temporary road (and landing) locations and stabilization measures are typically determined by the Forest Service Contract Administrator, with agreement by the contractor/purchaser. The Contract Administrator may request the advice of a watershed specialist in determining the most appropriate location and stabilization measures to be applied. Special stabilization measures would be required if need for a temporary road would extend for more than one year (seasonal mitigation measures).

D. Matrix Analysis of New Roads

As with the existing road system, issues regarding management of the roads within the Analysis Area were divided between those relating to potential or actual environmental effects (termed "environmental costs") and those issues related to the ways that the roads are utilized (termed "road benefit"). These values were developed by the Interdisciplinary Team and the overall environmental cost and road benefit ratings were applied similar to the Roads Analysis Matrix shown in Figure I-1. This matrix is a tool (from the Forest-level Roads Analysis) to aid in developing site-specific recommendations for road management decisions.

For the Eden Ridge Timber Sales analysis, a "high benefit" new road would be one that provides current and future access for a large area, as compared to a "low benefit" road which for its length and potential environmental impact, would access fewer acres. A "high environmental cost" new road could be one that would require crossing high risk or a number of Riparian Reserve areas, or is in a position on the terrain that would have increased likelihood of surface runoff entering a perennial stream, or is a road that would have steeper grades and/or involve a large amount of cut and fill of material during construction. As used in the Roads Analysis Matrix, road environmental costs were categorized into three levels; HIGH, MEDIUM (MED) or LOW, and road benefits were categorized into three levels; HIGH, MEDIUM (MED) or LOW

An assessment of the new roads associated with the Proposed Action, location and access notes and environmental costs and road benefits is presented in the table below.

Table I-4. Proposed New Classified (System) Road Construction

Road Segment Reference	Approx. Length (miles)	Notes	Environmental Cost	Road Benefit
A	0.23	Ridgetop road, skyline access, no grade	LOW	HIGH
B	0.74	Crosses some riparian; some grade up to 10%	MED	HIGH
C	0.03	Begins on PVT; ties to road M for FS access	LOW	HIGH
D	0.60	Ridgetop road, skyline access, no grade	LOW	HIGH
E1	0.34	Ridgetop road, skyline and GB access, no grade	LOW	HIGH
E2	0.22	Ridgetop road, skyline and GB access, no grade	LOW	HIGH
E3	0.20	Ridgetop road, skyline access, no grade	LOW	MED
F	0.39	Crosses riparian, minimal grade	MED	HIGH
G	0.15	Ridgetop road, skyline access, no grade	LOW	HIGH
H	0.21	Ridgetop road, skyline access, no grade	LOW	HIGH
I	0.09	Ties to existing route planned for reconstruction	MED	MED
J	0.08	Crosses riparian; provides GB access	HIGH	LOW
K	0.36	Begins on PVT; for FS skyline access	LOW	HIGH
L	0.01	Begins on PVT; for FS skyline access	LOW	HIGH
M	0.81	Ties to road C for FS access, minimal grade	LOW	HIGH
N	0.04	Begins on PVT for FS access	LOW	MED
O1	0.28	First segment for skyline access; minimal grade	HIGH	MED
O2	0.23	Second segment for skyline access; minimal grade	LOW	MED
O3	0.24	Third segment for skyline access; minimal grade	LOW	MED
O4	0.18	Additional segment for skyline access; minimal grade	LOW	MED
P1	0.06	Begins on PVT, ties to P2 for FS access	HIGH	LOW
P2	0.08	Ties to P1 for FS access	HIGH	LOW
P3	0.13	Ridgetop skyline access	LOW	MED
P4	0.11	Ridgetop skyline access	LOW	MED
Q1	0.11	Begins on PVT; ties to roads Q2 & Q3 for FS access	MED	MED
Q2	0.05	Second segment for GB access	MED	MED
Q3	0.10	Second segment for GB access	MED	MED
S1	0.09	Joins existing road with existing railroad planned for reconstruction	MED	HIGH
S2	0.12	Joins existing road with existing railroad planned for reconstruction	MED	HIGH
S3	0.06	Construction of new road to avoid railroad grade trestle	MED	HIGH
S4	0.15	Additional segment for GB access	LOW	MED
S5	0.05	Construction of new road to avoid railroad grade trestle	MED	HIGH
S6	0.24	Additional segment for GB & skyline access	LOW	MED
S7	0.11	Construction of new road to avoid railroad grade trestle	MED	HIGH
S8	0.04	Construction of new road to avoid railroad grade trestle	MED	HIGH
S9	0.06	Construction of new road to avoid railroad grade trestle	MED	HIGH
T	1.93	Crosses some riparian; some grade up to 10%	MED	HIGH
U	0.38	Crosses some riparian; minimal grades	MED	MED
V	0.14	Ridgetop road, skyline & GB access, no grade	LOW	MED
W	0.61	Crosses some riparian; minimal grades	MED	MED
X	0.22	GB access; minimal grade	LOW	LOW
Y	0.18	GB access; minimal grade	LOW	MED
Z	0.35	Crosses some riparian; some grade up to 10%	MED	MED
TOTAL	**10.81**			

Proposed new temporary roads were also evaluated using the same system.

Table I-5. Proposed New Temporary Road Construction

Road Segment Reference	Length (miles)	Notes		
Q4	0.25	No template crosses riparian	HIGH	LOW
R	0.03	Short spur; joins with existing road	LOW	LOW
TOTAL	**0.29**			

This analysis suggests that for Action Alternative development and consideration, opportunities associated with new roads could utilize modifications that include only "high to moderate road benefit/low to moderate environmental risk" new roads.

VI. ECONOMICS

Activities associated with the Proposed Action or its alternatives may generate various economic benefits/costs and overall present net values or benefit cost ratios. The economic value (cash flow) of commodities provided under these proposals may be less than the associated costs.

Under all Action Alternatives, varying amounts of commercial timber would be made available to the local wood products industry. Revenue sharing from harvested timber would provide contributions to federal, state, and county budgets relative to the amount of timber offered for sale.

This report includes an economic analysis of the alternatives considered in detail for the proposed timber sales projects. Proposed road related activities that serve the proposed logging systems are primary elements of costs associated with these alternatives.

A. Background

Siskiyou National Forest Land and Resource Management Plan
The decision to provide a sustainable and predictable supply of commercially valuable timber was made and documented in the Record of Decision for the Siskiyou National Forest Land and Resource Management Plan Final EIS (USDA 1989), as amended. The Forest Plan was designed to achieve the following Forest-wide goals (LRMP ROD-10):

1. Provide a balance of resource management that will maintain a healthy Forest ecosystem, and help to supply local, regional and National social and economic needs.

2. Provide a sustained yield of resource outputs at a level that will promote the stability of local communities.

Timber sale projects are expected to maximize net public benefits while achieving management goals for other resources in the most economically efficient manner and to contribute toward having total timber sale program benefits equal or exceed the total costs over time.

The lands of the Siskiyou National Forest have demonstrated their capacity to produce timber. Timber supply is critical to the communities of southwest Oregon. The amount of timber supplied by the Forest has been and will continue to be an important part of the economic picture. Timber production also contributes to the National economy, generates receipts to Oregon counties, and contributes to the overall economic health of the Nation (LRMP ROD-26).

The Matrix land allocation, as stated in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl:

> *"The matrix consists of those federal lands outside the six categories of designated areas (Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, And Riparian Reserves). Most timber harvest and other silvicultural activities would be conducted in that portion of the matrix with suitable forest lands, according to standards and guidelines. Most scheduled timber harvest (that contributing to the probable sale quantity [PSQ] not taking place in Adaptive Management Areas) takes place in the matrix. The matrix includes non-forested areas, and forested areas that are technically unsuitable for timber production, and therefore do not contribute to PSQ"*

Riparian Reserve treatments are to restore lands along all streams, lakes, ponds, wetlands, unstable areas, and potentially unstable areas that are subject to special Standards and Guidelines designed to conserve aquatic and riparian-dependent species. Standards and Guidelines apply to activities in Riparian Reserves that may otherwise retard or prevent attainment of Aquatic Conservation Strategy (ACS) objectives, as defined in the 1994 ROD for the Northwest Forest Plan.

> *"Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain the Aquatic Conservation Strategy objectives."*

New roads will be constructed as needed during the planning period to achieve the objectives specified in the Forest Plan. This is highly variable from year to year: the locations and extent of roading will be determined through site specific analyses at the project level (LRMP ROD-22).

Analysis Area
The Eden Ridge Timber Sales Planning Area is situated southeast of Powers, Oregon. Centrally located, commercial timber products have historically and are currently being transported to the communities of Broadbent, Myrtle Point, Coquille, Coos Bay, Bandon, Brookings, Glendale, Winston/Dillard, Roseburg and surrounding areas. Timber industry jobs include a variety of logging, forestry and mill positions. The current level of timber harvesting on the Rogue River-Siskiyou National Forest has dropped substantially from the levels of the mid-1980s. This decrease has contributed to a decline in the number of local jobs associated with the wood products industry in this and surrounding areas. Eden Ridge Timber Sales are proposed for several sale auctions and awards in the next five years (under separate and unique sales and sale names). There are three Action Alternatives plus a No-Action Alternative being considered.

The geographic scale used to assess economics includes the project activity units (Project Areas) associated with the Eden Ridge Timber Sales and the surrounding communities that would be affected by the proposed project.

B. Economic Assumptions

Outputs
The estimated sale volume varies with each alternative between a high of 53,130 thousand board feet (MBF) in Alternative 2, the Proposed Action, 52,028 MBF in Alternative 3, to a low of 49,175 MBF in Alternative 4 (Table I-6). The difference in volume between the alternatives is a reduction in treatment acres due to harvesting systems and engineering considerations. After the "no harvest" Riparian Reserve acres are deducted (based on Riparian Reserve Project Design Criteria), an average volume per acre of commercial product is used to calculate the total harvest volume by yarding system and alternative.

Table I-6. Projected Treatment Acres and Volume by Alternative

Alt.	Tractor Acres minus 8% RR No Harvest	Skyline Acres minus 8% RR No Harvest	Helicopter Acres minus 8% RR No Harvest	Total Treatment Acres	Total Tractor Volume MBF	Total Skyline Volume MBF	Total Helicopter Volume MBF	Total Volume MBF Harvested
1	0	0	0	0	0	0	0	**0**
2	1,939	1,097	0	3,036	33,933	19,197	0	**53,130**
3	1,641	863	469	2,973	28,718	15,102	8,208	**52,028**
4	1,324	420	1,066	2,810	23,170	7,350	18,655	**49,175**

Harvest volume is estimated at an overall average of 17.5 MBF/acre (not a target or a threshold)

Yarding Costs

Current costs and values were used which may not reflect future costs and values, but will show a ***relative*** comparison that should remain relatively consistent into the future. Currently, log values are near a historical low and costs are high due to recent increases in fuel costs. It can be expected that log values would increase as the economy improves and demand increases.

For this analysis, the costs are from logging systems and transportation needs by alternative. Each proposed yarding system has associated costs that have been averaged based on past timber sale appraisals on similar terrain (Table I-7).

Table I-7. Estimated Yarding Costs by Alternative

Alt.	Tractor Yarding Costs @210/MBF	Skyline Yarding Costs @250/MBF	Helicopter Yarding Costs@465/MBF	Total Yarding Costs
1	0	0	0	**0**
2	$ 7,125,825	$ 4,799,375	$0	**$ 11,925,200**
3	$ 6,030,675	$3,77,625	$ 3,816,487	**$ 13,622,787**
4	$ 4,865,700	$ 1,837,500	$ 8,674,575	**$ 15,377,775**

Note: Costs are meant to be used for the relative comparison of alternatives only and do not represent actual appraised costs

Roading Costs

New road construction, reconstruction of existing rail road grades, reconstruction of existing non-system roads and maintenance of system roads were identified and proposed in an effort to try and reduce associated harvest costs. Alternatives 2 and 3 propose new roads to increase access to harvest units and reduce harvest cost. Alternative 4 uses the existing system roads and proposes reconstruction of a portion of an existing rail road grade.

Additional costs are applied to the road construction, reconstruction and maintenance incurred by each alternative (Table I-8). The unit costs used for this analysis were determined by using current bid rates from recent projects in the area and by using local knowledge of construction practices. The rate per mile is not specific to individual roads but rather an average cost per mile of road. Maintenance estimates were determined in the same manor with the addition of surface rock replacement assuming $1/10^{th}$ of an inch of rock loss per 10 mmbf of haul. Maintenance collections for Roads 33 and 3358 were estimated using current bid rates from recent contracts. The need for collections in lieu of performance is due to multiple users at the same time.

Table I-8. Transportation Cost Estimates

	ALT 1		ALT 2		ALT 3		ALT 4	
Road Type	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost
Classified	31.03		31.03	$0.00	31.03	$0.00	31.03	$0.00
CUM	0		7.77	$234,654	7.77	$234,654	6.37	$192,374
CUW/R	0		3.74	$594,860	2.08	$419,440	1.89	$185,220
New Construction	0		10.45	$1,736,790	7.66	$1,273,092	0	$0.00
Maintenance	31.03	$62,000	52.99	$1,701,987	48.54	$1,580,910	39.29	$1,238,885
TOTALS	**31.03**	**$62,000**	**52.99**	**$4,268,291**	**48.54**	**$3,508,096**	**39.29**	**$1,616,479**

Classified: This designation is the existing roads system including the 33 and 3358 Roads that access the Planning Area.
CUM: Classified Use and Maintenance. This designation is existing roads that are not part of the National Forest Road System and would need some improvement before becoming part of the system. These roads would be added to the National Forest Roads System through the Cost-Share Roads Program.
CUW/R: Classified Use with Reconstruction. This designation consists mainly of abandoned railroad grades. The old rail grade prism is present but clearing and grubbing of trees and stumps, establishing drainage, placing crushed aggregate and cut and fill slope repairs would be needed.
New Construction: This designation is where no existing template or prism exists.
Maintenance: This designation is for the maintenance of the all roads as a result of log haul for this project, except for Alternative 1, the No-Action alternative. This cost represents the cost of reoccurring maintenance needed regardless of hauling activities.

Revenue

The benefit basis of this analysis is the timber sale revenue from the estimated volume. The present value of benefits is based on current log prices for timber sold in Region 6 obtained through the Transaction Evidence Appraisal System. This amount reflects deductions for logging, general logging overhead, road construction, road re-construction, road maintenance, and temporary developments. Additional deductions may include special tree falling costs, slash disposal, environmental protection, engineering design, and operator profit and risk margin.

Economic Indicators

The demands for timber harvest are most affected by regional and national economics as well as costs from other markets. One of the outputs and effects is the determination of **Present Net Value (PNV)**, which estimates the maximum value that might be attained by maximizing the net value of priced outputs under a non-declining flow policy. This benchmark serves as a basis for an economic comparison between benchmarks and alternatives, as well as a basis for determining the effects of various constraints on outputs and costs. Further discussion is found in the SNF-LRMP Standards and Guidelines where economic analysis shall be included when areas have alternatives with substantial roading and harvesting, and choices that maximize net public benefits are not obvious from environmental and resource considerations. Present Net Value or Least Cost are appropriate measures of economic efficiency to use in this analysis (SNF LRMP, page IV-39).

The ratio of **benefit to cost (B/C)** is a useful parameter of economic efficiency intended to complement the PNV calculations associated with projects. The ratio is simply the total discounted benefits divided by the total discounted costs and reflects an average value rather than the total return to the government. This ratio is a measure of cost efficiency given different levels of investment among the alternatives. It does not reflect benefits from future use of a road system developed for future harvests after this entry.

Cost increases, with all other factors held constant would reduce the likelihood that a proposed project would sell. It is obvious to have stumpage values greater than logging costs for projects to be sold. Cost efficiency analysis utilizing PNV calculations can provide an indication of whether or not a timber sale would be “cost efficient”. Increasing logging costs, with all else held constant, will result in projects being below cost.

It is important to recognize the impact more expensive harvest methods such as helicopter yarding in lieu of road construction with cable yarding or ground based methods has on the economic feasibility of a project. Historical information has shown that the cost to tractor yard (with associated construction for road access) is the least expensive operation. As yarding systems change to cable (skyline) and helicopter, these costs increase with helicopter yarding considered as very expensive due to the price of equipment and required support of material and personnel.

C. Economic Performance of Alternatives

Alternative 1 (No-Action)
The No-Action Alternative would not commercially harvest any timber, and therefore, would not generate a PNV or B/C for meaningful comparison to the Action Alternatives. Road maintenance costs for this alternative (Table I-8) represents the cost of reoccurring system road maintenance needed regardless of hauling activities.

Action Alternatives
The result of the economic analysis shows that the Proposed Action (Alternative 2) is the most economically feasible (Table I-9). The Proposed Action has the highest positive net present value and benefit cost ratio. The Proposed Action utilizes no helicopter yarding by adding engineer specified, low impact roads and spurs to allow access for tractor and cable yarding. Alternatives 3 and 4 have negative B/C ratios with Alternative 4 having the lowest PNV. Generally, this decrease of returns among the alternatives is reflected in the use of a greater % of high-cost yarding, (i.e., helicopters) as opposed to conventional yarding systems.

Table I-9. Present Net Value and Benefit/Cost Ratio Comparison between Alternatives

Alternative	Volume in MBF	Total Estimated Benefit or Revenue from Sale of Timber	Total Estimated Cost	Present Net Value PNV	Benefit-Cost Ratio (B/C)
1 No Action	0	0.00	$ 62,000.00	$ (62,000.00)	0.00
2 Proposed Action	53,130	$ 16,515,991.80	$ 16,193,491.00	$ 322,500.80	1.02
3 Less Roads–Some Heli	52,028	$ 16,173,268.65	$ 17,130,883.50	$ (957,614.85)	0.94
4 Least Roads–Max Heli	49,175	$ 15,286,540.50	$ 16,994,254.00	$ (1,707,713.50)	0.90

Note: Based on a market value of $310.86 per MBF; values and costs are meant to be used for the relative comparison of alternatives only and do not represent expected selling values or actual costs

Region 6 uses Log Lines for west side forests in Oregon, as the basis of relative stumpage values for western Douglas-fir. Market stumpage value or the price per thousand board feet of timber contributes the most to this economic analysis, assuming road and yarding costs remain the same. Slight changes in logging costs or road construction costs do not change the B/C ratio as must as market price. To demonstrate, an outcome of an 11.5% increase for the price per MBF, Table I-10 summarizes the effect to the point where Alternative 4 is at a break-even, otherwise the point where money spent and money returned is the same (B/C = 1.0). The cost to maintain the road system is included in the No-Action Alternative to demonstrate the associated cost of the existing road system.

Table I-10. PNV and B/C Comparison between Alternatives with an 11.5% increase in $/MBF

Alternative	Volume in MBF	Total Estimated Benefit or Revenue from Sale of Timber	Total Estimated Cost	Present Net Value PNV	Benefit-Cost Ratio (B/C)
1 No Action	0	0	$ 62,000.00	$ (62,000.00)	0.00
2 Proposed Action	53,130	$ 18,361,051.66	$ 16,193,491.00	$ 2,167,560.66	1.13
3 Less Roads–Some Heli	52,028	$ 17,980,041.69	$ 17,130,883.50	$ 849,158.19	1.05
4 Least Roads–Max Heli	49,175	$ 16,994,254.00	$ 16,994,254.00	$ 0.00	1.00

Note: Based on a market value of $345.59 per MBF; values and costs are meant to be used for the relative comparison of alternatives only and do not represent expected selling values or actual costs

D. Direct, Indirect and Cumulative Effects of Alternatives

Alternative 1 (No-Action)
The No-Action Alternative would not commercially harvest any timber, and thus no sawtimber or other forest products would be provided to regional mills, thus no economic value derived from the sale of forest products. No-Action would not support direct, indirect, and induced employment. It would not result in increased income to the regional or local economy (including the counties). Current levels of employment in the wood products sector would not change under this alternative.

Action Alternatives
All Action Alternatives could be economically viable, depending on current selling values, timber volume per acre, yarding systems required, proposed road construction, system road maintenance and the post-timber harvest projects. In general, the primary indirect and cumulative effect on timber harvest-related employment would occur from commercial timber harvest associated with the Action Alternatives from estimated selling years of 2013 through approximately 2017. The Action Alternatives would provide some opportunity for timber harvest-related employment, and higher revenues.

Alternative 2 would provide higher net value than Alternative 3 and substantially more than Alternative 4. Though the combined economic benefit from implementation of any of the Action Alternatives is expected to be positive, each of the action alternatives from the project would have a localized beneficial effect for the socio-economic environment of southwestern Oregon. The Action Alternatives would also have an indirect benefit in the form of revenues going toward the National Forest Fund (NFF). Portions of revenue generated by the sale of timber from the Action Alternatives would be available to the county for roads and schools.

Cumulative
Given that the current log prices and reasonably foreseeable future of the regional economy, the speculation is that prices will continue to be low during the life of this proposed project. In an economically depressed area such as southwestern Oregon, the work provided by this project is potentially substantial. The project and its Action Alternatives are primarily proposed within the land allocation intended for the purposes of sustained timber production. The silvicultural prescriptions are generally an intermediate treatment, and designed to include all attributes essential for ecologically sustainable land management. Roads constructed, reconstructed or otherwise used and maintained by the Forest Service or cooperators would not only provide feasible treatments to meet the Purpose and Need for this project, but would provide for future management needs to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people.

VII. SOUTH FORK COQUILLE NWFP KEY WATERSHED

The Aquatic Conservation Strategy (ACS) was designed to facilitate the management and restoration of aquatic ecosystems within lands covered by the Northwest Forest Plan (1994). Specifically, the strategy is intended to protect anadromous fish habitat on federal lands within the range of Pacific Ocean anadromy.

According to the Northwest Forest Plan Standards and Guidelines, the ACS was developed to improve and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The four primary components of the ACS are designed to operate together to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems; they include: 1) Riparian Reserves; 2) Key Watersheds; 3) Watershed Analysis; and 4) Watershed Restoration.

Under Northwest Forest Plan direction, Key Watersheds are not a designated area or matrix, but overlay all allocations. Key Watershed designation is a component of the ACS that is applied to watersheds that contain at-risk fish species or anadromous stocks and that provide high quality water and fish habitat. The South Fork Coquille fifth field watershed is designated as Key Watershed (the Middle Fork Coquille fifth-field watershed is not).

A. Background

South Fork Coquille River is a Key Watershed for which Watershed Analysis has been performed (see EIS Chapter I and Hydrology report, EIS Appendix C). An Aquatic Restoration Plan was prepared in 2007 (see above and Hydrology Report). As documented in the Restoration Plan, the South Fork Coquille (SFC) is a Tier 1 Key Watershed as defined by the Northwest Forest Plan (1994) and is approximately 108,300 acres in size. In 2005 the Rogue River - Siskiyou National Forest engaged in an Integrated Work Planning process. As part of that process, fifth-field watersheds across the Forest were prioritized for resource valve and restoration potential. The South Fork Coquille ranked as number 1 on the Forest for fisheries, water, and wildlife values.

Timber harvest cannot occur in Key Watersheds or Riparian Reserves unless watershed analysis is performed to characterize the aquatic, riparian, and terrestrial features within a watershed and to guide activities toward meeting Aquatic Conservation Strategy goals (ROD, page B-20, USFS, 1994). Outside of Inventoried Roadless Areas (RARE II) management direction is to reduce existing system and non-system road mileage.

According to the Northwest Forest Plan, Basis for Standards and Guidelines (NWFP page B-19),

> "*The amount of existing system and non-system roads within Key Watersheds should be reduced through decommissioning of roads. Road closures with gates or barriers do not qualify as decommissioning or a reduction in road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds. That is, for each mile of new road constructed, at least one mile of road should be decommissioned, and priority given to roads that pose the greatest risks to riparian and aquatic ecosystems."*

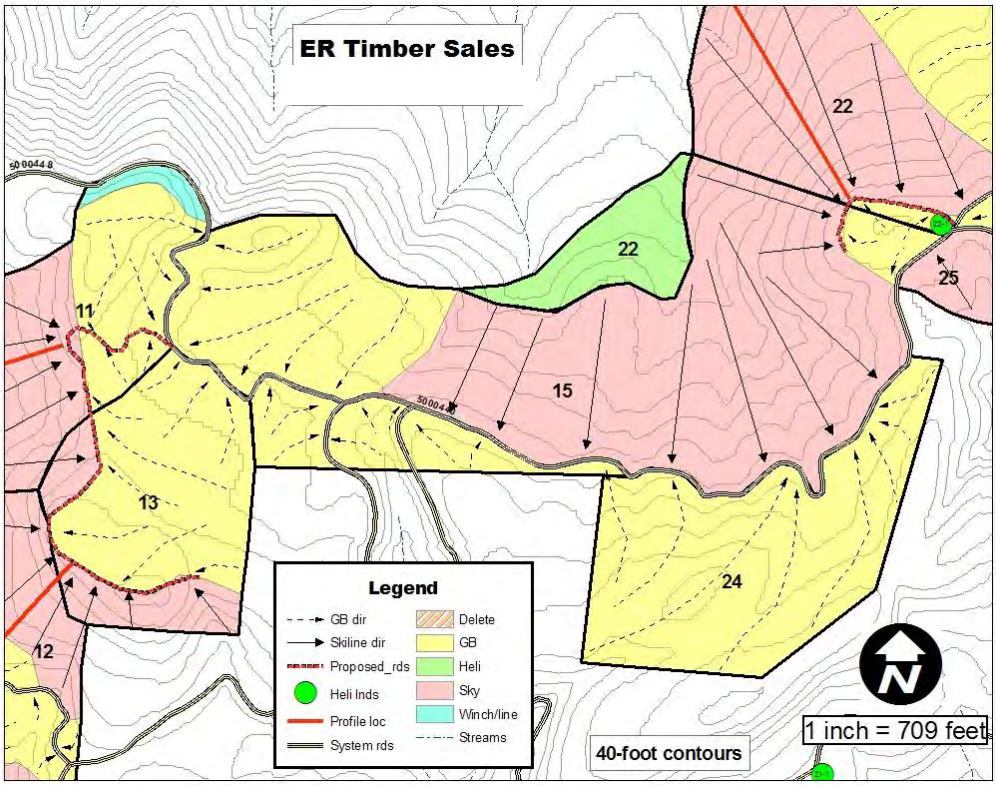
B. Road Decommissioning Road Bank

With the South Fork Coquille watershed, road decommissioning on the Powers Ranger District has been occurring since 1992. To date, the miles of decommissioned roads have totaled approximately 61.1 miles (see Attachment B; File Code 7720-1 regarding Road Mileage changes in Key Watersheds, 1999). This amount of roads removed from lands allocated to other purposes than timber production, has created a "road bank", that is, the current level of road mileage through decommissioning is less than the 1992 conditions.

The Eden Ridge Timber Sales project could construct roads to current environmental standards, and be located on the landscape to minimize effects to the environment and still result no net increase in the miles of roads within a Key Watershed. This is due to the "road bank" of decommissioned road miles, in compliance with this NWFP Standard and Guideline. The precise accounting of miles of decommissioned road compared to new road construction would depend on the final decision for Eden Ridge Timber Sales Project.

ATTACHMENT A

Example preliminary logging "paper plan"



ATTACHMENT B

This letter is a copy of a letter dated and signed by Carl Linderman on February 22, 1999 File Code: 7720-1

Subject: Reply to Verification of Net Road Mileage Changes in Key Watersheds

To: Bob O'Leary (Forest Engineer)

The following is a table of all Tier 1 Key Watersheds on the Powers Ranger District, and associated information as requested from the Regional office memo, dated February 2, 1999.

Watershed	Key WA#	Tier	Forest	FY 1992-1997	FY 1994-1997
Dry Creek	0-365a	1	Siskiyou	0	0
Elk River	0-366a	1	Siskiyou	-6.231	+1.222
S. Fork Coquille	0-367a	1	Siskiyou	-40.24	-19.91
West Fork Cow Creek			Siskiyou	-2.73	-2.73
Cherry Creek N. Fork Coquille	0-324a	1	Siskiyou	Not on Siskiyou NF	Not on Siskiyou NF
Total net Miles			**Powers RD**	**-49.20**	**-21.42**

Negative numbers are numbers in which more roads have been decommissioned than constructed
Positive numbers are numbers in which more roads have been constructed than decommissioned

In addition we are affirming the following five questions:

1. Decommissioned and corresponding mileage can be readily identified in the field, as well as on paper, with detailed documentation on maps and data tables of all decommissioned roads across the district.
2. A review of the district"s "bank account" of road decommissioned roads was completed this year (Jan., 1999) to be assured it meant the Northwest Forest Plan definition of road decommissioning. All road miles reflect in the above table meet the definition, as set forth in the Northwest Forest Plan.
3. No roads were constructed in RARE II areas.
4. Watershed analyses were completed for all watersheds prior to any new road construction.
5. Signed in 1994, the powers Ranger District piloted one of the first watershed analyses - the Elk River. On this team was an individual who was also a representative on the FEMAT team. Insight from the watershed analysis and the FEMAT process helped the district to begin its road decommissioning process earlier than many other districts, which lead the district to begin serious decommissioning in 1992. As a result, the district uses the 1992 numbers to reflect the foresight. If the district must stick with the 1994 date, a FY99 decommissioning of 1.57 miles within the Elk River Key Watershed is scheduled. This will offset the 1.22 miles of increased miles in the Elk River Key Watershed for the period of 1994-1997.

/S/ W. Carl Linderman
District Ranger

Changes / Additions to the SF Coquille since the above 2/2/1999 letter was signed:

Additions:	Silver Doe TS	5000290	1.63 miles	
		5000297	1.40 miles	+3.03
Deletions:	Pioneer Fish Enhancement	5000680	1.26 miles	
	Road Insides	3353140	1.22 miles	
	Copper/Salmon	3353150	1.50 miles	-3.98

Net road miles SF Coquille decrease since 1999

Watershed	Key WA#	Tier	Forest	FY 1992-1997	FY 1994-1997	FY 1998-2009
S. Fork Coquille	0-367a	1	Siskiyou	-40.24	-19.91	- 0.95

Total miles in the "road bank "for the SF Coquille Forest Service Roads: 61.1 Miles (40.24 +19.91+0.95 miles of decommissioned road)

R.McAlpin
5/3/10

APPENDIX J

HERITAGE RESOURCES

Specialist Report, Heritage Resources

Eden Ridge Environmental Impact Statement (EIS)

Prepared by: **Draft: August 2011**
KRISTEN HAUGE
Archaeologist

I. Introduction

A. Analysis Methods

The analysis methods used for cultural resources consist of a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the project and surrounding areas, and generally bounded by the Planning Area. This information includes not only that available from a variety of generalized sources, but also that information resulting from several years worth of Forest Service heritage resource inventories conducted within and adjacent to the Planning Area. The information on the results of these previous inventories and previously documented cultural resources also allows some idea of the type, frequency and location of cultural resources likely to be found within the Planning Area.

This synthesis of past data is then used during field inventories conducted of the proposed activities" areas of potential effect (APE) and adjacent areas of high site probability. Information from past inventories may be used to cover a current APE if upon review it meets current inventory standards. Additional inventory is then conducted of the APE in areas where no previous inventory was conducted, where previous inventory was not adequate or around known sites to relocate and verify their location.

Once field inventory is complete, identified cultural resources within the project"s APE are analyzed to determine their eligibility to the National Register of Historic Places as historic properties. For those considered eligible, the potential effects of the project on that historic property is analyzed. Where adverse effects may occur to a historic property, measures are designed to mitigate these effects. The State Historic Preservation Office is consulted for concurrence on each of these three steps. The consultation on all three steps is usually conducted simultaneously.

When no cultural resources are located within the project"s area of potential effect or when the project meets specific terms, the project may proceed under the terms of the *Programmatic Agreement among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (R6 PA), 2004.*

B. Measurement Indicators

The measurement indicators for cultural resources are the effects to historic properties. These effects may be beneficial or adverse. Beneficial effects could include stabilizing a historic property such as controlling erosion through an archaeological site, restoring and maintaining a historic building, or reducing fuel concentrations around a historic property to reduce the potential for a wildfire to impact it. As management actions beneficial effects are designed and agreed upon through consultation conducted under Section 106 of the National Historic Preservation Act (NHPA) with the State Historic Preservation Officer (SHPO).

Adverse effects are impacts to the integrity of the property, destroying a portion or all of the historic property and the information that it could yield, or destroying characteristic features or integrity of the historic property. A direct adverse impact occurs during the activity itself, such as when a road is built through a historic property and the construction process destroys the site. An indirect adverse impact can occur as a side effect of the activity or after the activity is complete, such as runoff from a road that eventually erodes a historic property adjacent to it. In some cases where a beneficial action is possible, a no action determination that does not implement the beneficial action could be adverse if it allows greater degradation or deterioration of the historic property.

This planning process allows adverse impacts to be avoided altogether through project redesign, or mitigated through project modification or scientific investigation and/or removal of the site so that there are no adverse impacts to historic properties. These avoidance or mitigation measures are agreed to in consultation conducted under Section 106 of the National Historic Preservation Act (NHPA) with the State Historic Preservation Officer (SHPO) and allow the project to proceed with no adverse impact to historic properties. Under certain conditions this consultation has been streamlined by the *Programmatic Agreement among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (R6 PA), 2004.*

C. Regulatory Framework

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies, such as the Forest Service, to take into account the effects of their actions, or undertakings, on historic or archaeological properties. This act also establishes the Advisory Council of Historic Preservation (ACHP) as the oversight agency which consults with federal agencies to review undertakings which have the potential to affect significant historic properties, although generally, this consultation and review capacity is delegated to State Historic Preservation Offices (SHPO). The *NHPA* also provides for Native American groups to be included in consultations where prehistoric sites are involved.

Project area inventories and consultation under *Section 106 of the NHPA* must be completed prior to project implementation. In some cases the consultation process has been streamlined or by-passed by agreement to facilitate project completion when certain conditions are met. Generally, these conditions include adequate inventories where no sites are located in a project's area of potential effect (APE), or particular site and project types which have recurring similar impacts which have allowed predetermined mitigation measures to be developed by agreement with SHPO, or projects with a low likelihood to impact historic properties. Documentation under these agreements is submitted to the SHPO in an annual report, and may or may not be submitted prior to project implementation. Section VII below includes a list of such agreements which affect the consultation process for projects on the Gold Beach and Powers Ranger Districts.

Both *NHPA* and the *Archaeological Resources Protection Act (ARPA)* prohibit the disclosure of the nature and location of cultural resource sites where a likelihood of harm to the sites could occur through disclosure. The intent of this prohibition is to protect sites from vandalism and looting, and to retain confidentiality of sites culturally significant to American Indian Tribes.

ARPA also establishes civil and criminal penalties for individuals removing or damaging archaeological resources on federal lands.

The **Land and Resource Management Plan for the Siskiyou National Forest** (USFS, 1989) requires compliance with Section 106 of the National Historic Preservation Act for areas where the commercial removal of timber is proposed.

Any cultural resource survey has the potential for missing unique and/or significant sites. Avoidance or mitigation of effects will be implemented under expedited consultation with Indian tribes, SHPO and ACHP (as provided for under 36 CFR 800.111) for any new site discovered during the course of project activities.

Other laws and regulations relevant to cultural resource management are briefly described in section VI below.

II. Land Use of the Rogue River-Siskiyou National Forest

The history and prehistory of the Siskiyou National Forest is treated in the Cultural Resource Overview of the Siskiyou National Forest (Beckham, 1978).

The archeological record attests to a continuous human occupation of southwest Oregon for the last nine thousand years. At the time of Euroamerican contact the Native American groups either inhabiting or using the general vicinity were the Upper Coquille. The history of these Athabascan speaking peoples is unclear, but it is theorized that successive waves of Athabaskan speakers with slightly different cultural adaptations immigrated into southwest Oregon over time. Several independent groups, speaking different dialects, inhabited much of southwestern Oregon from the beaches to the upland forests.

The year 1856 marked the sunset of the era of Native American dominance in the area. This year marked the conclusion of the Rogue Indian Wars. Following the wars the remaining aboriginal population was removed to the Grande Ronde or Siletz reservations. Some individuals escaped relocation or were allowed to return to their homelands, mainly because of intermarriage with the white settlers. Some of these people or their families received land claims (Indian Allotments) in the area after the passage of the Dawes Act.

Some of the first European settlers in the area were miners attracted to the region during the gold rush era of the mid-1800's. In southwest Oregon gold was first discovered on the coast at places like Gold Beach (named for the gold rich, black sand deposits found there) and later in the Rogue River. Large mining districts were established within what would become the Kalmiopsis Wilderness and along the Rogue, Chetco and Illinois Rivers and their tributaries. Mining activities and its impacts on the land have had major and long lasting effects on the surrounding environment.

Following the miners were the early settlers, farming in the flat lands along the rivers and creeks, and grazing cattle and sheep in the surrounding hills. These early settlers adopted a lifestyle characterized as a "subsistence living economy" in which the people lived off the land, using the abundant natural resources to supplement what they grew on small agricultural plots, in a manner similar to earlier aboriginal inhabitants, but with the addition of farming and modern technology (Beckham, 1979).

These pioneers brought along with them a few cattle for their milk, hides and flesh and introduced the effects of grazing to the watersheds. These emigrants and their descendants would scatter throughout the surrounding canyons planting fruit trees, thereby introducing new species, building trails, often over older aboriginal routes, and harvesting timber for cabins, firewood and many other uses.

With the establishment of the Siskiyou National Forest various trails, lookouts, camps and telephone lines were constructed during the first three decades of this Forests history. The creation of the Forest Reserve signaled an end to the assault on the public domain by timber speculators, land fraud experts, mill owners and dishonest politicians (Beckham, 1978).

Local histories exist in the form of family journals, manuscripts and photo collections. Oral histories, often compiled later in time, are also an invaluable source of information. After settlements became well established, the history of the area is better documented in the form of newspaper articles, tax, land ownership and mining records, religious, birth, death and marriage records.

A. Eden Ridge Tract

The Eden Ridge Tract has a unique history within Rogue River-Siskiyou National Forest lands. Originally included in the C.A. Smith Lumber and Manufacturing Company holdings, Eden Ridge played a role in the extensive logging history and economic development of Coos Bay and the surrounding county.

From the early days of Coos County, the area has been relatively isolated from the rest of Oregon by the steep range of coastal mountains. Coos Bay, a natual harbor, provided access to the rapidly expanding markets in California through the ports of the San Francisco Bay. While coal from nearby coal mines was an early export and economic driver of the area, by the turn of the century the virgin forests of the area were drawing interest and would become the economic driver that would shape the growth and fuel the industry of the county for most of the next century.

As the timber of the east coast was logged out, the immense industrial enterprise that had been built there began to seek other sources of timber and the virgin forests of Coos County were enticing, drawing the attention of such leaders of the timber industry as Weyerheuser, Menasha and C. A. Smith. By the early 1900s, these men and their companies began acquiring timberlands in often fraudulent transactions, locking up thousands of acres in corporate ownership. The effects of these companies would shape the fortunes of the counties where they operated, providing good employment and development while they were booming, followed by lean times as the forests were liquidated and the companies moved on.

The early settlements in the Coos Bay region were founded in the 1850s. While the area was relatively isolated from the rest of the state, internally, numerous small rail lines were constructed to transport the timber and coal to the sea port at Coos Bay where it could be shipped to markets. The longest and best known of the rail lines was the *Coos Bay, Roseburg and Eastern Railroad and Navigation Company* which was constructed between Myrtle Point and Marshfield (later renamed Coos Bay) by 1893. With its aspirations in its name, this 28 mile stretch of railroad linked to the Beaver Hill coal mines along with some of the virgin stands of Douglas-fir and Port-Orford-cedar. While most of the smaller lines were eventually abandoned, this 28 mile line was purchased by the Southern Pacific in 1906 when they announced intentions to build a railroad from Eugene to Coos Bay. Although these plans were finally realized 10 years later when the Willamette Pacific Railroad was completed from Eugene to Coos Bay (Robbins, 2006:, it was the stretch between Myrtle Point and Coos Bay that would play a role in the logging at Eden Ridge.

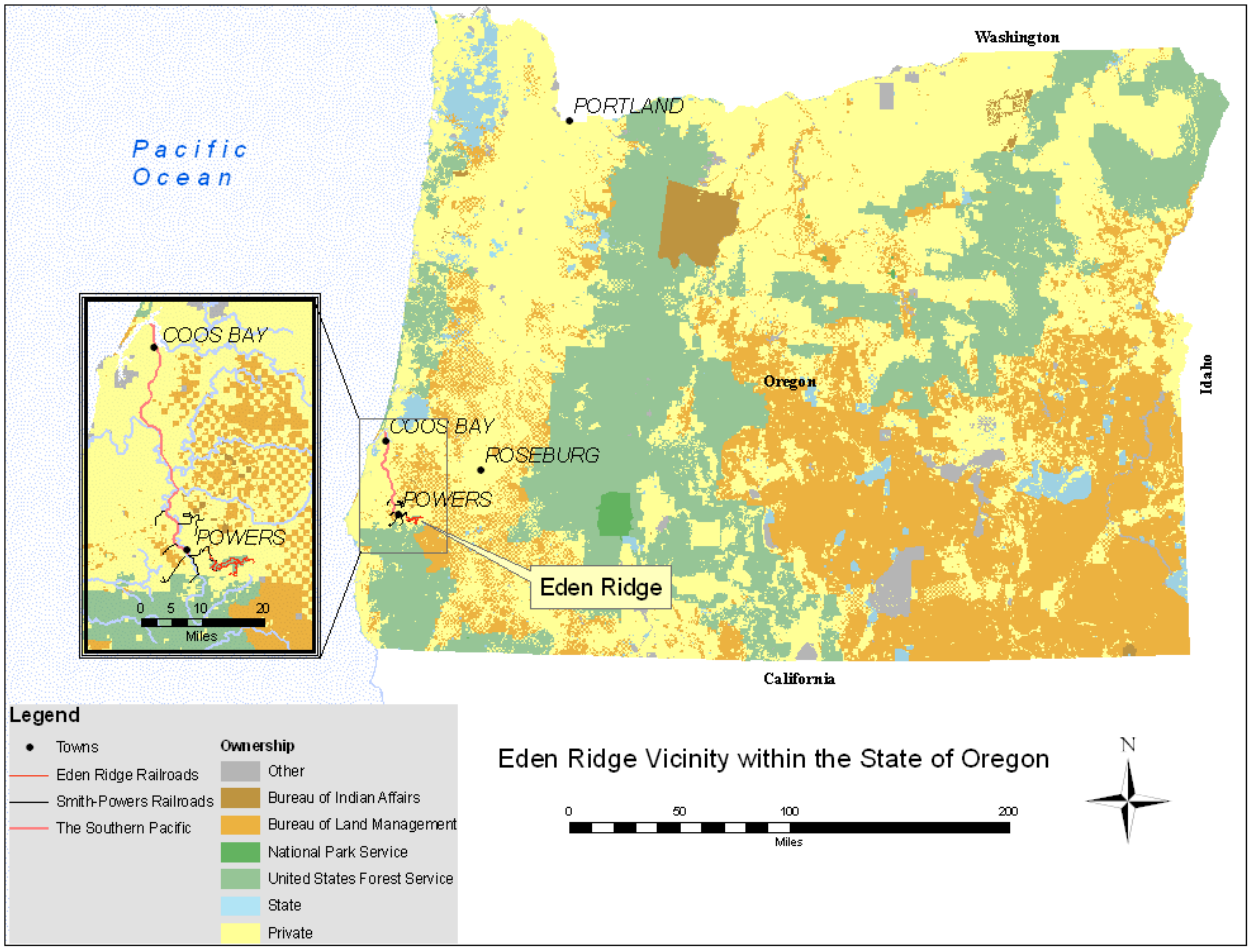


Figure 1: Vicinity Map

The C. A. Smith 'System'

Born in Sweden in 1852, Charles Axel Smith came to the United States in 1867. Educated in Minnesota, it was there he would make the contacts that brought him into the timber industry. His logging entrepreneurship helped him build a successful timber operation in Minnesota, at one time running the largest mill manufacturing white pine in Minneapolis. As the timber of the northeast was depleted, he began acquiring timberlands in the Coos Bay area and he would bring with him the contacts and entrepreneurship that would allow him to build a business in Coos Bay that would be the largest employer in the area for over half a century.

The head of Smith"s west coast operations was the C.A. Smith Lumber and Manufacturing Company. This company was supported by several subsidiary companies and by 1911 was described as a „system" where different operations were carried out under separate branches of the organization (American Lumberman, 11 November 1911: 62). Even under foreclosure in 1922, „the entirety of the property, its raw material, transportation, mills and distribution systems, as a living organization" (American Lumberman, 4 February 1922: 59) was seen as contributing to the value of a company that continued to produce under market lows.

Based in Marshfield, Oregon, the company reached into the nearby woods as well as through the shipping lanes to Bay Point, California. The mill built, between 1906 and 1908, brought the company fame as the most modern and largest electric mill in the world. The mill began operation in 1907, and between 1907 and 1911, the output of the company expanded from 25 MMBF to an estimated 150 MMBF (American Lumberman, 11 November 1911: 62), and over the next 10 years would reach as much as 180 MMBF per year (The Timberman, August 1918: 35; American Lumberman, 4 February 1922: 59). By 1912, as the company had run through their nearby timber holdings, the logging operations run by the Smith Powers Logging Company would need to expand the rail from Myrtle Point to new timber holdings up to fifty miles from Marshfield, and up to 3,000‟ in elevation.

Among the many experienced lumbermen Smith had drawn after him to Oregon was an experienced lumberman and railroad logger from Minnesota named Albert Powers. He was the man chosen by Smith to run the woods side of the operations providing the logs to the mills and markets that Smith directed. Under the direction of Al Powers, the Smith Powers Logging Company extended the Southern Pacific Rail line from Myrtle Point up the Coquille River towards the community that would be named after him, Powers. The line to Powers, completed in 1915, would continue to be extended into the nearby creeks and Eden Ridge which together held over 10 billion feet of timber, and would provide the raw material for one of the largest railroad logging operations of its time.

By 1918, Albert Powers was known as a man who „delivered the goods‟ using all available technologies as well as creating new solutions to get the timber off of near vertical slopes typical of the country, to the mill (The Timberman, 1918: pg 33). The terrain he logged was “a sort of moving picture panorama of rock, sand and trees. The sliding ground was pretty hard on his trestles but he lashed them with wire rope to the stumps on the side hills above and held them“ (The Timberman, 1918: pg 33). The company was logging up to 180 million feet a year (The Timberman, 1918: pg 35), bringing employment to the area, and making Powers “a modern little city of some 1700 inhabitants” (The Timberman, 1918: pg 33).

Constructed between 1916 and 1924, much of the rail line Powers constructed was characterized by log trestles which could provide a relatively straight and level rail way without the expense of excavating the railroad grades, although in some sections the cost was $50,000 per mile (The Timberman, 1918: pg 34). The Eden Ridge line required five switchbacks to ascend to 3400 feet in the 15 miles from Powers and was purported to access six to seven billion feet of timber (The Timberman, 1918: pg 34). Another main line ran up Salmon Creek and required two tunnels and five switchbacks to gain some 600 feet in elevation in the seven miles from the town of Powers. The rail line was purported to access about four billion feet of timber (The Timberman, 1918: pg 33). While logging would continue on Eden Ridge for over two decades, in 1928 the Salmon Creek railroad along with timber lands in the Sixes River was sold to the Port Orford Cedar Products Company of Coos Bay.

During the war years, the prices of logs rose, and army men were deployed to aid in the extraction of timber used in planes and ships used in the war effort. In 1918, 182 soldiers were among the 800 men employed by the Smith-Powers company (The Timberman, 1918: pg 35). The soldiers worked alongside their civilian fellows, in plain dress and were relieved of the duty of saluting during the logging work although they did have separate sleeping quarters. The soldiers along with the Loyal Legion of Loggers were seen as beneficial in forestalling the rise of the I.W.W efforts (The Timberman, 1918: pg 35) which were affecting so many of the camps.

Camp 2 was in operation just within the current Eden Ridge project area by 1919. Camps were supported by a train of five construction cars to house and feed the crews (The Timberman, 1918: pg 35). Two of the cars were sleeping quarters, with a mess hall car, the kitchen and cook's quarters in a fourth car, and the heating unit and shower facility made up the last car.

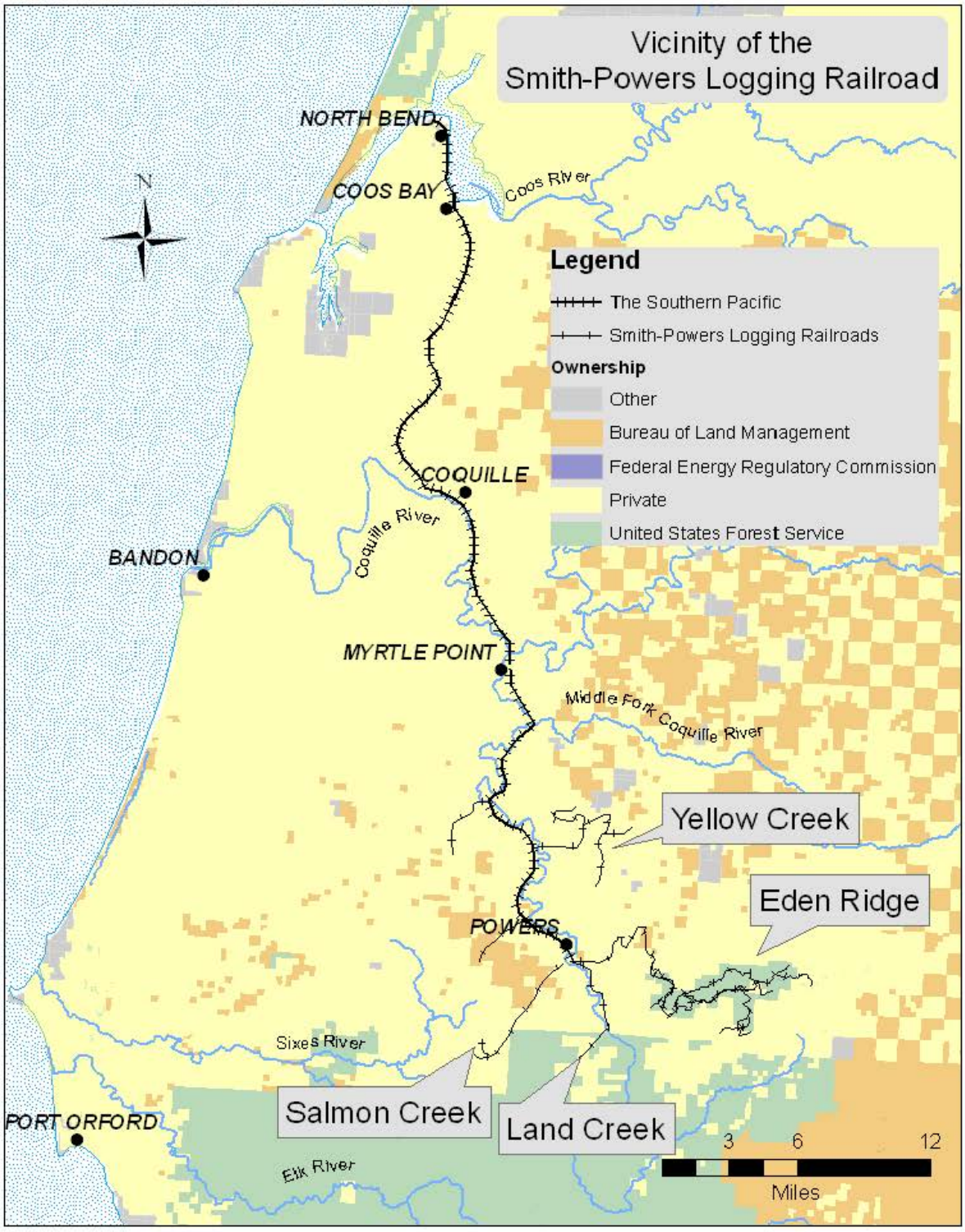


Figure 2: Map of the Southern Pacific Line and Smith-Powers Logging Railroads

The camps moved with the operations of logging and by 1936, a second camp at Doe Swamp was in operation with a capacity of 400 men. This camp was run until 1941 when the Coal Creek Camp took over near the switchbacks and operated until the mid 1950s when it was relinquished to the Forest Service by Georgia Pacific. As the logging operations drew to a close, many of the rails were salvaged for use elsewhere.

The Coos Bay Lumber Company

While the rail lines were being built and the logs were being cut, Smith was going through financial difficulties. The low timber prices of the glutted market in 1914 proved the previous expansion of Smith"s business interests to be ill-timed, and he lost control of his companies to a liquidating committee and over the next eight years the organization of the company would be restructured until the final foreclosure in 1922. Smith would be reinstated as President under the direction of the executive committee of the newly renamed Pacific States Lumber Company (American Lumberman, 4 February, 1922: 58) and the Coos Bay and Powers operations would continue as the Coos Bay Lumber Company. Smith would die just three years later in 1925.

While the economic struggles of the parent C.A. Smith Lumber and Manufacturing Company affected the organization and name of the company, the effects on the ground were slow to come, and some were mostly unnoticed (Stevens, N.D.). Albert Powers remained at the helm of the logging operations until 1926, when his son Fred Powers took on the reins to the consternation of the men who looked to „Uncle" Al Powers for leadership. Despite the uncertainty of such restructuring, the company continued to produce the logs supplying the mills of the Coos Bay Lumber Company, and it was noted that even in the low production year of 1920, the men out of Powers continued to produce at respectable rates.

From the time the mill began operations in Coos Bay in 1908, through the C.A. Smith Lumber and Manufacturing Company"s reorganization as the Coos Bay Lumber Company, this company and its subsidiaries, was the largest employer in the county. Its holdings of Port- Orford-cedar were considered to be over half of the stumpage in existence (American Lumberman, 4 February, 1922: 58). The legacy would continue after they sold to Georgia Pacific in 1956 until they were displaced as the largest employer by Weyerheuser in the 1970s.

Profiles

Charles Axel Smith:
Charles Axel Smith was born 1852 in Sweden, came to the US in 1867 and died in 1925 after building large lumber industries in two states. Educated in Minnesota, he entered the lumber trade there building his first lumber business as the largest white pine manufacturer in Minneapolis.

Albert Powers:
Albert Powers was born on a farm in Ontario, Canada in 1861, and died in 1930. „Uncle" Al Powers was a man known to „deliver the goods" managing camps, rails, and loggers to supply the nearly 500,000 board feet of timber a day which the mills in Coos Bay processed.

The C.A. Smith Lumber and Manufacturing Company:
Based in Marshfield, Oregon, the C.A. Smith Lumber and Manufacturing Company was the main company of C.A. Smith"s lumber system. The centerpiece of the company was the mill built between 1906 and 1908 in Marshfield that was the largest electric mill of its time.

Low lumber prices in 1914 would force CA Smith from the helm as the company went through foreclosure. In 1922 the company would reemerge as the Pacific States Lumber Company with the Coos Bay operations run by the Coos Bay Lumber Company.

Smith-Powers Logging Company:
This logging and railroad side of the C.A. Smith Lumber and Manufacturing Company was run by Albert Powers, an experienced Minnesota logger.

Coos Bay – Marshfield:
Early settlements around Coos Bay included Empire, Marshfield and North Bend. Settled in the 1850s, the nearby coal and virgin forests helped drive early development in the area. Marshfield became the center of C.A. Smith"s logging interests after the turn-of-the-century and he built the largest electric mill of its time to manufacture lumber from the nearby forests. Renamed Coos Bay in 1944, the timber industry would remain an economic mainstay of the region until its collapse in the 1980s.

Powers – Rural – Wagner's Ranch – North Carolina Settlement:
Established in 1873 by settlers coming from North Carolina, Rural, as its 1890 post office was named, was a homesteading settlement for the first several decades of its existence (Peterson and Powers, 1977 [1952], pg 126). The coming of the Smith-Powers Logging Company railroad marked the heyday of the newly renamed community of „Powers", and by 1918 the population of the community was reported as 1,700 (The Timberman, pg 33). The town of Powers prospered for many years along with the logging of the surrounding forests. The slowing of logging has impacted the community which is now listed with a population of 723 (in 2009 from http://www.city-data.com/city/Powers-Oregon.html 14 December 2011).

The Siskiyou National Forest – the Rogue River-Siskiyou National Forest:
The Siskiyou National Forest was established on October 5th in 1906 by proclamation and acquired all of the Coquille National Forest (established by Public Proclamation in 1907) in 1908. At that time it did not include the lands known as the Eden Ridge Tract that comprise this project area. During the Depression, many northwest timber owners would abandon cutover lands to reduce their tax burden. Instead of abandoning their lands to the county, in 1933 the Coos Bay Lumber Company proposed to convey their lands to the Forest Service. In return the Forest would extend their boundaries, and thereby fire protection, to the adjacent lumber company lands.

This agreement was made into Public Law 131 passed by Congress withdrawing the entirety of T31S R10 and 11W into the Siskiyou National Forest on June 10, 1935. The lands within the current Eden Ridge project area were relinquished to the Siskiyou National Forest between 1938 and 1941, but no other lands were conveyed to the forest under this agreement 1958 PLO 1610 revoked the earlier law and the northern Siskiyou National Forest boundary was returned to its earlier location with the exception of the Eden Ridge Tract.

III. Overview

A. Cultural Resource Surveys and Sites

Past inventories and site reports are on file at the Rogue River-Siskiyou National Forest, Medford, Oregon and in the appropriate district offices. These reports potentially contain information on the nature and location of archaeological or historic sites which is confidential in nature and may not be available under the Freedom of Information Act (FSH 6209.13 11.22). The purpose of this exemption is to protect sites from harm, and to retain the confidentiality of sites culturally significant to American Indian tribes.

Past cultural work within the Eden Ridge area includes two project inventories which recorded some of the remains from the Eden Ridge Railroad logging activities. The sites recorded were described as highly degraded by ongoing use, fire, logging and natural deterioration, and were found not eligible to the National Register of Historic Places (NRHP). These surveys did not record the entire rail system within the Eden Ridge Tract, and with this additional work, as well as the fact that the entire system is now over 50 years old, the site is considered eligible under criterion A with some features also being considered under criterion C. While many of the features of the site have been heavily impacted and in some cases destroyed, some remain in a condition that still conveys the history of the Eden Ridge Tract. The Eden Ridge logging railroad site includes over eighteen miles of railroad grade, camps, donkey sleds, and skid trails.

The condition of the features across the miles of railroad grade and skid trails is quite variable. While many of the features still show distinct characteristics of the technology of the logging at Eden Ridge, many also have become very deteriorated through natural or cultural means and their value mostly lies in the information they give about the locations of operations within the system. Because of this, treatment may not be the same for similar feature types.

Of the over seventeen miles of railroad grade that ran through the Eden Ridge tract, about ten have already been converted to classified roads. These roads largely run in the old railroad grades following the original grades and curvature of the railroad, with some detours around trestles and draws. Many of the other railroad-specific features of these grades have been altered or destroyed by road maintenance activities, but taken as a whole, these roads still convey the original railroad system within the Eden Ridge Tract.

Other features of the site include camps, donkey sleds, trestle and skid trail remains. The remains of the Doe Swamp Camp are still evident in a cut over area on a private land in-holding within the Eden Ridge area, most of the buildings are collapsed and the few buildings remaining are failing. Many other buildings related to these logging activities are to be found in the town of Powers itself. The other camps have largely been salvaged at the end of the logging activities with many of the buildings and other materials removed.

The donkey sleds are in varying states of deterioration, with some very rotted and in one case partially burnt. While several are single features, two have the remains of three sleds, along with other features.

The remains of numerous trestles lie along the railroad grades, and in some case alongside the current classified road system. The conditions of the trestles range from failed with upright bents still in place, to nearly indiscernible with only a few timbers or spikes sticking out of the vegetation to indicate the past. Taken along with the grade, these remains still show the original location of the railroad on the landscape.

While many of the skid trails were visible on the 1943 aerial photographs, on the ground the condition of these trails varies with some having donkey mounds spaced along the trail, along with anchor trees, stumps, or down log features

IV. Effects

A. Potential Effects & Mitigation Measures

The effects on cultural resource sites may vary with the type of site, as well as the type of project. Subsurface cultural materials may be more protected than standing structures, or cultural materials lying on top of the surface. In addition, all sites may be impacted by activities which draw people into an area, increasing the likelihood of vandalism, looting or incidental damage done through use of an area.

Where avoidance of a significant cultural resource site is not possible, measures are developed to mitigate or limit the effects of the project. Where the loss of the site, or a portion of the site will occur, the loss can mitigated by data recovery or interpretation of the history of the site. Data recovery generally includes a synthesis of known information about the site, and a plan for further research to retrieve further information from the site. Further information may be retrieved through excavation and analysis of the results, or researching and documenting the relevant records and histories about the site. Interpretation of the site is generally intended to inform the public about the history of the area to provide greater enjoyment of their cultural environment. Limiting the extent of disturbance to a site could include modifying the operating season of a project so that soil disturbance is kept to a minimum, directional felling of trees, using certain techniques or technology, or limiting the area where operations can take place to only a portion of the site.

B. Direct and Indirect Effects

ALTERNATIVE 1
Under this alternative, no actions are proposed and any previously recorded, or as yet undiscovered sites, would remain undisturbed. There are no identified on-going impacts to historic properties that will continue because of no action.

ALTERNATIVES 2, 3 and 4
The three Action Alternatives all propose to convert some of the railroad grades to classified roads. Alternative 2 proposes to convert the most railroad grade to road with four miles reconstructed as road. Alternative 3 proposes three miles of railroad grade to be reconstructed as road. Alternative 4 proposes one mile of railroad grade to be reconstructed as road.

Where the railroad grades contain multiple tracks, the road building will be confined to one. Most of the features also lie along the old grades. Those features that retain some integrity will be avoided. In some cases timber may be removed from within the feature boundary by directional felling keeping equipment outside the feature. Skid trail features that still retain donkey mounds and other associated features will be avoided with perpendicular crossings where necessary.

The Eden Ridge logging railroad provides an opportunity to bring interpretive displays to the public. This has already been recognized by the USFS and the town of Powers in the creation of the video *When Everybody Was Working*. In order to mitigate the impacts proposed, information about the early logging at Eden Ridge will be made available on the Rogue River-Siskiyou National Forest webpage.

If additional sites are encountered in the course of additional inventory or during project implementation, Forest specialists would consult with the State Historic Preservation Office, as required by law, to determine the significance of the discovery and the effects of the project upon them. The Confederated Tribes of the Siletz would be included in these discussions where Native American sites are involved. Mitigation would be accomplished and may include avoidance of the sites, or scientific investigation.

Consultation with SHPO

Project area inventories and consultation with the State Historic Preservation Offices (SHPO) is in progress at this time (DEIS). Consultation will be completed for the Eden Ridge Timber Sales Project by the time of the Final EIS; a Record of Decision will not be rendered prior to completion of this consultation**.**

C. Cumulative Effects

Before the National Historic Preservation Act (NHPA) of 1966 was implemented, project planning did not include consideration of impacts to historic properties. Any projects such as timber harvest, road building, fire suppression activities etc that occurred prior to this, had the potential to adversely impact historic properties, and many of these projects occurred in areas considered high probability for cultural resources.

Since the 1970s, cultural resource inventories have been conducted to locate cultural resources prior to project implementation. The knowledge of sites found during earlier inventories, and the refinement of the inventory process to locate properties, currently allows impacts from projects to be avoided or mitigated. While natural deterioration is ongoing, the current condition and trend of the historic record is that historic properties are being protected from project impacts. Information from the sites, their location and nature help to inform about the history of the area. Knowledge of the location and condition of historic properties also allows the potential for management action to abate or mitigate natural processes which affect the historical record.

Wild fire and suppression activities may impact cultural resources. Public actions on Forest Service lands have the potential to impact heritage resources. Generally these impacts are minimal because they are dispersed. However, when actions begin to concentrate impacts to known heritage resources, management actions can be taken to mitigate those impacts.

Cumulatively, when considering past, proposed, and ongoing and foreseeable actions, the project will not exacerbate effects to historic properties. The post-project condition and trend will continue the current condition and trend which protects historic properties through inventory and project design so no historic properties are impacted by project implementation.

C. Consistency with Regulatory Framework

The guidelines of the Forest Plan and that of other jurisdictions were recognized in the development of all alternatives. In addition, the laws and policies that govern cultural resource management on Federal lands are coordinated with the State Historic Preservation Officer (SHPO) of Oregon, who serves in an advisory capacity. The policies of the Forest Service and the SHPOs are consistent.

V. Consulting Parties

The Advisory Council of Historic Preservation (ACHP) oversees Cultural Resource Programs and Laws at the National level. They work with the State Historic Preservation Offices and resolve conflicts of determinations of significance or effects between the SHPOs and federal agencies. When significant cultural resources will be adversely affected, the Advisory Council works with the SHPO and federal agency to develop appropriate mitigation measures.

The Oregon State Preservation Office (OR SHPO) reviews recommendations for site significance, and mitigation measures when sites cannot be avoided for sites located on the Gold Beach and Powers Ranger Districts.

The Confederated Tribes of the Siletz (CTSI) have general concerns about the management of the Rogue River-Siskiyou National Forest, including the area comprised of the Gold Beach Ranger District. The Gold Beach Ranger District lies within the aboriginal territory of several of the tribes who make up the CTSI. Project proposals are submitted to the CTSI to solicit their concerns during the planning phase under a government-to-government relationship. Where American Indian sites may be affected, mitigation measures are developed in consultation with the Confederated Tribes of the Siletz, as well as the State Historic Preservation Office.

Coquille Indian Tribe have general concerns about the management of the Rogue River-Siskiyou National Forest, on the Powers Ranger District along the South Fork of the Coquille River. The Powers Ranger District lies within the aboriginal territory of the Coquille Indian Tribe. Project proposals in this vicinity are submitted to the Coquille Indian Tribe to solicit their concern during the planning phase under a government-to-government relationship. Where American Indian sites may be affected in this area, mitigation measures are developed in consultation with the Coquille Indian Tribe, as well as the State Historic Preservation Office.

Smith River Rancheria have general concerns about the management of the Rogue River-Siskiyou National Forest especially along the Winchuk and Chetco Rivers. The south end of the Gold Beach Ranger District lies within the aboriginal territory of the Smith River Rancheria. Project proposals in this vicinity are submitted to the Smith River Rancheria to solicit their concern during the planning phase under a government-to-government relationship. Where American Indian sites may be affected in this area, mitigation measures are developed in consultation with them, as well as the State Historic Preservation Office.

VI. Cultural Resource Laws & Regulations

36 CFR 60 describes the process for nominating sites to the National Register. Web. 01 December 2010 <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr;sid=b42048a07bd6c7c745d457841af90950;rgn=div5;view=text;node=36%3A1.0.1.1.26;idno=36;cc=ecfr>.

36 CFR 800 describes the process for meeting compliance with the National Historic Preservation Act (36 CFR CH VIII 7-1-93 Edition) Web. 01 December 2010 < http://www.achp.gov/regs-rev04.pdf>.

American Indian Religious Freedom Act of 1978 (AIRFA) requires agencies to make a good faith effort to learn about Indian religious practices and consider any adverse impacts on them in their decision-making practices. The consideration of intangible, religious, ceremonial, or traditional cultural values and concerns which cannot be tied to specific cultural sites/properties could be considered under AIRFA. Web. 01 December 2010 <http://www.fs.fed.us/spf/tribalrelations/documents/policy/statutes/American_Indian_Religous_Freedom_Act.pdf>.

Archaeological Resources Protection Act of 1979 (ARPA) [16 USC 470aa - 470mm, PL 96-96]provides for criminal and civil penalties for anyone collecting artifacts or damaging archaeological sites on federal lands without a federally issued permit to excavate for research purposes. Web. 01 December 2010 <http://www.fs.fed.us/spf/tribalrelations/documents/policy/statutes/ARPA_PL96-95.pdf>.

Executive Order 11593 of 1971 provides for the protection and enhancement of the cultural environment. Web. 01 December 2010 <http://www.apfo.usda.gov/Internet/FSA_File/eo11593.pdf>.

Executive Order 13007 of June 1996, Indian Sacred Sites directs Federal land managers to "(1) accomodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites". Furthermore it states that "where appropriate, agencies shall maintain the confidentiality of sacred sites". Web. 01 December 2010 <http://www.fs.fed.us/spf/tribalrelations/documents/policy/executiveorders/EO13007_5_24_96.pdf>.

Forest Service Handbook (FSH 6209.13 11.2, 11.22) describes the exemption of the location and nature of archaeologic and historic sites from disclosure under the Freedom of Information Act. This Handbook chapter is currently being revised as of 12/01/2010.

Forest Service Manual – Chapter 2360 Heritage Program Management (FSM 2360.1-2368.1) clarifies Heritage Program direction and requirements to line officers. This includes direction on the confidentiality of cultural resource information. Available Web. 01 December 2010 <http://www.fs.fed.us/cgi-bin/Directives/get_dirs/fsm?2300>.

National Historic Preservation Act of 1966 as amended through2006 [16 USC 470] (NHPA) requires federal agencies to take into consideration the effects of their activities or permitted activities on cultural resources. The NHPA also requires management of historic properties. Web. 01 December 2010 <http://www.achp.gov/docs/nhpa%202008-final.pdf>.

National Register of Historic Places (NRHP) Sites eligible for or on the National Register must be managed to protect and enhance their cultural value, or to mitigate their loss. Sites are determined eligible by their a) importance to major events or affairs of history, b) their association with people who played significant roles in history, c) characteristics unique to a style, period or event in history or d) their potential to yield more information about history.

Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) recognizes the rights of the Indian Tribes and Native American organizations as caretakers of human remains, funerary objects, sacred objects, and objects of cultural patrimony with which they can demonstrate a reasonable biological or cultural affiliation. As part of this recognition, this statute conveys to such groups the rights to decide upon the disposition of such items. Web. 01 December 2010 <http://www.fs.fed.us/spf/tribalrelations/documents/policy/statutes/American_Indian_Religous_Freedom_Act.pdf>.

VII. Agreements with SHPO and ACHP regarding Cultural Resources

Programmatic Agreement among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service (R6 PA), 2004 allows Forests meeting agreement conditions to streamline the Section 106 process as follows:

- Allows programmatic review of undertakings, which by definition, would be considered undertakings, but typically have negligible potential to affect historic properties (appendix A).
- Allows programmatic review of undertakings which may have some limited potential to affect historic properties, but may be inspected, monitored or otherwise identified (appendix B).
- Allows programmatic review of activities that have no potential to cause effects to historic properties (appendix c).
- Allows programmatic review of No Effect or Historic properties avoided projects

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IX. Glossary

Area of potential effects (APE): "means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking". [36 CFR 800.16 incorporating amendments effective August 5, 2004]

Cultural Resource Site: the physical remains of human activity (including historic and prehistoric artifacts, ruins, buildings, structures, burials, petroglyphs, etc.) having scientific or social values. See also "historic property".

Indian Tribe: *"*means an Indian tribe, band, nation, or other organized group or community, including a native village, regional corporation or village corporation, as those terms are defined in section 3 of the Alaska Native Claims Settlement Act (43 U.S.C. 1602), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians." [36 CFR 800.16 incorporating amendments effective August 5, 2004]

Historic Property: "means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria." [36 CFR 800.16 incorporating amendments effective August 5, 2004]

National Register (NRHP): "means the National Register of Historic Places maintained by the Secretary of the Interior." [36 CFR 800.16 incorporating amendments effective August 5, 2004]

Undertaking: "means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval. [36 CFR 800.16 incorporating amendments effective August 5, 2004]