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BUREAU OF LAND MANAGEMENT
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In Reply Refer To:
1792/5400 (ORC030)
DOI-BLM-OR-C030-2010-0001-EA
Fairview NWFP Project

October 17, 2011

Dear Citizen:

As a result of comments received on the Fairview NWFP (Northwest Forest Plan) Project Environmental Assessment (DOI-BLM-OR-C030-2010-0001-EA), released on June 30, 2011, we have updated the EA to provide additional clarification within some sections.

The Fairview NWFP Project EA (October 17, 2011) and signed Finding of No Significant Impact (FONSI) have been posted to the district's website: http://www.blm.gov/or/districts/coosbay/plans/index.php. This project is designed to implement management objectives and direction of the 1995 Coos Bay District Resource Management Plan. The Environmental Assessment analyzes a No-Action Alternative and a Proposed-Action Alternative for conducting commercial thinning, alder conversion, and density management treatments.

The treatments are to be accomplished by multiple timber sale contracts sold in FY 2012 through FY 2016 (estimated). A Decision Document would be prepared for public comment prior to each timber sale.

The added language within the EA is intended to clarify project planning considerations, the need for roads, the effects of treatment within the Riparian Reserves, Large Woody Debris effects, and provide additional explanation on how the project is consistent with Aquatic Conservation Strategy objectives. These additions do not change the proposed action or effects, and only provide additional clarity to the analysis.

The following section has been added to chapter 1 on page 7 to describe other alternatives considered. These alternatives were considered by the IDT, but were determined to be unreasonable alternatives.

"ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Regeneration Units

An alternative to incorporate regeneration harvest would have yielded approximately 1200 acres of final harvest treatment. This would have reduced the amount of projected new road construction by approximately 10 percent compared to the Proposed Action Alternative. The regeneration alternative was dropped from detailed consideration.

Additional Helicopter Units
An alternative to incorporate use of helicopter yarding in substitution of transportation development within approximately 9 percent of the proposed acres would have reduced the amount of new road construction by approximately 16 percent compared to the Proposed Action Alternative.The environmental effects of reduced road construction mileage would not have been appreciably different from the Proposed Action Alternative due to the ridgetop or upper slope location of roads, and the implementation of project design features to minimize potential impact. This alternative was dropped from detailed consideration because it would result in deficit timber sales that would not provide cost effective management on public lands (as specified by Purpose #5 on page 2).”

Road Management: The description on page 14 has been expanded to clarify the need to update the District’s transportation system. The following statement has been added to the first paragraph: *“Development would involve redesign of the old road network to eliminate roads from the transportation system that had paralleled various stream networks for access or roads designed for downhill yarding harvest systems. The redesign of the road network is intended to lessen environmental impacts by reducing proximity to streams, sedimentation potential and overall ground disturbance.”*

PROJECT DESIGN FEATURES

Aquatic Resources: The text for the first PDF for this section on page 19 has been amended to provide clarity on how riparian no harvest buffers would be determined for perennial streams. Text has been added to the third sentence as follows: “Perennial streams and other fish-bearing streams would have no-harvest buffers *that vary between 60 and 100 feet horizontally depending on the results of Light Detection and Ranging (LiDAR) shade analysis. LiDAR can be used to accurately delineate the trees and shrubs that are tall enough to provide primary shade or shade from 10 a.m. to 2 p.m., the period of greatest solar loading (Figure II-1). No-harvest buffers would be specified for each proposed harvest unit to capture the primary shade zones and portions of the secondary shade zones that provide shade during the morning and afternoon hours*.” An illustration, Figure II-1, has also been added on page 20.

VEGETATION - EFFECTS

The following text has been added to the No Action Alternative at the end of the second paragraph on page 34: “*With the finite site resources being divided among many trees, the individual trees will have slower growth rates, and therefore will be smaller than trees growing in the more open areas of a stand (Oliver and Larson 1990, pp. 211-217).”*

Riparian Reserves: The descriptions on pages 35 and 38 have been revised to clarify woody debris and snag effects. The following statement has been added to the third paragraph on page 35:“*The higher stocking levels would increase the availability of small snags and down wood, but would delay attainment of wildlife habitats associated with large diameter trees. These include large diameter snags, large diameter down wood, prey substrates provided by large surface areas of coarse deep-fissured bark, deep canopies, large limbs, and large platforms, cavities, and other structures found in damaged or injured large trees (Neitro et al. 1985; Weikel and Hayes 1997).*

Carey et al. (1999) observed that suppression mortality in conifers does not contribute materially to cavity habitat or canopy gap formation. Small snags usually do not have top rot or cavities and do not stand very long. They do contribute to the wood debris amounts on the forest floor for a relatively short time before decaying."

The following paragraph has been added to the effects of the Proposed Action Alternative within Riparian Reserves on page 38: "*Thinning would remove mainly trees that would have died in the coming 20 years, from competition mortality, had there been no thinning. The no-treatment buffer would assure attainment of small wood entering the stream for short-term recruitment needs. As the stand grows and competition or natural disturbance causes mortality, the trees that die would be larger in the treatment area. Although, the dead trees would be larger than those recruited from the unthinned area, few of those dead trees would be large enough to provide long-lasting, large structure until the stands are at least 80-years of age* (*USDI, BLM 2001)*."

Species and Structural Diversity: The following text has been added to the first paragraph for this section on page 37: "*There is also a mix of untreated areas adjacent to proposed stands that would contribute to landscape diversity. These stands would be retained in current condition indefinitely due to inaccessibility or current structural attributes. Approximately 650 acres have already been withdrawn from proposed treatment after project scoping.*"

HYDROLOGY - EFFECTS

Large Woody Debris Delivery to Streams: Paragraphs and illustrations for the entire section have been added on pages 45–50 to clarify and enhance the analysis of alternative effects upon woody debris processes near streams.

CONSISTENCY WITH AQUATIC CONSERVATION STRATEGY OBJECTIVES

Watershed Analysis: This entire section has been replaced on page 57 to better explain the analyses completed and the relevant concepts that have been incorporated into the project.

Watershed Restoration: "Applying silvicultural treatments to restore large conifers in Riparian Reserves." The following text has been added to the first paragraph of this section on page 58: *"The Standards and Guidelines (USDA and USDI 1994b) elaborate on the riparian vegetation restoration component as follows: "Active silvicultural programs will be necessary to restore large conifers in Riparian Reserves. Appropriate practices may include planting unstable areas such as landslides along streams and flood terraces, thinning densely-stocked young stands to encourage development of large conifers, releasing young conifers from overtopping hardwoods, and reforesting shrub and hardwood-dominated stands with conifers."*

AQUATIC CONSERVATION STRATEGY OBJECTIVES

ACS #1: The text within the first paragraph of "Site Scale Evaluation" on pages 59-60 has been amended to read as follows: "Under the proposed action, several functions of the Riparian Reserves including *stream bank stability, leaf and particulate organic matter input to the stream, shade, erosion control, and microclimate would be maintained at the site scale in the short-term and long-term, via the network of no-harvest buffer and upslope trees remaining after harvest*."

CARBON STORES AND CARBON FLUX

Short-term Impacts: The following text has been added to the first paragraph on page 107:

> "*The FVS model predicted the stands would transfer approximately 60 percent of tree carbon to wood product storage. Life cycle assessment (LCI) mill survey data shows that approximately 50–70 percent of the aboveground biomass in a sustainably managed forest is currently utilized in product processing mills to make solid wood products along with paper and biofuel co-products (Lippke, Oneil, Harrison, Skog, Gustavsson & Sathre 2011).*"

Questions regarding these changes and clarifications to the Fairview NWFP Project EA should be directed to John Goering at (541) 751-4271.

Sincerely,

/s/ A. Dennis Turowski
A. Dennis Turowski
Umpqua Field Manager

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Fairview NWFP Project

FINDING OF NO SIGNIFICANT IMPACT (FONSI) for the Fairview NWFP Project Environmental Assessment DOI-BLM-OR-C030-2010-0001-EA

I. Introduction

An Interdisciplinary Team has prepared an Environmental Assessment (EA) for the Fairview NWFP Project located within the Umpqua Resource Area, Coos Bay District, Bureau of Land Management. Within this document, the team analyzed two alternatives: a No-Action Alternative (Alternative 1) and a Proposed Action Alternative (Alternative 2). The No Action Alternative describes the effects of not conducting management activities on project lands at this time. The Proposed Action Alternative describes the effects of managing tree densities on approximately 7,344 acres designated as Matrix and Riparian Reserves. This alternative also includes approximately 31.2 miles of new road construction, 69.1 miles of road renovation or improvement, and 24.5 miles of road decommissioning. The location of the project area is summarized in Table 1.

Table 1: Legal Description for all Units

Township	Range	Sections
T. 26 S.	R. 12 W.	25, 26, 35, & 36
T. 26 S.	R. 13 W.	11, 13
T. 27 S.	R. 11 W.	7, 17, 19
T. 27 S.	R. 12 W.	2, 3, 4, 5, 9, 11, 13, 15, 17, 19, 23, 25, 27, & 33

II. Background

This EA was developed under the management direction of the 1995 Coos Bay District Record of Decision and Resource Management Plan (1995 ROD/RMP). The analysis supporting this decision tiers to the *Final Coos Bay District Proposed Resource Management Plan/Environmental Impact Statement* (USDI 1994). The 1995 Record of Decision is also supported by, and in conformance with, the *Final Supplemental Environmental Impact Statement (EIS) on Management of Habitat for Late-Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl (Northwest Forest Plan)* and it's *Record of Decision* (USDA and USDI 1994a) as supplemented and amended.

On March 31, 2011, the United States District Court for the District of Columbia vacated and remanded the administrative withdrawal of the Coos Bay District's 2008 Record of Decision and Resource Management Plan (Douglas Timber Operators et al. v. Salazar).

The EA process was initially started under the 1995 Coos Bay RMP and contains design features from that RMP. Nonetheless, this project is consistent with the goals and objectives of both the 1995 and 2008 ROD and RMP.

This EA is also tiered to and in conformance with the:

- *Final Supplemental Environmental Impact Statement For Amendments to the Survey & Manage, Protection Buffer, and other Mitigation, Measures, Standards and Guidelines* (USDA/USDI 2000) and it's *Record of Decision* (USDA/USDI 2001).
- *Management of Port-Orford-cedar in Southwest Oregon Final Supplemental Environmental Impact Statement* (USDA/USDI 2004b) and its *Record of Decision* (USDA/USDI 2004c).
- *Coos Bay Integrated Noxious Weed Program* (EA OR120-97-11) (USDI 1997).

Through these documents, the BLM, in conjunction with other Federal land agencies, is directed to conduct watershed analysis (WA), and to implement restoration projects to aid in the recovery of water quality and aquatic, riparian, and terrestrial habitats.

As stated in the Record of Decision for the Northwest Forest Plan, the Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands within the range of Pacific Ocean anadromy. Consistency of the proposed alternative with the ACS objectives is described in Chapter 3 of the Fairview NWFP Project EA (pp. 49-58).

III. Finding of No Significant Impact

The EA effects analysis indicates that there would not be a significant impact on the quality of the human environment from the implementation of either alternative. This finding and conclusion is based on my consideration of the Council of Environmental Quality's (CEQ) criteria for significance (40 CFR 1508.27), both with regard to context and intensity of the impacts described in the EA.

<u>Context:</u>

The proposed activities are not national or regional in scope. The Fairview NWFP Project comprises approximately 7,344 treatment acres. Table 2 summarizes treatment acres by watershed/subwatershed.

The proposed action would occur within the Matrix and Riparian Reserve land use allocations as designated by the 1995 Coos Bay District ROD/RMP. The RMP anticipated the need to conduct silvicultural treatments within: (1) the Matrix to supply a sustainable supply of timber, and promote tree survival and growth; and (2) Riparian Reserves to restore or maintain the objectives of the Aquatic Conservation Strategy.

Table 2: Treatment Acres by Analysis Area Subwatershed

Watershed (5th field)	Sub-watershed (6th field)	Treatment Acres	Percent of Sub-watershed
North Fork Coquille River	Hudson Creek	4,192	18.2%
North Fork Coquille River	Middle Creek	137	0.4%
North Fork Coquille River	Johns Creek	41	0.2%
South Fork Coos River	Daniels Creek	342	1.3%
Coquille River	Beaver Slough	418	3.1%
Coquille River	Cunningham Creek	1,333	6.2%
Coos Bay Frontal Pacific Ocean	Isthmus Slough	58	0.3%
Coos Bay Frontal Pacific Ocean	Catching Slough	823	4.9%
Analysis Area Total		**7,344**	**4.2%**

Intensity:
Impacts that may be both beneficial and adverse (40 CFR 1508.27(b)(1)
Impacts, both beneficial and adverse associated with either alternative, are not significant as they are consistent within the range and scope of timber management effects analyzed and described in the 1994 Final Coos Bay District Proposed Resource Management Plan/Environmental Impact Statement to which this EA is tiered.

Public Health and Safety (40 CFR 1508.27(b)(2)
The proposed activities would not significantly affect public health and safety. Smoke management from pile burning would adhere to the Oregon Smoke Management Plan (OAR 629-43-043). The State of Oregon Administrative Rule No. 340-108, *Oil and Hazardous Materials Spills and Releases*, would minimize impacts to Air Quality and from Solid/Hazardous Wastes.

Unique characteristics of the geographic area (40 CFR 1508.27(b)(3)
The proposed activities will have no impact on unique characteristics of the geographic area such as historic or cultural resources, park lands, prime or unique farmlands, wetlands or floodplains, Wild and Scenic Rivers, wilderness, or ecologically significant or critical areas. The individual areas within the Fairview NWFP Project EA are located at previously disturbed sites, and the silvicultural prescriptions would help restore the natural physical environment.

Degree to which effects are likely to be highly controversial (40 CFR 1508.27(b)(4)
The effects on the quality of the human environment for the proposed activities are not highly controversial. The Coos Bay District has been operating under the management direction of the Resource Management Plan since 1994. Thinning and restoration treatments are not considered controversial.

Degree to which effects are highly uncertain or involve unique or unknown risks (40 CFR 1508.27(b)(5)
The possible effects of the proposed activities on the quality of the human environment are not highly uncertain and do not involve unique or unknown risk.

Consideration of whether the action may establish a precedent for future actions with significant impacts (40 CFR 1508.27(b)(6)
The proposed projects do not establish a precedent for future actions or represent a decision in principle about future actions with potentially significant effects. The timber management program on BLM-managed lands in western Oregon is well-established and this project would not establish a new precedent.

Consideration of whether the action is related to other actions with cumulatively significant impacts (40 CFR 1508.27(b)(7)
There are no significant cumulative effects identified by this assessment. This includes impacts to forest vegetation, wildlife, water resources, fisheries, botany, soil resources, and carbon storage. Although there would be removal of vegetation within the Riparian Reserves, potential adverse impacts to resources are eliminated or substantially avoided by the implementation of no-harvest buffers along streams.

Scientific, cultural, or historical resources, including those listed in or eligible for listing in the National Register of Historic Places (40 CFR 1508.27(b)(8)
The proposed activities would not affect districts, sites, highways, structures or objects listed in, or potentially eligible for listing in the National Register of Historic Places. Nor would the activities cause a loss or destruction of significant scientific, cultural, or historical resources.

Threatened or endangered species and their critical habitat (40 CFR 1508.27(b)(9)
- The Umpqua Field Office initiated consultation with the U.S. Fish and Wildlife Service in accordance with Section 7(A)(4) of the Endangered Species Act . A letter of concurrence was received from the U.S. Fish and Wildlife Service (USFWS, 2010) in which they concur that the proposed actions are not likely to adversely affect the northern spotted owl or the marbled murrelet.
- The proposed action has been determined to have “no effect” to federally threatened Oregon Coast coho salmon and its associated Critical Habitat. Based on analysis by the Fisheries Biologist, we also find that the proposed action would not adversely affect Essential Fish Habitat (EFH) as designated by the Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. 1855 as amended). Therefore, consultation with the National Marine Fisheries Service is not warranted. This conclusion further supports a finding of no significant impact.

Any effects that threaten a violation of Federal, State, or local laws or requirements imposed for the protection of the environment (40 CFR 1508.27(b)(10)
The proposed activities would not violate Federal, State, or local laws imposed for the protection of the environment. These include the Clean Air Act and the Clean Water Act.

Analysis has also concluded that implementation of the proposed actions would not contribute to the need to list any Special Status Species as identified in BLM Manual 6840 and BLM OR/WA 6840 policy.

Pursuant to Executive Order 13212, the BLM must consider the effects of this decision on the President's National Energy Policy. As there would be no impact to the exploration, development, or transportation of undeveloped energy sources from the proposed action, a Statement of Adverse Energy Impacts is not required.

<u>Conclusion:</u>

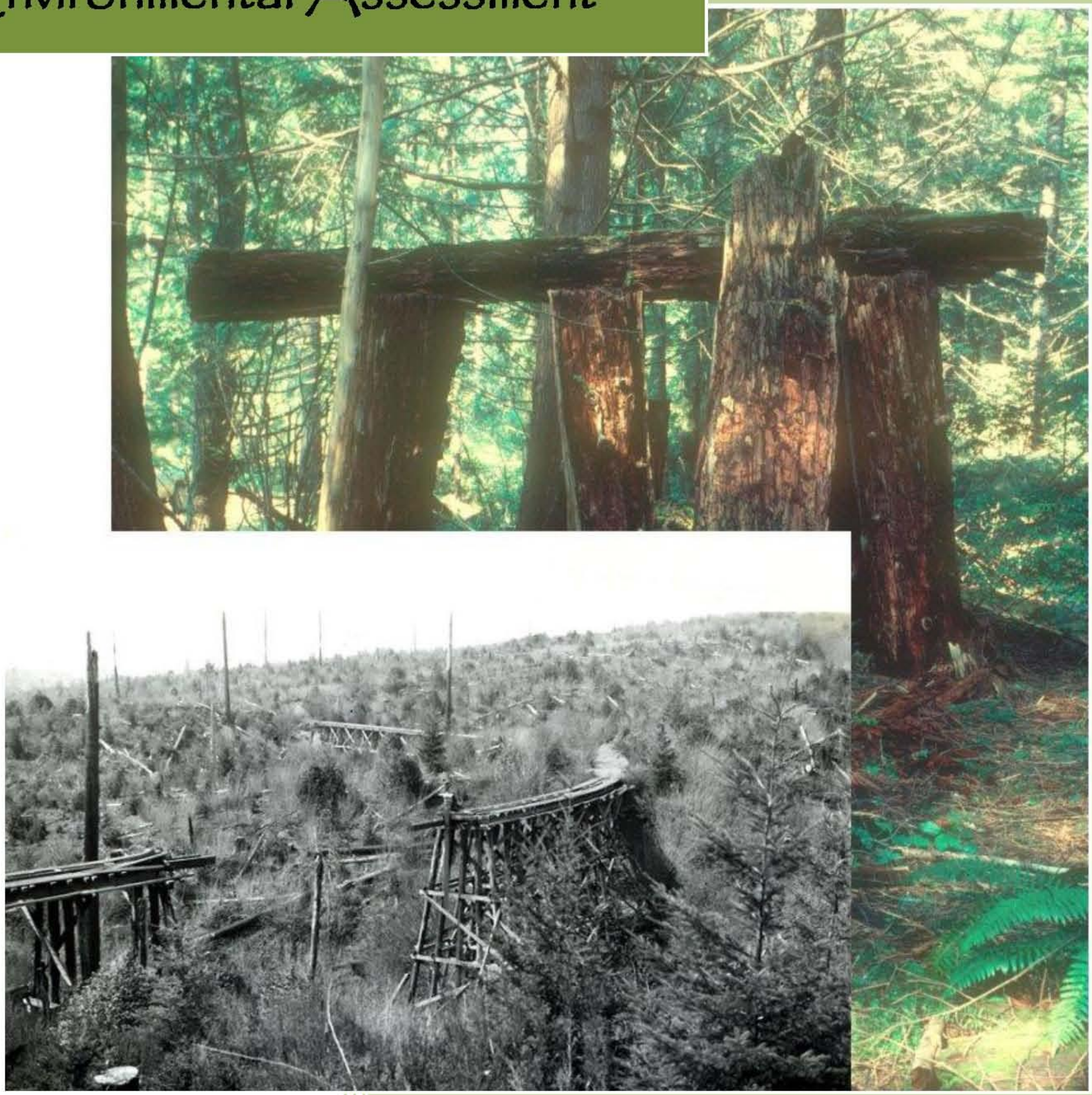
Based on the information and analysis contained in the EA (DOI-BLM-OR-C030-2010-0001-EA), I have determined that the proposed action would not have a significant impact on the human environment within the meaning of section 102(2) (c) of the National Environmental Policy Act of 1969, and that an Environmental Impact Statement is not required. I have determined that the effects of the proposed silvicultural treatments and associated road management activities are within those anticipated and already analyzed in the *Final Coos Bay District Proposed Resource Management Plan/Environmental Impact Statement* and would be in conformance with the 1995 *Record of Decision/Resource Management Plan* for the Coos Bay District.

/s/ A. Dennis Turowski ***10/17/2011***

A. Dennis Turowski Date
Umpqua Field Manager

Fairview NWFP Project Environmental Assessment

October 17, **2011**



DOI-BLM-OR-C030-2010-0001-EA

Coos Bay District
Bureau of Land Management
1300 Airport Lane
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Table of Contents

CHAPTER I: PURPOSE AND NEED FOR ACTION

BACKGROUND

The *Final - Coos Bay District Resource Management Plan and Environmental Impact Statement* (RMP) (USDI 1994) and its *Record of Decision* (ROD) (USDI 1995) allocates lands for different primary purposes. The General Forest Management Area (GFMA) is federal land located outside of designated reserves and special management areas that are available for timber harvest at varying levels. The Riparian Reserve (RR) land use allocation (LUA) was designed to restore and maintain the ecological health of watersheds and their aquatic ecosystems on public lands (RMP, p. 6.) Management direction includes use of silvicultural practices in Riparian Reserves to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives (RMP, p. 13). The Riparian Reserve LUA would serve as connectivity corridors within and between watersheds.

The proposed project described herein is intended to implement specific management opportunities, some of which were identified within the project areas watershed analyses, in a manner consistent with the standards and guidelines outlined in existing planning documents described below.

NEED FOR THE PROPOSED PROJECT

The *Final - Coos Bay District Resource Management Plan and Environmental Impact Statement* and its *Record of Decision* (USDI 1995) responds to two needs: the need for forest habitat and the need for forest products (USDI 1995 p1). These needs were addressed in the RMP through an ecosystem management strategy under which BLM lands "will be managed to maintain healthy, functioning ecosystems from which a sustainable production of natural resources can be provided" (USDI 1995, p. 5). The Coos Bay District declared in the RMP an Allowable Sale Quantity (ASQ) of 27 MMBF per year, which is to be derived entirely from the GFMA land use allocation.

Analysis of forest stands within the watersheds of the Fairview area indicate that there is a need to treat stands that are currently overstocked to maintain stand vigor in the GFMA and to enhance structural diversity in the Riparian Reserve. There is also a need to treat stands predominantly occupied with red alder to develop the stand characteristics necessary for achievement of the desired future condition in the GFMA and Riparian Reserve land use allocations. These red alder stands were affected by past harvest, became established as a result of poor reforestation, and have the potential to be restored to coniferous forest cover.

Approximately 7,344 acres of 40 to 75 year-old timber stands in the GFMA and Riparian Reserve have been identified that would benefit from commercial treatments. Current stocking levels are producing growth trends that are not on a trajectory to optimize growth or improve stand stability. The proposed treatments of the stands inside the Riparian Reserve LUA would restore landscape level vegetation patterns observed on historical aerial photos. Treatments of stands to reduce their density would provide a supply of timber to the local economy, improve the growth rate of the residual stand, and ensure a healthy stand of timber would be available for future needs.

PURPOSE OF THE PROJECT

The Coos Bay District ROD/RMP specifies the following objectives and management actions to be accomplished in managing the lands in the project area. These purposes may be given different weight, depending on the objectives for that particular RMP land allocation. For example, timber production would be given greater emphasis on the portion of the action located on the GFMA land allocation and ecosystem management purposes would have greater emphasis on the portion of the action within the RR lands. A reasonable action alternative must meet the objectives outlined below to be considered and analyzed in the EA.

1. Improve GFMA stand structure by thinning out excess trees in overstocked stands to enhance the growth and vigor of the residual trees and to provide larger and healthier trees for future management objectives while maintaining native species diversity. *"Apply silvicultural systems that are planned to produce, over time, forests with desired species composition, structural characteristics, and distribution of seral or age classes"* (RMP, p.53).

2. Re-establish conifer in red alder dominated stands to provide a sustainable supply of timber that would contribute to future management objectives and the allowable sale quantity. "*Plan harvest of marketable hardwood stands in the same manner as conifer stands, unless the land is otherwise constrained from timber management. Where hardwood stands became established following previous harvest of conifers, plan to reestablish a conifer stand on the site*" (RMP, p.53).

3. Improve Riparian Reserve stand structure to enhance the growth and vigor of the residual trees, provide larger and healthier trees for future management objectives, and enhance wildlife habitat connectivity within and between watersheds. *"Apply silvicultural practices for Riparian Reserves to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives"* (RMP, p.13).

4. Work towards the goals in the *Western Oregon Districts Transportation Management Plan* by renovating or improving problem roads and decommissioning roads not needed for continued resource management. "*Develop and implement a Road Management Plan or a Transportation Management Plan that will meet the Aquatic Conservation Strategy objectives*" (RMP, p.14).

5. Provide cost effective management that would enable implementation of these management objectives while providing collateral economic benefits to society.

6. Provide timber sale volume toward the Coos Bay District Allowable Sale Quantity as required in the O&C Act of August 28, 1937. The BLM has a statutory obligation under the Oregon and California Act of 1937 (O&C Act) to manage suitable commercial forest lands revested by the government from the Oregon and California Railroad grant (O&C lands) for permanent forest production in accordance with the sustained yield principle.

CONFORMANCE WITH EXISTING LAND USE PLANS

This project was initiated, is tiered to and is in conformance with the *Coos Bay District Resource Management Plan/Final Environmental Impact Statement* (USDI 1994) and it's *Record of Decision* (ROD/RMP), as supplemented and amended. The Coos Bay District ROD/RMP is supported by and consistent with the *Final Supplemental Environmental Impact Statement (FSEIS) on Management of Habitat for Late Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl* (Northwest Forest Plan [NFP]) (USDA and USDI 1994a) and its *Record of Decision* (USDA and USDI 1994b).

This EA is also tiered to and in conformance with the:

- *Final Supplemental Environmental Impact Statement For Amendments to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA/USDI 2000) and it's *Record of Decision* (USDA/USDI 2001).
- *Coos Bay Integrated Noxious Weed Program* (EA OR120-97-11) (USDI 1997).
- *Management of Port-Orford-cedar in Southwest Oregon Final Supplemental Environmental Impact Statement* (USDA/USDI 2004b) and its *Record of Decision* (USDA/USDI 2004c).

Documents Incorporated by Reference

The following documents were used to assist in the analysis of the Fairview NWFP Project and are referenced throughout this document:

- *North Fork Coquille Watershed Analysis* (2nd iteration), July 20, 2001 (USDI-BLM 2001).
- *Middle Main Coquille Watershed Analysis,* September 30, 1997 (USDI-BLM 1997).
- *Catching Beaver Watershed Analysis,* June 3, 2010 (USDI-BLM 2010).
- *South Fork Coos River Watershed Analysis,* (revised) March 31, 2001 (USDI-BLM 2001).

Endangered Species Act

Consultation with the U.S. Fish and Wildlife Service (USFWS) as provided in Section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1536 (a)(2) and (a)(4) as amended) has been completed and a project level Biological Assessment (BA C08-01) was submitted for activities causing noise disturbance to northern spotted owls and marbled murrelets during nesting periods. A Letter of Concurrence (FWS Ref. # 13420-2010-I-100) was received from the Fish and Wildlife Service on June 23, 2010 stating that the Fairview NWFP Project timber sales "may affect, but are not likely to adversely affect" the northern spotted owl or the marbled murrelet. All of the appropriate Terms and Conditions would be incorporated.

Consultation with the National Marine Fisheries Service is not required because the proposed project has been determined to have "no effect" to threatened Oregon Coast coho salmon and coho critical habitat. Additionally, project activities would not adversely affect Essential Fish Habitat as identified by the Magnuson-Steven Fishery Conservation and Management Act (16 U.S.C. 1855(b)).

PROJECT LOCATION

The project area is located in T.26 S., R.13 W., Sections 11, 13 and T.26 S., R.12 W., Sections 25, 26, 35, 36 and T.27 S., R.12 W., Sections 2, 3, 4, 5, 9, 11, 13, 15, 17, 19, 23, 25, 27, 33, and T.27 S., R.11 W., Sections 7, 17, and 19, Willamette Meridian, Coos County, Oregon (See maps in Appendix A). This area is located approximately 15 miles inland from the Pacific Ocean. The mean annual rainfall is about 50 to 80 inches across the area. Winters are cool and wet, and summers are hot and dry. The steepness of the terrain varies from gentle to steep, with slopes ranging from flat to 80%. Elevations of the analysis area range from 100 to 2,500 feet with the higher elevations found in the northeast sections. There is a valley within the southeast side that encompasses the North Fork of the Coquille River. Appendix A (Map A) displays the general unit locations within the watersheds.

Table I-1: Project Area Location by Watershed and Subwatershed

Fifth Field Watershed	Sixth Field Watershed
North Fork Coquille River	Hudson Creek
North Fork Coquille River	Middle Creek
North Fork Coquille River	Johns Creek
South Fork Coos River	Daniels Creek
Coquille River	Beaver Slough
Coquille River	Cunningham Creek
Coos Bay Frontal Pacific Ocean	Isthmus Slough
Coos Bay Frontal Pacific Ocean	Catching Slough

The project area is primarily within the North Fork Coquille Fifth Field Watershed. The edges of the project area overlap into Coquille River, Coos Bay Frontal Pacific Ocean, and South Fork Coos River watersheds. The analysis area drains primarily to the North Fork of the Coquille River and Coquille River itself but some of the western portion of the area drains into Catching and Isthmus sloughs and from there drain directly into Coos Bay itself. Only a small portion of the entire analysis area drains into Daniels Creek then into the South Fork of the Coos River.

PROJECT DESCRIPTION

The Umpqua Field Office (UFO) proposes to treat 40 to 75 year-old stands of primarily Douglas-fir within the GFMA and within the adjacent Riparian Reserve land use allocation.

Treatment areas in the GFMA LUA would receive commercial thinning (CT) to remove the suppressed, intermediate, and some of the co-dominant trees competing with each other for growing space. Dense stands would be thinned to leave approximately 50 to 100 stems per acre. This intermediate harvest would maintain or increase the growth and vigor of the residual trees and capture much of the growth that would otherwise be lost through mortality.

Treatment areas within the Riparian Reserve LUA are in need of density management thinning to enhance tree growth so that these areas would be on a trajectory to develop large diameter trees, and future large diameter snags and down wood debris. This thinning would promote the structural diversity needed to meet Aquatic Conservation Strategy objectives.

Some of the areas identified for thinning are interspersed with red alder and other hardwoods, either in small pockets or individual trees scattered throughout the stands. The stands or pockets of alder greater than one acre would be considered for treatment to increase the presence of conifer species within the stands. This conifer restoration, also known as alder conversion, is a series of treatments designed to re-establish coniferous species dominance in areas changed by past management actions. Patches of alder that are too small to manage separately as individual conversion units, embedded within the conifer thinning units, would be thinned.

Harvest would be accomplished with a combination of skyline cable, ground based, and helicopter logging equipment depending on road access, steepness of the terrain, and environmental impacts.

New road construction, road renovation, and road improvement would be required as part of the project to update the infrastructure needed to facilitate timber harvest operations. Roads that are no longer needed for administrative purposes, deemed unnecessary for forest management purposes in the near future or have a high probability of causing resource damage, within proposed action areas would be decommissioned.

The project would be funded by the sale of excess trees removed from the stands in timber sales that are tentatively planned for FY 2012 through 2015. Additional information such as timber type maps, topographic maps, aerial photos and stand exams used for this assessment are in the project planning folders and are hereby incorporated by reference.

PUBLIC INVOLVEMENT

The primary purpose of scoping is to identify agency and public concerns relating to a proposed project and help define the issues and alternatives that are examined in detail in this EA. The initial scoping process consisted of an ID Team that identified potential issues that may result in the development of alternatives to the proposal. The general public was notified of the proposed project and EA through publication of the District's semi-annual Planning Update. Additional scoping notices were also sent to adjacent landowners, agencies that have requested these documents, and other interested parties on the District NEPA mailing list. The scoping period for the proposed project ran between October 30, 2009, and November 30, 2009.

IDENTIFIED ISSUES

The interdisciplinary team reviewed scoping comments from outside agencies, adjacent landowners, and the public. Most of the scoping comments received were determined to either be beyond the scope of this EA, or are minor issues that could be resolved by modifying individual proposed units or modifying the design features of the project. Some of the comments were similar in context to merit a response, but not substantive enough to warrant detailed analysis in the EA.

ISSUES ELIMINATED FROM FURTHER ANALYSIS

ALDER CONVERSION

1. How do you know if a conversion area was formerly a conifer stand, not an area of chronic disturbance, and if it may result in a loss of ecological benefit?

Resolution: Research of historical surveys completed for local watershed analysis has shown that areas considered for alder conversion were composed of conifer stands prior to logging. Lands were cleared, actively managed for grazing, or impacted by grazing activities. Grazing was not fully eliminated until 1964. The history of disturbance including fire, and passive reforestation, allowed alder to dominate stands. Most of the proposed alder conversions are not pure alder stands but rather have inclusions of conifer and other hardwoods. The intent of treatment is not to eliminate alder from stands, but rather restore conifer species within the stand. Scattered conifer, large diameter single stemmed hardwoods, and some scattered alder would be retained. Overstocked conifer patches would be thinned to retain dominant trees. All species including red alder would be retained within riparian no-harvest stream protection buffers on intermittent and perennial streams.

While there is benefit of red alder contributing nitrogen within areas of severe disturbance, research has shown that benefit is limited within established upland conifer stands. With close spacing of admixed alder, individual Douglas-fir are likely to be mechanically damaged or suppressed by neighboring alder or, conversely, individual red alder are likely to be dominated by Douglas-fir before contributing N-rich organic matter to the stand. (Miller, Richard E.; Anderson, Harry W.; Murray, Marshall; Leon, Rick. 2005). Potential short term effects of treatments would be alleviated by preserving the biological function of forest vegetation near streams through buffering. “Although it (alder) does mitigate a number of the effects of clearcutting, there are some things it can’t address, such as loss of large woody debris, as well as erosion and sedimentation.” (Wipfli, M. S., PNW Science Findings. Issue 63, 2004). Site conditions (soil type, slope, and geology), road location and construction standards, and site prep intensity have more affect in sediment delivery than soil disturbance caused by logging. Sources of sediment from surface erosion are soils exposed by broadcast burning, and along roads and landings (Beschta, 1978). Beschta also noted in the Alsea Study that high-lead cable logging and light broadcast burning (in contrast to extremely hot burns) had little effect on sedimentation, and the retention of stream side buffers protected stream banks from damage by yarding activities.

DIVERSITY

1. How would treatments within the Riparian Reserve be different from the treatment within the GFMA portion of the stand?
2. How would the density management prescription help restore some of the stands variable spacing diversity characteristically found in old-growth forests?

Resolution: While prescriptions may not differ significantly within the different land use allocations on the Fairview NWFP Project, additional design features would be utilized within the Riparian Reserve to emphasize land use allocation objectives. Basal area prescriptions would provide the means to thin the stand at variable spacing widths to produce canopy gaps and diversify structure. On appropriate locations on the landscape, stand level spacial diversity would be increased by cutting gaps and leaving unthinned clumps. No harvest stream protection buffers would also provide this spacial diversity while protecting ecological function near streams (see Chapter 2, pages 17-20). Elements of existing stand level diversity would be retained by retaining wolf trees, remnant old trees, and large down wood. Prescriptions within the Riparian Reserve would retain some hardwood clumps to the extent that they do not prevent or delay attainment of late-successional characteristics or prevent establishment of a conifer component in the stand area.

ROADS

1. How would individual roads be evaluated for cost and benefit of accessing lands?

Resolution: Road use and construction would be evaluated for economic viability before the time that individual timber sales are offered. Because economic conditions are variable, forest operations would be evaluated during pre-sale activities to assess the costs and benefits of harvest. Appendix B Table B-1 provides a summary of the acres accessed by new road construction per section of proposed harvest. Specific timber and road surveys and appraisals for the sale units are completed prior to sale to further validate cost and benefit.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

REGENERATION UNITS

An alternative to incorporate regeneration harvest would have yielded approximately 1200 acres of final harvest treatment. This would have reduced the amount of projected new road construction by approximately 10 percent compared to the Proposed Action Alternative. The regeneration alternative was dropped from detailed consideration.

ADDITIONAL HELICOPTER UNITS

An alternative to incorporate use of helicopter yarding in substitution of transportation development within approximately 9 percent of the proposed acres would have reduced the amount of new road construction by approximately 16 percent compared to the Proposed Action Alternative. The environmental effects of reduced road construction mileage would not have been appreciably different from the Proposed Action Alternative due to the ridgetop or upper slope location of roads, and the implementation of project design features to minimize potential impact. This alternative was dropped from detailed consideration because it would result in deficit timber sales that would not provide cost effective management on public lands (as specified by Purpose #5 on page 2).

DECISION FACTORS

In choosing the alternative that best meets the purpose and need, consideration would be given to the extent to which each alternative would:

1. Reduce competition-based mortality and increase tree vigor and growth specific to the Matrix (GFMA);
2. Improve Riparian Reserve stand structure by removing excess trees in overstocked stands to enhance the growth and vigor of the residual trees while retaining structural and habitat components, such as large trees, snags, and coarse wood;
3. Provide timber resources and revenue to the government from the sale of those resources;

4. Provide cost effective management that would enable implementation of these management objectives while providing collateral economic benefits to society;
5. Implement goals of the Western Oregon Districts Transportation Management Plan (TMP) by renovating or improving roads and decommissioning roads not needed for continued resource management within proposed action areas;
6. Comply with applicable laws and Bureau policies including, but not limited to: the Clean Water Act, the Endangered Species Act, the O&C Act, The Magnuson-Stevens Fishery Conservation and Management Act, and the Special Status Species Program.

CHAPTER II: ALTERNATIVES

This chapter contains a description of a No Action Alternative and a Proposed Action Alternative. For an action alternative to be considered, it must meet the purpose and need while not violating any minimum environmental standards. The alternatives developed are consistent with the RMP and satisfy the purpose and need of implementing the RMP. All quantifications (i.e. acreages, mileages, etc.) are based on estimates obtained from geographic information systems (GIS). Final numbers could vary slightly as the plans are translated to the ground.

NO ACTION ALTERNATIVE

Under this alternative, BLM lands in the project area would not receive treatment in the near future. There would be no thinning treatments to reduce densities in overstocked stands, nor would restoration of conifer to former sites occur. The proposed road construction, improvement, renovation, and road decommissioning would not occur. Ongoing activities necessary to comply with laws, and regulations would continue. These include but are not limited to compliance with Oregon fire control regulations, construction of roads across BLM land under existing right-of-way agreements, routine road maintenance, control of noxious weeds, and silvicultural activities in young precommercial stands. Timber harvest on adjacent private lands may occur and would be guided by the Oregon Forest Practices Act.

The no action alternative provides a baseline for the comparison of the alternatives. This alternative describes the existing condition and the continuing trends. Selection of this alternative would not constitute a decision to reallocate these lands to non-commodity uses. This alternative would not meet the Purpose and Need. Future harvesting in this area would not be precluded and could be analyzed under a subsequent EA.

PROPOSED ACTION ALTERNATIVE: Commercial Thinning/Density Management/Red Alder Conversion

PROJECT TREATMENT ACRES: LAND USE ALLOCATION AND HARVEST SYSTEM

The proposed action is to implement silvicultural treatments on approximately 7,344 acres of BLM administered lands. This would occur by offering separate timber sales from 2012 to 2015. Approximately 55% of the project is inside the GFMA land use allocation, and 45% is within the Riparian Reserve land use allocation as designated by the *Coos Bay District Resource Management Plan and Record of Decision.*

This action would include commercial thinning (CT) in the GFMA or conifer restoration, also known as alder conversion, in conjunction with the thinning in selected alder dominant stands. Alder areas that are not likely to be successfully converted to conifer would be thinned similarly to the adjacent stand or excluded from the treatment area. The density management (DM) prescription would be applied to the Riparian Reserve LUA identified within units prescribed for commercial thinning or alder conversion. Density management treatments would occur within the portion of the Riparian Reserve land use allocation that is outside the streamside protection buffers. The treatment acres for proposed action are summarized in Table II-1.

Table II-1: Estimated Project Treatment Acres

Stand Prescription (Rx)	Primary Rx	DM	**Total**
Commercial Thinning	3630.1	2739.8	6369.8
Alder Conversion	427.0	547.2	974.2
Total Acres			**7344.0**

DM = Density Management

Proposed units would be harvested using a combination of skyline cable, ground-based equipment, and aerial (helicopter) harvest systems. Table II-2 shows the estimated acreage for each unit within the project area by harvest system. Maps D-1, 2, & 3 in Appendix A display the approximate geographical location of the logging systems to be used within each unit.

Table II-2: Estimated Planned Harvest System Acres

Unit #	Harvest System Acres			Unit #	Harvest System Acres			Unit #	Harvest System Acres		
	Cable	Ground	Aerial		Cable	Ground	Aerial		Cable	Ground	Aerial
1	408.0	156.6		33	63.3			59	83.7	60.9	
3	91.7	191.6		34	146.2			60	15.1		
4	23.8			35	35.6			61	11.4		
5	230.4	106.4		36	39.5			62	21.2		3.7
8	231.1	43.6		37	39.7			63	30.1		
9	28.8			38	33.9			67	55.5		
11	163.0			39	156.6			69	2.8		
12	271.6	27.0		41	109.3			70	61.7		
13	310.0	128.8		42	48.2			71	95.5		
14	402.7		23.0	43	23.9			72	295.4	41.1	

Unit #	Harvest System Acres			Unit #	Harvest System Acres			Unit #	Harvest System Acres		
	Cable	Ground	Aerial		Cable	Ground	Aerial		Cable	Ground	Aerial
15	184.0			44	12.3			73	9.4		
16	44.7			45	49.4	1.1		74	58.5		
17	43.6			46	10.1	2.3		75	32.0		
19	479.0			50	222.1	45.1	5.3	76	8.7		
22	106.0			51	63.6			77	11.5		
24	67.7			52	84.8			79	6.2		
26	171.1		46.0	53	154.8	14.4		80	11.4		
27	47.0			54	134.1			81	35.1		
28	177.3			55	116.1			82	26.1		
30	66.7			56	51.6	2.4		83	11.2		
31	31.7	8.2		57	150.1			Sub-total	**6436.5**	**829.5**	**78.0**
32	154.2			58	74.7			**Total:**	**7344.0**		

SILVICULTURAL PRESCRIPTIONS FOR THE PROPOSED ACTION

Silvicultural treatments offer the opportunity to reduce tree density, convert alder stands to conifer stands, increase tree species diversity, improve forest structural characteristics, and create downed logs and snags. Silvicultural treatments can accelerate the development of young stands and provide habitat structures that may in turn restore wildlife species diversity.

GENERAL DESCRIPTION OF SILVICULTURAL TREATMENT

The stands considered for commercial thinning are overstocked and are in or are approaching the stem exclusion phase of stand development. The stands considered for alder conversion are within areas affected by past harvest and have the potential to be restored to coniferous forest cover to benefit Aquatic Conservation and other natural resource management strategies.

The thinning method that would be used is commonly called "thinning from below." The trees that would be left following treatment are the dominant and larger co-dominant trees with the largest crowns and stem diameters. These trees would be distributed across the site to rapidly capture the growing space made available by the thinning. Stands have been inventoried and growth modeled to project the post-harvest density needed to achieve a stocking level that is below a level of competition induced mortality (self-thinning).

Stands typically would be marked to leave a target square footage of basal area per acre. Using a basal area target rather than a spacing target would obtain a greater variation in spacing and a more natural appearing relation between the tree sizes and spacing. Stand basal area is the sum of the basal areas of all trees in the stand divided by the stand area. Through the use of the basal area prescription, variable density within a stand may be more readily introduced versus the use of a traditional spacing target (trees per acre) prescription. When thinning from below to a basal area target where the trees to be selected as leave tree are small, more trees per acre would be retained than in stand areas where potential leave trees are large. The effect is that where the suitable leave trees are small, trees would be spaced more closely together; where leave trees are large, the trees would be more widely spaced. Where gaps in the canopy occur, a basal area prescription would result in additional trees being left next to the gap to compensate for the lack of trees in the gap. The effect would be that trees would be spaced closer together adjacent to gaps than in those areas away from gaps. This would help attain the target basal area per acre target averaged across the unit while incorporating more variation in tree spacing.

Measures to sustain or enhance species diversity would be implemented by use of species preference and/or a diameter limit on subject species within applicable mixed species stands. These measures, established on a stand by stand basis, would be in addition to the basal area marking technique. This would allow thinning objectives to be utilized while sustaining a diverse but stable species composition within the stand. A component of all existing species would be retained in individual stands to provide biological, spatial, and structural diversity. Large scattered hardwood tree species such as bigleaf maple, and any minor species such as cascara buckthorn and bitter cherry would be reserved.

COMMERCIAL THINNING PRESCRIPTION:

Commercial thinning would be applied to conifer dominated stands on GFMA lands and is intended to redistribute the growth of a stand to individually selected trees. These trees would represent the healthier trees on site which can then take advantage of the increased growing space to compete for water and nutrients. Thinning treatments would cut and remove the overtopped, intermediate and the smaller co-dominant conifer and red alder trees within stands. The prescribed basal area of leave trees would coincide with a Relative Density (RD) of approximately 35, which is considered as fully occupying the site. This would leave an average of 63 trees per acre in the stand overstory. This is equivalent to leaving trees spaced an average of 26 feet apart. The prescription for individual stands would vary depending on pre-treatment stand density, age, and diameter. For more information on Relative Density, see Affected Environment (Chapter 3) under Vegetation, Stand Density. Table II-3, below, shows the existing density for each stand and the projected results following thinning.

DENSITY MANAGEMENT PRESCRIPTION

The thinning prescription applied to stands within the Riparian Reserve land use allocation differs from conventional commercial thinning in that the intent of treatment is to redirect the stand development trajectory to provide desired stand structural conditions typically found in older forests. Whereas commercial thinning prescriptions emphasize production of larger trees to maintain growth of high stand-level volume, density management prescriptions focus on enhancing future structure and large tree woody debris while sacrificing total stand volume production potential.

Stands would be thinned from below by cutting and removing the overtopped, intermediate, and the smaller co-dominant trees to obtain the desired relative density. The leave trees would be those trees with the largest crowns and the largest diameters relative to the other trees in the immediate area of each leave tree. The relative density targets are chosen to ensure sufficient trees are retained to produce a fully stocked old-growth stand and have a sufficient number of trees for mid-term and long-term recruitment of large snags and down wood.

Where commercial thinning is the primary prescription, the stands in the Riparian Reserve portion of the proposed project (outside of the no harvest stream buffers) would be thinned down to the same basal area target as the adjacent commercial thinning stand but would incorporate a variety of techniques to provide near term and future canopy gaps that would add to overstory and understory diversity. This could include variable density marking of conifer, thinning of red alder where it is competing with releasable conifers, or leaving small patches of red alder, which when they breakup at approximately stand-age 100 years, would create additional gaps. Setting these young stands on a trajectory to develop into old-growth would require a disturbance of sufficient intensity to increase growing space to allow attainment of large diameter trees that, in turn, can eventually become large diameter snags and down wood.

Where alder conversion is the primary prescription, some hardwood clumps would be incorporated in the Riparian Reserve LUA to the extent that their retention would not prevent or delay attainment of late-successional characteristics or prevent establishing a conifer component on the site. Bigleaf maple clumps would be given preference for retention. The lower retained basal areas associated with stands prescribed for conversion would result in locally more rapid tree growth and more vigorous understory vegetation. Thinning is proposed within the interior of conifer clumps to obtain rapid and sustained diameter growth.

RED ALDER STAND CONVERSION PRESCRIPTION:

Red alder dominated stands would be harvested either as small areas in conjunction with the thinning operations, or as separate units. Removal of the red alder is necessary to re-establish coniferous species dominance and produce gaps which provide adequate sunlight for conifer regeneration. Some of the areas are not uniformly composed of pure red alder and may be interspersed with various conifer species and other hardwoods that occur in pockets or individuals scattered throughout the stands. Within these red alder dominant stands, scattered individual healthy and releasable conifers would be reserved. Small dense clumps of conifer occurring within red alder stands would be thinned to improve growth and vigor of dominant trees.

Conifer species such as grand fir, western hemlock, and western redcedar may be thinned from below to reduce inter-tree competition (where these species are present in sufficient numbers to not be considered a minor species in the stand). However, western redcedar regeneration would be retained in mixed species stand conditions. Other species such as Port-Orford-cedar, Pacific yew, willow, cherry, and cascara buckthorn would typically be excluded from harvest. No-harvest riparian buffers would be maintained.

In order to maintain species diversity, the fundamental composition of other hardwood species within stands would be retained. In some stands, individual prescriptions may require the reduction of other specific hardwood or conifer species so that the overall species composition and dominance in the stand would not shift to that species. Bigleaf maple and Oregon-myrtle stems greater than 18 inches diameter, or those exhibiting a strong single-stem growth form would be retained.

After harvest, alder conversion areas would receive site preparation treatment and be planted with a mix of conifer species. The predominant species would be Douglas-fir, with a mix of other species such as western hemlock and western redcedar. The planting spacing used would be based on an assessment of the risk of mortality from light competition and animal browse damage. The assessment of light competition would take into consideration the percent cover and composition of vegetation on the units following site preparation. The assessment of animal damage potential would take into consideration animal signs and sightings, and habitat condition.

The size of alder conversion areas would average approximately 39 acres. The alder conversion treatments are tentatively planned for fiscal years 2013 and beyond. Subsequent silvicultural treatments would be implemented through BLM service contracts.

Table II-3 indicates the planned unit prescription and stand statistics projected at the time of harvest for each unit using the Forest Vegetation Simulator (FVS) growth model. For modeling purposes, the prescriptions are based on thinning to a post-harvest basal area target to reach a relative density level at or below self-thinning. Maps C 1, 2, & 3 found in Appendix A graphically display unit prescriptions.

Table II-3: Unit Prescription and Comparison of Pre and Post Thinning Stand Data[1]

EA UNIT #	Primary Unit Prescription	Basal Area Target	Age	Pre-QMD	Pre-TPA	Post-QMD	Post-TPA	Acres
1	CT	150 BA	49	16.4	149	19.4	73	564.7
3	CT	140 BA	48	15.5	164	18.2	77	283.3
4	CT	130 BA	42	15.2	137	16.4	88	23.8
5	CT	170 BA	56	18.0	125	23.7	55	336.8
8	CT	160 BA	57	19.9	101	23.4	54	274.7
9	CT	140 BA	46	14.5	198	16.3	97	28.8
11	CT	150 BA	57	12.9	249	19.6	71	163.0
12	CT	140 BA	48	12.9	252	18.5	75	298.6
13	CT	145 BA	52	17.4	125	21.6	56	438.8
14	CT	200 BA	66	17.2	177	26.1	54	425.7
15	CT	160 BA	73	14.8	224	20.3	67	183.9
16	CT	200 BA	68	23.9	87	27.2	50	44.8
17	CT	160 BA	46	17.6	159	22.1	62	43.6
19	CT	170 BA	70	18.9	139	23.8	55	479.0
22	CT	160 BA	60	17.9	123	23.1	55	106.0
24	CT	160 BA	58	11.3	387	20.0	73	67.7
26	CT	180 BA	66	16.5	198	23.6	59	217.1
27	CT	160 BA	55	15.7	209	20.9	67	47.0
28	CT	170 BA	65	16.9	167	23.1	58	177.3
30	CT	145 BA	64	17.3	155	21.4	60	66.7
31	CT	200 BA	69	19.5	137	28.2	51	39.8
32	CT	130 BA	53	12.2	262	21.3	57	154.2
33	CT	160 BA	47	16.6	149	20.7	67	63.3
34	CT	160 BA	51	15.0	222	21.8	61	146.2
35	CT	200 BA	56	20.6	137	25.3	57	35.6
36	CT	150 BA	44	18.1	132	19.4	73	39.5
37	Alder Conv.	110 BA	48	19.8	128	21.9	42	39.7
38	CT	170 BA	52	15.7	188	23.4	57	33.9
39	CT	170 BA	61	15.9	249	24.4	52	156.6
41	CT	170 BA	62	14.8	224	24.5	52	109.3
42	CT	150 BA	56	16.7	163	21.6	59	48.2
43	Alder Conv.	20 BA	48	18.1	86	18.0	12	23.9
44	Alder Conv.	60 BA	55	15.4	162	15.4	46	12.3
45	Alder Conv.	60 BA	55	15.4	162	15.4	46	50.5
46	CT	170 BA	52	17.1	163	23.4	57	12.4
50	CT	140 BA	41	14.7	174	17.4	85	272.5
51	CT	170 BA	53	17.0	186	24.3	53	63.6
52	Alder Conv.	160 BA	48	16.9	182	22.4	58	84.8
53	CT	170 BA	52	17.1	163	23.4	57	169.2
54	Alder Conv.	100 BA	58	14.1	186	16.6	66	134.1
55	Alder Conv.	80 BA	42	17.2	133	17.6	47	116.1
56	CT	160 BA	50	18.9	125	23.1	55	54.0
57	CT	150 BA	60	17.8	142	21.8	62	150.1
58	Alder Conv.	80 BA	43	12.7	213	19.2	40	74.7
59	CT	180 BA	61	19.0	131	25.3	51	144.6
60	CT	200 BA	52	15.0	249	25.1	58	15.1
61	CT	200 BA	52	15.0	249	25.1	58	11.4
62	CT	200 BA	55	18.9	163	26.8	51	24.9
63	Alder Conv.	140 BA	62	15.5	200	26.6	39	30.1

[1] Stand data including age is projected to time of proposed harvest.

EA UNIT #	Primary Unit Prescription	Basal Area Target	Age	Pre-QMD	Pre-TPA	Post-QMD	Post-TPA	Acres
67	Alder Conv.	80 BA	50	15.4	209	19.2	39	55.5
69	Alder Conv.	120 BA	57	15.0	215	21.6	47	2.8
70	Alder Conv.	100 BA	32	13.0	196	14.2	91	61.7
71	Alder Conv.	80 BA	58	15.3	136	22.9	28	95.5
72	CT	160 BA	46	14.6	239	20.6	69	336.5
73	Alder Conv.	60 BA	42	13.9	157	18.2	33	9.4
74	Alder Conv.	70 BA	44	13.7	204	21.8	27	58.5
75	Alder Conv.	60 BA	42	13.9	157	18.2	33	32.0
76	Alder Conv.	70 BA	44	13.7	204	21.8	27	8.7
77	Alder Conv.	70 BA	44	13.7	204	21.8	27	11.5
79	CT	200 BA	66	15.6	222	24.0	64	6.2
80	CT	200 BA	66	15.6	222	24.0	64	11.4
81	Alder Conv.	70 BA	44	13.7	204	21.8	27	35.1
82	Alder Conv.	70 BA	44	13.7	204	21.8	27	26.1
83	Alder Conv.	70 BA	44	13.7	204	21.8	27	11.2
Total								**7,344.0**

BA = Basal Area (cross-sectional area of the tree stem at breast height[1] and includes the bark)
QMD = Quadratic mean diameter at breast height
TPA = Trees per acre

ROAD MANAGEMENT

Road management for the project consists of developing and maintaining a transportation system that serves the project needs in an environmentally sound manner as directed by the Coos Bay RMP/ROD and the Western Oregon Districts Transportation Management Plan (USDI 2010). Development would involve redesign of the old road network to eliminate roads from the transportation system that had paralleled various stream networks for access or roads designed for downhill yarding harvest systems. The redesign of the road network is intended to lessen environmental impacts by reducing proximity to streams, sedimentation potential and overall ground disturbance. This would involve construction of new roads, renovation and reconstruction of existing roads, maintenance of roads necessary to facilitate harvest operations, and decommissioning of roads following the completion of the individual sale operations.

Construction of new roads and use of existing roads have been designed to allow harvest operations to occur at times of the year appropriate to minimize impacts and to protect various resource values. In order for year-round operation to occur, roads must have a rocked or paved surface adequate to withstand winter operation. Winter operation would be emphasized within areas that already have adequate all weather haul routes. Table II-4 lists the miles of road renovation, improvement, and new construction by surface type.

Table II-4: Road Renovation/Improvement and New Construction[2]

Road Construction	Current Surface Type (miles) Natural	Current Surface Type (miles) Rock	Proposed Surface Type (miles) Natural	Proposed Surface Type (miles) Rock	Total Miles
Improvement	14.45			14.45	**14.45**
Renovation	12.26	42.38	12.01	42.63	**54.64**
Swing Road Renovation	0.53		0.53		**0.53**
New Dirt Roads	7.37		7.37		**7.37**
New Rock Roads	23.67			23.67	**23.67**
New Swing Road	0.13		0.13		**0.13**
Grand Total	**58.41**	**42.38**	**20.04**	**80.75**	**100.79**

* Appendix B includes a detailed list of roads by unit (Table B-2) and a summary of the road miles on private ownership (B-3).

ROAD RENOVATION/IMPROVEMENT

Road renovation consists of returning existing roads back to their original construction design standards. It may include clearing brush and/or trees along roadsides, cleaning or replacing culverts, restoring proper road surface drainage, grading, surface replacement, or other maintenance. Road improvement consists of a capital investment that raises the condition of a road to a higher construction standard. Improvements may include, but are not limited to, additional culvert installation, surfacing existing dirt roads, or increasing the design depth of rock on existing rocked roads. Roads are selected for improvement, to allow cable logging and hauling during the wet season to reduce sediment delivery from roads, reduce potential impacts to wildlife, and provide a greater window of operation in those areas subject to summer time seasonal restrictions.

NEW ROAD AND LANDING CONSTRUCTION

"Conservation Practices for Road and Landing Construction" Best Management Practices (USDI-BLM 1995, pg. D3-D4) for road and landing construction would be implemented. These may include, but are not limited to, construction during the dry season, avoiding fragile or unstable areas, minimizing excavation and height of cuts, end-haul of waste material where appropriate, and provision for adequate road drainage. Roads would incorporate design features to minimize erosion and sediment transport into the channel network appropriate for the seasons when the roads would be used, and proximity to water bodies.

New road construction would consist of approximately 31.2 miles of dirt or rocked surface roads to be constructed on or near ridge top locations. New roads would be single lane with turnouts. Landing construction would mainly consist of creating wide spots on existing roads to facilitate safe yarding and loading of logs. Cable and cut-to-length system ground-based landings are typically about one quarter-acre in size including the existing roadbed.

New road construction would be minimized in Riparian Reserves. Ninety-two percent or 28.7 miles of new roads would be located outside of the Reserves, and only 0.3 mile or 1% of the new roads would be within the inner half of the Reserves. There are only two new intermittent stream crossings proposed. Approximately 45 roadside landings may occur on roads within the upland portion of the Riparian Reserve. The Umpqua Field Office hydrologist has reviewed roads that are not located along a ridgetop and has determined that new construction of these roads would not retard attainment of the ACS

[2] Road renovation, improvement and new construction mileage includes BLM and other ownerships.

Objectives. All road construction would be completed in the dry season. All new construction would avoid wetlands, late-successional habitat, and fragile sites.

ROAD EASEMENT AND RIGHT-OF-WAY AGREEMENTS

To facilitate stand treatments, some road easements or right-of-way agreements would be pursued. Approximately 17.6 miles would be using existing roads. A total of 1.7 miles of new road segments would be incorporated into the existing road systems to provide needed access. Route analyses (hereby incorporated by reference[3]) determined that easements with neighboring landowners was the most economical and viable alternative. Other alternatives considered in this analysis included use of longer routes, use of historic routes following stream drainages, and/or additional easement requests with other landowners. The route analysis resulted in the proposed action to construct the new roads and request use of the existing roads, all of which are analyzed for effects in his environmental assessment. Table B-4 in Appendix B contains a summary of areas that would need new access agreements across private ownerships.

ROAD MAINTENANCE

Existing roads would be maintained during the life of the project to minimize road drainage problems and reduce the possibility of road failures. Maintenance may include, but is not limited to, grading to remove ruts, removal of bank slough, placement of silt trapping straw bales or other sediment control devices, and adding gravel lifts where needed such as stream crossings and soft spots in the road surface. Maintenance on BLM controlled asphalt and rock surfaced roads would be performed by the BLM road maintenance crews.

ROAD CLOSURE/DECOMMISSIONING

Following completion of harvest, approximately 13.2 miles of the newly constructed roads and 8.7 miles of renovated or improved rock and dirt surface roads under BLM control would be decommissioned. An additional 2.6 miles of existing road within the Riparian Reserve LUA in the action area, that will not to be used or renovated, would be decommissioned. Water barring, sub-soiling, pulling in-stream culverts, and seeding and mulching would be required as needed to reduce potential erosion and to help restore the natural hydrologic flow. Decommissioned roads would also be barricaded to prevent vehicle passage in order to protect resources, prevent illegal dumping, and provide for public safety. Road closure status by unit is referenced in Appendix B Table B-2.

SAMPLE TREE FALLING

Timber cruising would employ methods that include the felling of sample trees to formulate local volume tables. This method would aid in refining cruise measurements for the timber sale for appraisal purposes. A separate decision record would be issued prior to this action. Trees selected for measurement would be subsets of those already designated for removal, only representing a very small sample of those prescribed for cutting, would be no larger than 28 inches in diameter, and would not occur in the proximity of streams or within the inner half of the riparian reserve.

Approximately 1 sample tree per 2.5 acres would be felled, in stands less than 80 years of age, resulting in an estimated 2,000 sample trees to be felled for the 6,370 acres of commercial thinning units contained in

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[3] Individual route analysis available upon request , Coos Bay District BLM

the Fairview EA[4]. The BLM would provide 100% contract administration throughout all sample tree falling activities maintaining oversight on items to include tree selection, seasonal and/or daily timing restrictions, avoidance of snags, and avoidance of suitable or existing nest trees for northern spotted owls and marbled murrelets.

The timing of sample tree falling would typically coincide with timely recovery of logs for a timber sale. However, the decision to sample tree fall in no way obligates, or irreversibly commits the BLM to proceed with the timber sale. In the event the area chosen for sample tree falling is removed as part of a planned timber sale, the felled trees would be designated as down woody material for the site. Felling operations would be subject to seasonal timing restrictions (see Table II-5). Sample tree falling would not occur in the immediate vicinity of existing snags. A description of the necessity of Sample Tree Falling as a tool for the timber measurement program is found in Appendix C.

PROJECT DESIGN FEATURES

This section describes measures designed to avoid or minimize impacts on resources and is included as part of the proposed action. Design features are site-specific measures, restrictions, or requirements included in the design of a project in order to reduce adverse environmental impacts.

Implementation monitoring would be accomplished in the form of road construction and renovation inspections, logging inspections, slash disposal and noxious weed monitoring. Site monitoring for solid and hazardous waste would be performed in conjunction with normal contract administration. Monitoring would also consist of silvicultural inspections of planting, site preparation, and regularly scheduled post-planting surveys until the trees are considered free to grow.

PROJECT DESIGN FEATURE – HARVEST METHODS

1. Areas with road access, but otherwise unsuitable for ground-based systems, would be harvested with a skyline cable logging system. In cable yarding areas, a skyline cable system with 75 feet lateral yarding capability and ability to obtain one-end log suspension would be required.
2. A helicopter would be required to aerially yard logs in those areas where road access is not economically feasible, or where other protection needs preclude the use of cable logging systems. At the option of the purchaser, helicopter yarding would be allowed in areas specified as cable or ground based yarding.
3. Trees in skyline cable yarding corridors would be cut to facilitate yarding operations. Skyline corridors would be kept to the minimum width necessary to facilitate the removal of cut trees. Generally, corridor width would be no wider than 12 feet. The location, number, and width of cable yarding corridors would be specified prior to yarding, with natural openings used as much as possible.
4. Where feasible, the distance between skyline corridors would be required to be at least 150 feet apart at the far unit edge opposite from the landing.
5. Where skyline corridors cross a stream, the corridors would be kept as perpendicular to the stream as possible to minimize potential ground disturbance.

[4] While STF is desired, due to the timing of issuing a Record of Decision, it is unlikely that the first two sales will have sample trees felled within them. A subset of approximately 460 sample trees may be over 20 inches dbh.

6. Within safety standards, trees would be directionally felled to the lead of cable yarding corridors.

7. Trees in the thinning units would be cut into log lengths not exceeding 40 feet prior to yarding.

8. Where feasible, the skyline corridors would be spaced parallel to each other and avoid multiple corridors extending out radially from landings.

9. Lift trees and/or intermediate supports may be required to attain desired log suspension. Lift trees and intermediate supports would be left on site to provide snag recruits for potential habitat.

10. Trees in all yarding corridors outside the no harvest buffer would be directionally felled away from stream channels. Full log suspension would be required over perennial streams and would typically be achieved over intermittent streams because of the steep terrain. Bare mineral soil exposed by skidding logs would be covered with slash within 50 feet of any channel to trap sediment and prevent erosion.

11. Ground-based operations would occur only when soil moistures are below 25 percent, outlined in Table II-4, with consideration of compaction resistance and equipment operability as depicted by maps F and G in Appendix A. A maximum operational allowable moisture content would be 25% as measured by the Authorized Officer using a "Speedy" moisture meter or an equivalent method. Soil moisture above 25% would require the discontinuation of ground-based operations in order to prevent excessive compaction to the soils and/or disruption of the soil column.

12. Ground based operations would require placement of slash under the operating equipment so as not to expose mineral soil. Repeated passes over lateral trails would be kept at a minimum. Existing compacted skid roads would be used to the extent practical.

13. Ground-based harvest would be restricted to slopes less than 35 percent. Ground–based harvest equipment would not be permitted to travel through or within stream channels. Project Area Map D 1 & 2, in Appendix A, depicts the approximate location of the harvest systems to be used in the project area. Smaller areas, not depicted on the map, that meet the slope and moisture criteria could be harvested using ground based equipment.

14. A crawler tractor/skidder may be used in conjunction with road construction operations to skid logs within the road construction right-of-way.

15. Hauling on dirt-surfaced roads would only be allowed between June 1 and October 15 unless dry conditions extend the hauling season.

16. Falling and yarding would be restricted between March 31 and July 1 to minimize bark damage during periods of high sap flow.

17. Within safety standards and to the extent possible, harvest trees would be directionally felled away from all posted boundaries, property lines, mainline roads or roads not planned for closure or decommissioning, orange painted reserve trees, no cut riparian buffers, existing snags, and known managed sites for S&M species.

18. In thinning stands that are identified as having moderate to high levels of Swiss Needle Cast infection, other conifer species would be favored for retention. In alder conversion areas with similar SNC presence, provide for a planting species mix favoring conifer species other than Douglas-fir.

19. Native American Grave Protection and Repatriation Act (43 CFR Part 10; IM OR-97-052) Notification Requirements would be followed. If any important cultural materials are encountered during the project activities, all work in the vicinity would stop and the District Archaeologist would be immediately notified.

20. Seasonal timing restrictions would be implemented to minimize soil compaction, damage to residual trees, and disturbance to areas of suitable marbled murrelet habitat. Daily Operating Restrictions limiting potentially disturbing activity from two hours after sunrise to two hours before sunset would be implemented on applicable units from August 6 through September 15. Table II-5 summarizes these restrictions.

Table II-5: Seasonal Restrictions

Activity	Reason for Restriction	Restricted Dates	Dates Restrictions in Effect											
			J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Road renovation, improvement construction	Erosion Sedimentation	Rainy season, generally Oct. 15 – June 1	>	>	>	>	31					15	>	>
Conventional tree falling	Tree bark damage	April 1 thru June 30				1	>	30						
Ground-based yarding	Tree bark damage	April 1 thru June 30				1	>	30						
	Potential soil damage in rainy season	Soil moisture exceeds 25% plastic limit	Primarily rainy season, depending on soil moisture											
Cable yarding	Tree bark damage	April 1 thru June 30				1	>	30						
Hauling on dirt roads	Potential road surface damage in rainy season	Oct. 16 thru June 30	1	>	>	>	>	30				16	>	31
Potentially disruptive activities	Occupied or unsurveyed suitable marbled murrelet habitat within 100 yards of habitat	No activity April 1 thru Aug. 5, then apply daily timing restriction until Sept. 15				1	>	>	>	5				

* Restriction may be extended to September 30 based on site specific conditions. Seasonal operating restrictions for marbled murrelet are based on disturbance only, not suitable habitat removal.

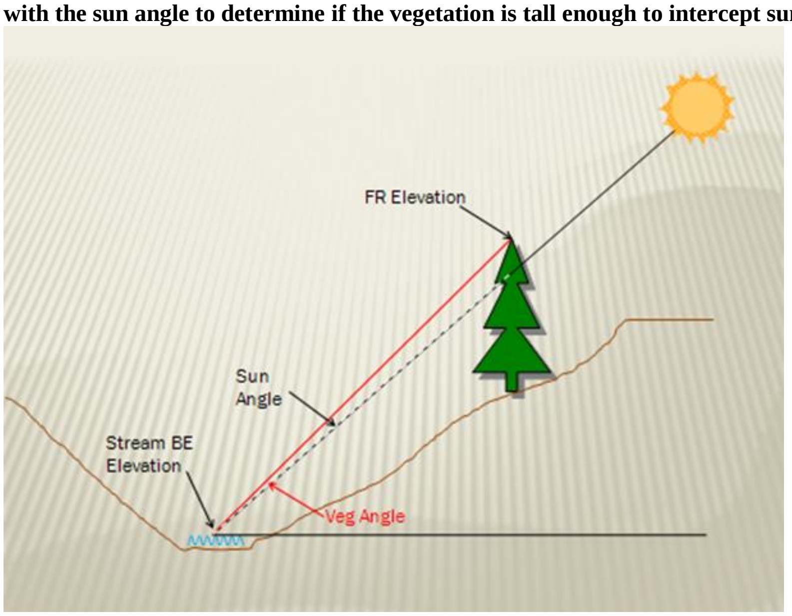
PROJECT DESIGN FEATURE - AQUATIC RESOURCES

1. Streamside no-harvest buffers would be maintained to prevent sediment delivery, and to protect bank stability, beneficial litter inputs and shade. Harvest unit boundaries would be at least 100 feet slope distance from occupied coho habitat and coho critical habitat (CCH). Perennial streams and other fish-bearing streams would have no-harvest buffers that vary between 60 and 100 feet horizontally depending on the results of Light Detection and Ranging (LiDAR) shade analysis. LiDAR can be used to accurately delineate the trees and shrubs that are tall enough to provide primary shade or shade from 10 a.m. to 2 p.m., the period of greatest solar loading (Figure II-1). No-harvest buffers would be specified for each proposed harvest unit to capture the primary shade zones and portions of the secondary shade zones that provide shade during the morning and afternoon hours. Along intermittent channels, no-harvest buffers would extend upslope greater than or equal to 35 feet slope distance. Buffers may be expanded on a site specific basis depending on the presence of unstable areas, the amount of understory shade, and terrain slope. Stream-adjacent slumps and inner gorge areas where steep valley walls are found between the stream and gentler upslope topography would also be excluded from harvest.

2. Within safety standards, all harvest trees would be directionally felled away from stream channels; however, trees that must be felled within the no-harvest buffer to provide cable yarding corridors would be felled toward or parallel to the stream channel and retained on site to provide bank armoring.

3. When yarding across flowing streams, logs would be fully suspended above the stream banks. Logs yarded over known fish bearing streams would require suspension over streambank trees.

Figure II-1: LiDAR is used to compare the first return (FR) elevation of vegetation with the sun angle to determine if the vegetation is tall enough to intercept sunlight.



4. Ground-disturbing activities that occur within the channel of any stream, including disturbances to stream banks, would be limited to the period between July 1 and September 15. Activities that involve work performed with heavy equipment in a stream channel include culvert replacement, culvert removal, new road construction over stream channels, and road maintenance. This work would occur during the dry season and adequate erosion control would be established before the onset of fall rains.

5. Natural surfaced roads used as log haul routes would be upgraded to an all-weather surface at perennial and known fish bearing stream crossings. Length of surfacing would be to the extent of the immediate crossing culvert and a minimum of 100 feet of the approaches to the crossing. Additional erosion control, such as hay bales and silt fence, would be placed as additional measures to prevent sediment delivery to stream as determined necessary.

PROJECT DESIGN FEATURE - WILDLIFE T&E SPECIES, SPECIAL STATUS SPECIES

1. Seasonal and daily timing restrictions to minimize disturbance to nesting murrelets would be applied to equipment operations as summarized in Table II- 5 and explained below. In some cases, only portions of units would be subjected to restrictions because of topographic breaks or other landscape features. Restrictions only apply within the disruption zone within the units.

2. All timber sale contracts would contain a standard provision covering all Special Status Species including Threatened and Endangered Species that may be discovered after the contract is awarded. If threatened or endangered plant or animal species are found in the timber sale units, management guidelines for the T&E Species would be implemented. Timber sale contracts include a special provision that includes management guidelines for Threatened & Endangered Species, occupied marbled murrelet sites, active raptor nests, federal proposed, federal candidate, Bureau sensitive or State listed species protected under BLM Manual 6840.

3. Recommendations listed here represent terms and conditions resulting from completed consultation with the US Fish and Wildlife Service. Provide protection for individual and groups of remnant trees which contain platforms suitable for marbled murrelet nesting as follows:

a. Where there is an individual or a small group of up to five potential marbled murrelet remnant habitat trees, BLM biologists would selectively mark habitat modification areas around the known individual potential habitat trees. As an additional measure to assure that all potential habitat trees are protected, markers would be instructed to reserve all trees within a 30-foot radius of any tree that is greater than 36 inches in diameter at breast height. A seasonal restriction would be applied, generally within 100 yards of the potential habitat trees that would restrict potentially disturbing activities from April 1 through August 5 for those units within 20 miles of the coast. Additionally, from August 6 through September 15, a daily timing restriction would limit potentially disturbing activity to a period between two hours after sunrise and two hours before sunset. When thinning occurs, the individual habitat tree and any tree that may be enhancing habitat quality of the habitat tree must be protected. This would include adjacent trees that may have branches or foliage providing protective cover for a platform on the habitat tree.

b. Where there is a group of six or more potential marbled murrelet remnant habitat trees within a five-acre moving circle, post out a no-touch ½ site potential tree height reserve buffer around the group of remnant trees. These areas would be removed from the unit, and yarding through the protected area would not be permitted. Additionally, seasonal and daily timing restriction would be applied to the area within a 100-yard radius of the habitat trees. The seasonal and daily timing restrictions would also apply to potentially disturbing activities near suitable habitat along the boundaries of units, and around suitable habitat areas that are within the boundaries, but removed from the units.

PROJECT DESIGN FEATURE - SOILS

1. Locate road construction to minimize intersections with stratigraphy dip angles inclined with the slope. Failure hazards are greater on the north-facing slopes (USDI-BLM, 1995).
2. Locate new road construction on stable geologic features; observant of recent or on-going slide features such as hummocky topography, "pistol-butt" trees, seeps, and springs.
3. Under the direction of a qualified specialist, existing compacted skid roads may be de-compacted through the use of tracked excavation type equipment.
4. Close and decommission roads according to the Best Management Practices listed in Appendix D of the Resource Management Plan.
5. Use one-end suspension cable systems or other similar low impact operations in FGR1[5] classified slopes. Full suspension or seasonal restrictions (dry season only) would be required on FGR2 classified slopes.
6. Place slash on areas of exposed mineral soil when yarding logs within 50 feet of an active stream channel.
7. Identify appropriate waste area disposals prior to road construction, renovation, slide removal, or fill removal. These areas should be located away from stream channels and unstable areas.
8. Protect any identified wetlands from soil disturbance, consistent with Resource Management Plan direction.

[5] Timber Production Capability Classification : fragile due to slope gradient but suitable for forest management using appropriate mitigation. The FGR classification is based on landscape features, various soil properties, and reforestation potential.

PROJECT DESIGN FEATURE - PLANT T&E SPECIES, SPECIAL STATUS SPECIES

Guidelines for management for Special Status Species would be implemented and management recommendations would be used to maintain local persistence of Special Status Species (Brian et al, 2002). Managing known sites is an activity that maintains a species at an occupied site to prevent contributing to the need to list that species as threatened or endangered under the Endangered Species Act.

PROJECT DESIGN FEATURE - TREES EXCLUDED FROM HARVEST

1. Snags and large remnant trees would be reserved from cutting. Snags that must be felled to meet safety standards or are accidentally knocked over would be retained on site. Additional snags would be created by retaining trees used for lift and intermediate support for cable logging operations.
2. Boundaries, spur roads, landings, and yarding corridors would be designed to avoid and protect dominant trees whenever possible.
3. All presently existing down logs in Decay Classes 3, 4, and 5 would be reserved from cutting and removal.
4. Within red alder conversion units, dominant, co-dominant, and healthy shade tolerant conifers would be reserved without regard to land use allocation. Large diameter bigleaf maple and Oregon-myrtle stems greater than 18 inches diameter, or those exhibiting a strong single-stem growth form, would also be reserved without regard to land use allocation to the extent that their retention does not prevent or delay establishing a conifer component on the site or prevent attainment of late-successional characteristics in the Riparian Reserve.
5. The Riparian Reserve LUA would incorporate some hardwood clumps to the extent that their retention does not prevent or delay attainment of late-successional characteristics or prevent establishing a conifer component on the site.
6. Within red alder conversion units and thinnings, multi-stemmed stump sprouted bigleaf maple and myrtle would be cultivated to encourage single stem trees where conifers and dominant single stem hardwoods are absent.
7. When marking and selecting trees for removal, marking crews would be made aware of options beneficial to wildlife that should be considered during tree selection. This would include leaving trees that contain nests currently or previously in use. The marker would also be allowed to leave trees that have damaged tops or other abnormalities that may provide a valuable wildlife habitat component, while having little effect on the results of the thinning operation. These habitat trees would be considered as retained basal area but ignored when determining spacing of leave trees. Fallers would be advised that there is no requirement to fall small or defective live trees that are considered to be non-merchantable.

PROJECT DESIGN FEATURE - ROADS

NEW CONSTRUCTION

1. Road and landing construction activities would be limited to the dry season, generally from May to October.
2. Roads and landings would be designed and constructed to BLM standards. For this project, rocked roads would typically have a running surface of 16 feet, while natural surfaced roads may have a running surface between 12 and 16 feet.
3. Roads would be located on stable locations, such as ridge tops, stable benches or flats, and gentle-to-moderate side-slopes.
4. Stable end-haul (waste) sites would be located prior to end-hauling. These sites would be kept properly shaped, drained and vegetated.
5. Road drainage would be designed to minimize soil erosion and stream sedimentation. Energy dissipaters, culvert down pipes, or drainage dips would be used where water is discharged onto loose material and onto erodible or steep slopes.
6. Road surface shape (e.g. crowning, insloping, and outsloping) that meets planned use and resource protection needs would be used.
7. Bare soil areas created from landing and road construction would be mulched with appropriate weed-free straw, or equivalent, and seeded with a native or BLM-approved mix.
8. Right-of-way clearing limits including the road bed would be approximately 35 feet in width.

ROAD IMPROVEMENT AND RENOVATION

1. Road improvement/renovation activities would be planned to minimize soil erosion and subsequent stream sedimentation (ROD, D-4 #18). These would include, but are not limited to, grading to remove ruts, removal of bank slough, placement of silt-trapping sediment control devices, and adding gravel lifts where needed in the road surface. Existing drainage ditches that are functioning and have a protective layer of non-woody vegetation would not be disturbed.
2. Drainage and soil erosion control practices would be applied to improved or renovated roads in the same manner as newly-constructed roads (ROD, D-4 #17). These may include, but are not limited to, dry season grading and ditch-relief culvert replacements, appropriate end-haul and disposal areas, and proper dispersal of water from ditch-relief culverts.
3. Dirt roads and landings would receive seasonal preventative maintenance prior to the onset of winter rains. Seasonal preventative maintenance may include, but is not limited to installing water bars, sediment control mats or devices, removing ruts, mulching and barricades.
4. When replacing stream culverts, stream flow would be diverted around the work area, sediment would be contained using appropriate filters or barriers, and turbid water would be pumped from the excavation site onto a vegetated terrace or hillslope. Stream culvert replacements would follow ODFW in-stream timing guidelines, which is from July 1 – September 15.
5. Other stream culverts or cross-drains may be installed in areas with deficient drainage during road maintenance or renovation. Table II-6 would be used as the guide for road drainage spacing if needed. In addition, a road drainage feature would be installed upslope of each stream crossing in order to route most of the ditch flow away from the stream and onto forest soils where it can re-infiltrate. Depending on slope and other site conditions, this distance would generally be about 100 feet from the drainage feature outlet to the channel.

Table II-6: Guide for Drainage Spacing by Road Grade and Surface.

Gradients (%)	Road Surface	
	Natural	Rock or Paved
3-5	200	400
6-10	150	300
11-15	100	200
16-20	75	150
21-35	50	100
36+	50	50
Spacing is in feet and is the maximum allowed for the grade. Drainage features may include cross drains, waterbars, ditch-outs, or water dips.		

ROAD MAINTENANCE

1. Road maintenance/renovation activities would be planned to minimize soil erosion and subsequent stream sedimentation (ROD, D-4 #18). These would include, but are not limited to, grading to remove ruts, removal of bank slough, placement of silt-trapping sediment control devices, and adding gravel lifts where needed in the road surface. Existing drainage ditches that are functioning and have a protective layer of non-woody vegetation would not be disturbed.
2. Maintenance of roadway ditch segments that drain directly into stream channels would be conducted only during the in-stream work period from July 1 to September 15 to prevent sediment roadway run-off water from entering stream channels. Work on these ditch line segments can be conducted outside this period when appropriate protection of water quality and soils are applied to these specific sites.
3. Dirt roads and landings would receive annual seasonal preventative maintenance before the onset of winter rains and prior to the contractor leaving the project area during non-hauling periods. Seasonal preventative maintenance may include, but is not limited to cross-ditching, sediment control devices, removing ruts, mulching, and barricades. Bare soil areas created from landing and road construction would be mulched and seeded with native species, if available. If native seed is not available the area would be seeded with an approved seed mix.

HAUL

1. Hauling on dirt-surfaced roads would be prohibited during the wet season, generally November through April.
2. Road conditions would be monitored during winter use to prevent rutting of the rock surface.
3. Depending on road conditions during winter haul, additional sediment filters may be required to prevent sediment from entering stream channels from road ditchlines. Sediment filters would allow for free passage of water without detention or plugging. The filters would receive frequent maintenance and would be removed at the completion of haul. Sediment retained by the filters would be removed and disposed of in areas where the sediment would not be delivered to stream channels.
4. An additional lift of rock would be applied to the area of road that can influence the stream if erosion and sediment delivery is evident from the road tread near live stream crossings.

ROAD CLOSURE/DECOMMISSIONING

1. Water barring, sub-soiling, pulling in-stream culverts, and seeding and mulching would be required as needed to reduce potential erosion and to help restore the natural hydrologic flow. Water bar spacing would follow the guidelines in Table II-6 above.

2. Decommissioned roads would be closed with the installation of a barrier to prevent vehicular traffic. Barriers could include, but are not limited to, tank traps and boulder barriers.

PROJECT DESIGN FEATURE - NOXIOUS WEEDS

1. BLM-controlled haul routes, potential landing areas, and inventoried locations of weeds would be treated, either mechanically or chemically, prior to harvest or road construction activities taking place.
2. To prevent the introduction and spread of noxious weeds during the contract period, machinery and equipment would be washed prior to entering federally-managed lands.
3. Vehicles and equipment would be required to stay on road and landing surfaces, except equipment specifically designated to operate off roads and landings (e.g. mechanical harvesters).
4. To reduce the chance of noxious weeds becoming established, bare soil areas from landing and road construction would be mulched and seeded with native plant species, if available, and fertilized if determined necessary. If native seed is unavailable, bare road surfaces would be seeded with an appropriate seed mix.
5. Units would be periodically monitored after treatment, particularly along roadsides of open and decommissioned roads, to identify new invaders and treat them using an integrated pest management approach.

PROJECT DESIGN FEATURE - FUELS TREATMENTS / FIRE DEFENSE SYSTEMS

1. A standard special provision is included in timber sale contracts to require compliance with applicable Oregon State Fire Laws. Disposal of slash through various burning methods requires compliance with the Oregon Smoke Management Plan.
2. Landing Pullback: Residual slash would be pulled back from all cable landings prior to removal of equipment from the site. Material would be re-piled and placed on top of the existing landing. Pullback and re-piling would also be required for roadside landings in thinning units.
3. Landing and roadside hazard reduction:
    - Fuel hazard reduction measures would be taken on all landing sites and along all primary and secondary roads within the project area that are not identified for closure or decommissioning after harvest operations.
    - In ground based harvest areas ensure that the operator falls trees away from roads as much as possible to reduce the necessity for, and amount of, roadside hazard reduction treatment.
    - Slash within twenty feet each side of those roads within harvest areas not identified for closure or decommissioning after harvest would be hand or machine piled.
    - Landing and hazard reduction piles would be covered with 4 mil black polyethylene plastic and burned during late fall or winter months. Piles would need to be located a sufficient distance (minimum ten feet) from leave trees to limit scorch potential.
    - In lieu of burning the landing or hazard reduction piles, logging debris could be available for biomass utilization. In most cases piled material would be processed within one year after the piling occurs.

AVAILABLE WATER SOURCES/FIRE DEFENSE STRUCTURES

Water sources located on BLM managed lands used to support prescribed fire and wildfire suppression are very limited in the analysis area. Existing fire ponds like the one located in T26S, R12W, Sec. 35 would be maintained to allow for access by fire fighting helicopters. Slash created from these maintenance activities would be either left to decay or disposed of by broadcast or pile burning.

ALDER CONVERSION AREA SITE PREPARATION

Anticipated post-harvest fuel loading (PNW-GTR-231, Series 3-RA-PRE-01, 02, 03 or 05; Ottmar, R.D., Hardy, C., 1989) in conversion harvest units would require some form of fuels treatment to prepare the sites for planting. Multiple site preparation options are available and would be chosen for each site based on slope, aspect, access, available water sources, cost, risk and effectiveness. The most appropriate and cost effective method or a combination of methods would be used to (1) prepare the site for planting at an appropriate spacing or density, (2) reduce the amount and retard the re-establishment of undesirable competing vegetation , (3) reduce hazardous fuel loadings (Table II-7).

Broadcast Burning

For reforestation purposes, broadcast burning would provide the most effective treatment for temporary control of competing vegetation. A hot surface burn with good coverage may set back some competing vegetation for up to 2-3 years allowing for more rapid establishment of young conifer trees. Future maintenance costs may also be reduced. Depending on the actual scale of the project it may also be a more cost effective treatment.

Table II-7: Alder Conversion Units: Site Preparation Recommendations*

Unit No.	Unit Acres	Recommended Treatments
37	40	Hand pile burn/slash lop scatter
43	24	Broadcast/hand pile burn/slash lop scatter
44	12	Broadcast/hand pile burn/slash lop scatter
45	51	Broadcast/hand pile burn/slash lop scatter
52	85	Hand pile burn/slash lop scatter
54	134	Machine & hand pile burn/slash lop scatter
55	116	Broadcast/hand pile burn/slash lop scatter
58	75	Broadcast/hand pile burn/slash lop scatter
63	30	Hand pile burn/slash lop scatter
67	55	Hand pile burn/slash lop scatter
69	3	Hand pile burn/slash lop scatter
70	62	Broadcast/machine & hand pile burn/slash lop scatter
71	95	Broadcast/hand pile burn/slash lop scatter
73	9	Broadcast/hand pile burn/slash lop scatter
74	58	Broadcast/hand pile burn/slash lop scatter
75	32	Broadcast/hand pile burn/slash lop scatter
76	9	Machine & hand pile burn/slash lop scatter
77	12	Hand pile burn/slash lop scatter
81	35	Broadcast/hand pile burn/slash lop scatter
82	26	Broadcast/hand pile burn/slash lop scatter
83	11	Broadcast/hand pile burn/slash lop scatter
Total	**974**	

*(treatment shown by order of fuels management and silvicultural preference)

Units would be prepared for broadcast burning by slashing residual brush and damaged trees. Fire trails with water bars would be constructed down to mineral soil around the perimeter of the burn units. Existing manmade or natural topographical features that would provide a natural barrier to fire may also be used. The units would then be broadcast burned under “spring like” conditions when reserve areas, larger coarse wood and soil moisture remain high. Units would be ignited using hand or aerial ignition. After burning is completed, 100% mop up would be required.

Hand/Machine Piling and Burning/Swamper Burning

Hand piling is an effective method for reducing fuel loading to prepare a unit for replanting. Machine piling is more cost effective but is limited in scope to units with slopes less than 35%. Both methods provide only short term reductions (0-2 years) in competing vegetation. Maintenance may be needed within a few months of replanting.

Units would have existing vegetation (brush, non-commercial hardwoods, prostrate and damaged conifers) slashed during or after harvest, followed by hand or machine piling of logging slash and slashed vegetation ½” to 6” in diameter. Piles would be covered with 4 mil polyethylene plastic and be burned during late fall/early winter months. Machine piling would be an acceptable and more economical option on units where slope and soil conditions allow for such operations, and provided that project design criteria can be met. Jackpot/swamper burning would be an allowable substitute for hand piling where fuels are unevenly distributed in spotty but heavy concentrations. Jackpot/swamper burning involves covering heavy fuel concentrations with black plastic and then burning those areas during late fall/early winter months. Swampers would attend to the burning and create additional planting spots as needed by throwing additional slash from the surrounding area into the burning concentrations. Additional saw work would be done concurrently with the operation to facilitate swamping.

Slash, Lop and Scatter

From a fuels management and silvicultural standpoint, this method of site prep is the least desirable but tends to be the least expensive in initial cost. Future stand maintenance costs are usually incurred from year one through establishment of planted trees. This method does little to abate fuels hazards for the first few years. Until the slashed vegetation and logging slash begins to rot, the site carries a much higher fuel load making it more susceptible to damaging wildfire.

This method of site prep involves slashing brush and logging slash and then lopping the material down to a desired depth. In order to ensure an adequate number of planting spots are obtained, the slash may be scattered in order to reach a fuel bed depth that allows for access with shovels for planting trees.

Fuel Reduction Zones

Much of the project area is adjacent to both private industrial and non-industrial ownership. Fuels reduction along property lines would reduce the risk of damaging wildfire moving from public lands onto private lands and from private lands on to public land.

PROJECT DESIGN FEATURE - HAZARDOUS MATERIALS

Activity resulting from the Action Alternative would be subject to State of Oregon Administrative Rule No. 340-108, *Oil and Hazardous Materials Spills and Releases,* that specifies the reporting requirements, cleanup standards, and liability that attaches to a spill, release, or threatened spill or release involving oil or hazardous substances. In addition, the Coos Bay District Hazardous Materials Contingency Plan and Spill Plan for Riparian Operations apply when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

Timber sale contracts contain appropriate provisions for the appropriate disposal of wastes and handling of hazardous materials. State of Oregon Department of Environmental Quality regulations for spill prevention and containment would apply to any sale contracts resulting from this EA.

CHAPTER III: AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This Chapter identifies the direct, indirect, and cumulative environmental effects that may result from implementation of either of the two alternatives described in Chapter 2. It also addresses the interaction between the effects of the proposed action with the current environmental baseline, describing effects that might be expected, how they would occur and the incremental effects that could result. The description of the current conditions inherently includes and represents the cumulative effects of past and current land management activities undertaken by the BLM and private entities.

ANALYSIS BACKGROUND

Reasonably Foreseeable Actions

Annual recurring activities in the project area include, but are not limited to, fire suppression activities, construction of roads across BLM land under existing right-of-way agreements, routine road maintenance, control of noxious weeds, and silvicultural activities in young stands. Table III -1 displays the timber sale acres and new road construction miles for sales that are active or would be active in the analysis area over the next 3 years outside of the actions covered in this analysis.

Table III -1 Federal Timber Sale activity in the Analysis Area

EA name/number	Timber Sale Name	Contract number	Type of Treatment	Acres in AA	New Road Construction (miles)
OR125-04-17	High Voltage	OR120-TS11-07	CT	60	0
OR125-04-17	McLee	OR120-TS11-08	CT	89	0

Another BLM proposed action that may occur on BLM lands in the analysis area is the Blue Ridge Communication Site Beam Path & Fuels Reduction Project (BRCSB) (DOI-BLM-OR- C030-2010-0007-EA). This project proposal would consist of removing trees from within beam paths that originate from the communication towers at the Blue Ridge communication site to various receivers located throughout Coos County. This would result in narrow corridors extending from the communication towers to allow signal transfer through the forest canopy. A 300 foot hazard fuels reduction zone is also proposed around the tower area. Where possible, the proposal would integrate prescriptions of the Fairview NWFP Project into the BRCSB project. Increasing spacing of trees within the line of the communication site beam path and decreasing the spacing immediately adjacent to the path would allow the average spacing prescribed for the stands to be maintained.

Proposed actions by the Coos County Forestry Department include the Wagons West Sale (WR-1-11). This sale consists of harvesting timber on Coos County owned lands within 50 feet from each side of the centerline of the Coos Bay Wagon Road. Approximately 35 acres of timber is planned for removal within the next several years.

On December 17, 2009, the Federal Energy Regulatory Commission issued a certificate of public convenience and necessity to Pacific Connector Gas Pipeline, L.P. for construction of a natural gas pipeline from Coos Bay to Malin, OR (FERC 2009b). The project is still pending a decision by the BLM to issue a Right-Of-Way grant for this project before it can proceed. A portion of the proposed route goes through the action area and some BLM-managed lands would be crossed. Construction operations would include clearing a temporary 95 foot wide construction right-of-way (ROW), additional storage, and temporary work areas. Following construction, most of the ROW, storage, and work areas would be replanted with conifer, leaving a 30 foot wide portion of the ROW maintained permanently as low herbaceous cover. The PCGP Project is analyzed as part of the baseline (the No Action Alternative) from which the Fairview NWFP Project effects would be added. The effects of this project concerning forest removal are summarized in the following table, Table III -2.

Table III -2: Analysis area BLM acreage in the PCGP Project by age class.

	Age Class Grouping (acres)				Operation Totals (acres)
	> 40 yrs	40-80 years	80+ years	Non-forest	
Permanent 30' ROW - low herbaceous cover condition	1.1	8.7	1.4	0.4	11.6
Clearing' operations for construction	3.6	24.8	3.4	2.8	34.6

When considering other ownerships in the planning area, it is assumed private forests would be intensively managed on a 50-year harvest rotation under the direction of the State of Oregon Forest Practices Act (OAR 527).

Cumulative Effects Considerations

The Council on Environmental Quality (CEQ) provided guidance on June 24, 2005, as to the extent to which agencies of the federal government are required to analyze the environmental effects of past actions when describing the cumulative environmental effect of a proposed action in accordance with Section 102 of the National Environmental Policy Act (NEPA). CEQ noted the "[e]nvironmental analysis required under NEPA is forward-looking," and "[r]eview of past actions is only required to the extent that this review informs agency decision making regarding the proposed action." This is because a description of the current state of the environment inherently includes effects of past actions. Guidance further states 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 historic details of individual past actions."

The information on individual past actions is merely subjective, and would not be an acceptable scientific method to illuminate or predict the direct or indirect effects of the action alternative. The basis for predicting the direct and indirect effects of the action alternative should be based on generally accepted scientific methods such as empirical research. The cumulative effects of this project upon the environment did not identify any need to exhaustively list individual past actions or analyze, compare, describe the environmental effects of individual past actions in order to complete an analysis which would be useful for illuminating or predicting the effects of the proposed action.

VEGETATION

AFFECTED ENVIRONMENT

DISTURBANCE INFLUENCE ON VEGETATION

The effects and frequency of vegetation disturbance in the analysis area can be inferred from historical records and regional fire histories. Fire, agricultural practices, and logging have altered landscape level vegetation patterns. The effect of this history is an overall younger forest that is less capable of providing large wood structures to the streams, and in some cases resulted in changes in species composition. In addition, the history of frequent disturbance suggests the expansion and spread of red alder on the landscape. Records indicate that historical hardwood dominated stands were concentrated on flood plains and low terraces. Data from watershed analyses indicate major fires plausibly burning in the analysis area during the 1500's and mid-1700's. The conversion of floodplains and nearby foothills to agricultural use began in the mid to late 1800's. Records also indicate a portion of the analysis area burned in 1868, and possibly in 1846 or 1850.

Early vegetative maps and published timber inventory document large areas of merchantable timber in the early 1900's. Timber volumes, values, and accessibility were sufficient to allow the General Land Office, charged with managing the Coos Bay Wagon Road lands, to sell timber patents from 1917 to 1937. Settlers attempted but ended up relinquishing homesteads on four sections currently managed by the BLM in the project area. The extent of the effects of these settlement attempts is not known but they likely cleared and burned areas to convert forested areas to grassland.

Figure III- 1: " A view of a typical Fairview grazing area. This is the type of area which is subjected to repeated burning to get it in shape for grazing." Picture taken March 3, 1949 by C. Dunbaur.

The vegetation map for 1930 shows the Blue Ridge area as being recently cutover. This area was likely logged sometime between 1920 and 1930 and then burned in the McKinley-Fairview Fire of 1936. Any regeneration or smaller trees that existed after the logging operations likely burned up in this fire. Under the O&C Administration, and later the BLM, at least some of the sections were grass seeded and managed for grazing into the 1950's. Grazing was an established practice in the analysis area until it was phased out by 1964. As sustained yield for timber management was phased-in, aerial seeding or planting supplemented by natural seeding from harvest unit seed trees became the preferred regeneration methods.

Little information on mortality patterns due to natural agents exist prior to 1950. The 1949-1950 blowdown provided conditions favoring the buildup of severe bark beetle populations in 1951 and persisted until they began to decline in 1953 (Wright; Lauterbach 1958).

The Coos Bay Wagon Road which provided a link to Coos Bay from the Roseburg area, was completed in 1873 and passes through the project area. The rest of the road network in the Fairview NWFP Project area is a mixture of public, private, and BLM roads built over the past 70 years of forest management activities and agricultural settlement.

Figure III-2: Photo showing the Blue Ridge Area in 1936 following the McKinley-Fairview Fire.

STAND DENSITY

Most stands included in the proposed treatment units regenerated following timber cutting. Some areas have received silvicultural treatments such as brush control, pre-commercial thinning, and fertilization to enhance growth and vigor. Several areas on Blue Ridge were commercially thinned in the 1970's and 1980's. Portions of these previous thinnings are included in proposed units 14, 15, 19, 22, and 57. These stands have continued to grow since the previous thinning to the point where inter-tree competition and density are affecting growth and vigor once again.

Relative density (RD) expresses the density of the trees relative to a theoretical maximum density. RD increases for a given number of trees per acre as stem diameters increase. RD decreases for a given stem diameter as the number of trees per acre decreases. Stands with a relative density above 40 are experiencing high inter-tree competition leading to the threshold of competition based imminent mortality. The proposed stands in the project area have an average RD of approximately 65 and have reached the stem exclusion stage of stand development.

SPECIES AND STRUCTURAL DIVERSITY

Douglas-fir (*Pseudotsuga menziesii*) is the primary overstory tree and most common species in the proposed treatment area. The majority of the areas proposed for commercial thinning are densely stocked plantations of 30 to 60 year-old conifer trees. Douglas-fir is the dominant overstory species and can comprise upwards of 80% of the species composition in many of these stands. Western redcedar (*Thuja plicata)*, and western hemlock (*Tsuga heterophylla*) are also components in the overstory in some areas. A higher concentration of one of these species can demonstrate a different plant association for the area. Remnant legacy trees, 80 years and older mostly Douglas-fir and western redcedar, can also be found scattered in the project area either in clumps or located sporadically in amongst the younger trees.

Western hemlock is the primary understory conifer in most of the project area; however western redcedar is also common in some stand areas. Western redcedar has been observed in approximately half of the proposed treatment units ranging from a co-dominant cohort to an understory tree.

Port-Orford-cedar (*Chamaecyparis lawsoniana*) is a regional endemic species, occurring only in southwest Oregon and northern California. On the Coos Bay District, the northern limit of the species is the coastal dunes north of North Bend, within the Coos watershed. There is little known occurrence of Port-Orford-cedar within the proposed treatment area. Recent inventory of stands in the proposed area indicate that it is limited to occupying the intermediate and suppressed canopy layers. Based on stand inventory data, of the approximately 18 % of project acres that may contain the species, less than 1% of the species composition may include Port-Orford-cedar.

The hardwood tree component is patchy within the stands of the project area. Red alder (*Alnus rubra*) is the most common hardwood species and is found throughout the elevational range of the area but most often occurs on lower slopes, drainage bottoms, wet areas, and along roadside areas. Other hardwoods include Oregon-myrtle (*Umbellularia californica*) on the upper slopes, and scattered bigleaf maple (*Acer macrophyllum*) on lower slopes or drainage bottoms. Relatively small amounts of tanoak (*Lithocarpus densiflorus*) and golden chinkapin (*Castanopsis chrysophylla*) occur along drier ridges and upper south facing slopes.

Understory shrub and herbaceous plant communities are underdeveloped in many areas due to the dense canopy layer. Rhododendron (*Rhododendron macrophyllum*) and Oregon grape (*Berberis nervosa*) typically dominate the drier ridge tops, upper slopes, and south and west aspects. Vine maple (*Acer circinatum*), salal (*Gaultheria shallon*) and huckleberry (*Vaccinium ovatum*) typically dominate the more moist lower slopes, drainage bottoms, and north and east aspects which usually contain a low herbaceous cover typified by sword fern (*Polystichum munitum)* and sorrel (*Oxalis oregana)* in varied dense copious amounts in the semi-shaded canopied areas. Other fairly common shrubs and herbs found in the majority of the area are California hazelnut (*Corylus californica*) ocean spray (*Holodiscus discolor*), creeping blackberry (*Rubus ursinus*), salmonberry (*Rubus spectalibis*), bedstraw (*Gallium aparine*), redwood violet (*Viola sempervirens*) and trillium (*Trillium ovatum*).

Most snags and down trees in the treatment area are the products of suppression related mortality and were recruited from the smaller trees in the stands. Random events, such as wind damage, and biotic disturbance, such as root rot, are ongoing fine-scale processes that create small gaps, and recruit low numbers of larger snags and down wood across the project area. Conifers in the proposed project area are young enough to exhibit rapid lateral branch elongation in response to the added growing space provided by a gap-creating event. Consequently, canopy gaps created by the death of one or a few trees will disappear within a few years following a gap-creating disturbance for as long as the stands remain in the stem exclusion stage of stand development (Peet and Christensen 1987; Oliver and Larson 1996, pg. 146-149).

The structural stage of federal forest land within the analysis area includes 10% early seral, 21% mid seral, 34% late seral, 17% mature seral, and 17% old-growth as defined by the 1995 RMP. Treatments would occur within the late seral stage which includes the competitive exclusion stage of stand development as defined by Franklin et al. (2002). "The biomass accumulation/competitive exclusion stage is an extended period of young stand development in which the tree cohort totally dominates the site. In Douglas-fir seres it commonly extends from canopy closure until 80–100 years of age. This stage is characterized by rapid growth and biomass accumulation, competitive exclusion of many organisms, and, in many cases, intense competition among the tree cohort. Competitive exclusion of species and competitive thinning amongst the tree cohort began with canopy closure and intensifies during this stage."

Table III-3: Proportion of Late Successional Forest by Watershed

Fifth Field Watershed	% Late Successional
North Fork Coquille River	34%
South Fork Coos River	47%
Coquille River	17%
Coos Bay Frontal Pacific Ocean	39%

The analysis area currently supports 34% late-successional forest patches as defined by the 1995 RMP. This proportion of late successional forest, compared to younger age classes, is above the 15% retention level required by the 1995 RMP. Table III-3 summarizes a broader landscape level analysis of late-successional forest by individual 5th field watershed.

CONIFEROUS STANDS

The conifer stands in the treatment area are a result of establishment after timber removal. Stand ages range from approximately 40 to 75 years in age. The average diameter of the individual stands ranges from 12 to 21 inches at breast height (DBH). The stands proposed for commercial thinning are even-aged and overstocked conifer dominated stands composed of primarily Douglas-fir.

RED ALDER STANDS

The red alder dominant stands were previously disturbed by past timber removal, grazing, fire, or other disturbances. The areas proposed for alder conversion have scattered and clumped conifers growing within them and supported conifer previously based on timber surveys and historical accounts of the area documented within various watershed analyses. The history of land clearing and burning for grazing activities greatly influenced these landscape areas.

The Coos Bay District used the Western Oregon Digital Image Project data, derived from 1997 Landsat Thematic Mapper images, to estimate that 15.7% of the analysis area supports hardwood stands. The proposed units contain 4.7% of all hardwood acres within the analysis area (Appendix A, Map B - Hardwood Stands and Proposed Units). This estimate includes alder thinning areas. These hardwood areas are too small to break out as separate units and are embedded within some conifer thinning units.

Alder composition in the units proposed for conversion averages approximately 58%. Total hardwood composition averages approximately 76%. Stand ages range from approximately 32 to 62 years in age. The average diameter within individual stands ranges from 13 to 18 inches at breast height (DBH). Species that may occur within these stands is roughly the same as those found within the conifer dominated stands. Conifer and other hardwood species are present in varying degrees as scattered clumps within the alder stands. The canopy position of clumped or scattered individual conifer trees within the alder stands can vary from dominant overstory to suppressed understory.

FOREST DISEASE MANAGEMENT

Port-Orford-cedar (POC) is often affected by a root disease pathogen (*Phytophthora lateralis*). Spread of the pathogen is linked, at least in part, to transport of spore-infested soil, surface water, and other vectors such as animals. Restricting movement and activities of vectors is a control method that can be either active or passive. Active restrictions include closing roads to travel, requiring dry-season harvesting, and cleaning of all vehicles before they leave infested areas or enter clean areas.

The POC Risk Key provided in the 2004 ROD (p.33), which gives direction for assessing risk and controlling spread of P. lateralis, was used for stands in the project area. Risk is deemed to be low and no additional POC management practices are required due to low occurrence and presence away from streams.

Swiss Needle Cast (SNC) is a foliage disease of Douglas-fir caused by the ascomycete fungus *Phaeocryptopus gaeumannii*, resulting in defoliation and reduction of growth. The pathogen itself is native to the Pacific Northwest and specific to Douglas-fir. The effects of Swiss needle cast (SNC) are most severe in Douglas-fir (Pseudotsuga menziesii) plantations on coastal sites of northwestern Oregon, where Sitka spruce and western hemlock or red alder were historically dominant species (Hansen et al. 2000). The disease has been viewed with increasing concern due to its presence and increase throughout Douglas-fir plantations of the coast range.

In 2009, the Swiss Needle Cast Cooperative (SNCC) decided to expand their plot system sampling from only those lands affected by the Swiss Needle Cast disease in the high-impact zone to other zones affected by the disease including the southern Oregon coast and SW Washington. As a result, the SNCC installed 51 new sites along the southern Oregon coast, including one plot installed within one mile of the Fairview project. SNC was present in all 51 stands sampled, however, the degree to which it was present varied widely. Results from the sample plots installed in Coos County showed an overall favorable needle retention (2.4 – 3.1 years) that would not preclude thinning operations (Shaw et al. 09_).. SNC levels on the Coos Bay District are typical of those found in Coos County.

Ellen Goheen, USFS Pathologist with the Southwest Oregon Forest Insect and Disease Service Center, stated that in her numerous visits to the Coos Bay District over the last 20 years, she has not observed levels of SNC that indicate the district is experiencing SNC impacts that are over and above the levels typical for this part of the coast range. Her most recent visits in 2011 support this observation (Pers. Phone Conversation). She recommends assessing individual stands using walk-through evaluations of needle retention and maintaining or planting a mix of species in stands with moderate to high levels of SNC (needle retention 2.5 years or less).

EFFECTS OF THE NO ACTION ALTERNATIVE

The No Action Alternative would leave stands on a development trajectory that would be very different from the pattern followed by the stands that developed into the old-growth forests found in the Coast Range today. The attainment of secondary structural characteristics would be postponed. Furthermore, the No Action Alternative would retard the stand growth, would not provide wood fiber in the near future or increase the growth rate of wood fiber for future harvest.

The timber stands identified for treatment in this project are characterized by uniform structure, heavy stocking, slowing growth rate, and declining stand vigor. Research indicates that stands that develop at very high densities have a limited variation in tree size, which makes them susceptible to diameter growth stagnation and instability (Wilson and Oliver 2000). Without treatment at the appropriate time, these dense plantations rapidly decline in growth and vigor resulting in a stagnant stand that becomes more susceptible to wind, fire, insects, and disease. With the finite site resources being divided among many trees, the individual trees will have slower growth rates, and therefore will be smaller than trees growing in the more open areas of a stand (Oliver and Larson 1990, pg. 211-217).

The high competition and low-light penetration into these stands would result in an exclusion of an understory stand (USDI-BLM 2001, Ch. 14). The low light levels at the forest floor may result in the death of legacy understory plants that carries over from the previous stands, and in the death of plants that established during the stand initiation phase of stand development. The low light levels would limit the establishment and growth of new understory herbs and shrubs for as long as the stands remain in the stem exclusion stage. At the highest overstory densities, little or no chlorophyllic vegetation would survive.

RIPARIAN RESERVES

Under the No Action Alternative, retaining the higher stocking levels in the proposed stands would hinder attainment of three functions of the Riparian Reserve that are contingent on the presence of large diameter trees: large wood delivery to streams, large wood delivery to riparian areas, and wildlife habitats (FEMAT 1993, USDI, Ch. 13 BLM 2001).

Stand density and diameter growth are inversely related, thus slowing diameter growth would delay attainment of habitat features provided by large diameter trees and inhibit potential for quality large wood delivery in the future. From a habitat perspective, higher stocking levels in these areas also translate to a general lack of stand gaps and openings within forested stands. The gaps and stand openings are necessary for recruiting understory trees and associated multi-canopy structural complexity (Hayes et al 1997).

Snags and down wood produced by competition mortality in the dense unthinned stands would be from the lower crown classes and thus result in recruitment from among the smaller diameter and short crown-depth trees. The higher stocking levels would increase the availability of small snags and down wood but would delay attainment of wildlife habitats associated with large diameter trees. These include large diameter snags, large diameter down wood, prey substrates provided by large surface areas of coarse deep-fissured bark, deep canopies, large limbs, and large platforms, cavities and other structures found in damaged or injured large trees (Neitro et al. 1985; Weikel and Hayes 1997). Carey et al. (1999) observed that suppression mortality in conifers does not contribute materially to cavity habitat or canopy gap formation. Small snags usually do not have top rot or cavities and do not stand very long. They do contribute to the wood debris amounts on the forest floor for a relatively short time before decaying. Stand projection simulations suggest it would take an un-thinned stand 200 years to produce large diameter forest structure associated with late-seral stands.

Whereas the candidate stands for thinning are well stocked to over stocked, research suggests that the stands that survived to become old-growth were under stocked when young. The rarity of old-growth trees with tightly-spaced rings that were laid down when they were young suggests young stands grown at high densities have a lower chance of surviving 250 years or longer compared with young stands grown at wider spacing (Tappeiner et al. 1997; Poage 2000). Thus, slow growing high-density stands may not be able to provide long term structural components needed to achieve Aquatic Conservation Strategy objectives.

The alder dominated stands in the Riparian Reserve would neither be fully capable of providing the conifer related benefits to streams, floodplains, or aquatic organisms nor provide connectivity and habitat benefits for late-successional associated species. Red alder dying during stand breakup would provide some snag habitat; however, when an alder dies, it decays quickly. This rapid rate of decay greatly limits the longevity of alder stems as instream structure, snags or down wood (Niemiec et al 1995; Keim et al. 2000). Salmonberry may contribute organic litter to streams, but it would also limit or exclude other vascular species from streamside areas, limiting the diversity of organic matter that could enter the aquatic system. In areas near streams, Hibbs and Bower (2001) found the greatest shrub diversity occurred under pure conifer stands and the greatest herb diversity occurred under conifer-dominated stands. The amount and character of organic particulate matter provided by red alder to streams under the No Action Alternative would not be meaningfully different from that provided by retaining alder within the no harvest buffers on perennial and intermittent streams.

CONIFEROUS STANDS

Under the No Action Alternative, the trees would continue to grow, but tree and stand vigor would decrease with age due to overcrowding. Differentiation would occur over time with the more dominant trees suppressing the less vigorous trees. Suppression induced mortality would occur in the less vigorous intermediate and suppressed crown classes.

In stands of shade intolerant species such as Douglas-fir, suppression related mortality would kill the smaller trees in the stand. Because untreated stands remain in the stem exclusion stage longer, the closely spaced trees generally have small crowns, low crown ratios, and a correspondingly small root mass. Trees in this condition are more vulnerable to blowdown around where gaps form in those stands, and on the lee side of sharp ridges and stand edges (USDI-BLM 2001, Ch. 14). This mortality would provide snags and down wood; however, because of their small sizes, they would only last a relatively short time. Few large trees die because of competition (Peet; Christensen 1987). Instead, insects, disease, mechanical or weather related injury or physical disturbance cause most mortality among larger trees.

RED ALDER DOMINANT STANDS

Under the No Action Alternative, alder stands without an adequate conifer component would be expected to transition into shrub-dominated communities as the alder reaches maturity. These stands would not be fully occupied or contribute to future sustainability objectives for GFMA lands. Stands with only a scattering of surviving conifers or a scattering of long-lived shade-tolerant hardwoods would likely transition into a very open stand condition with a heavy shrub layer. As the alder component of the stand breaks up, more light reaches the forest floor allowing the shrub layer to become very vigorous (Oliver; Larson 1996, pgs. 252-259). Studies of succession in Coast Range alder stands (Henderson 1970, Carlton 1989) have indicated that shrub dominance, especially by salmonberry increases with time, and that tree regeneration is generally lacking (Minore and Weatherly 1994). In the absence of a disturbance, the red alder stands with a salmonberry understory will become brush fields when the alder dies (Newton and Cole, 1994). On seeing how effectively salmonberry can hold a site, Hemstrom and Logan (1986 pgs. 24-26) proposed the theory that salmonberry stands are the probable climax communities where the seral community is an alder stand with a salmonberry understory without a releasable conifer component. Later authors concur with Hemstrom and Logan's observations (Emmingham and Hibbs 1997; Newton and Cole 1994). In addition, some authors further propose other highly competitive clonal species, such as vine maple and salal, can also form climax communities in the absence of disturbance following the demise of an alder stand (sources summarized by Harrington 2006).

Barring disturbance, persistent shrub communities can delay establishment of conifer trees indefinitely. Trees cannot establish in a salmonberry brush field without a disturbance that frees growing space (Emmingham, Hibbs 1997; Hemstrom, Logan 1986 as cited in Emmingham et. al 2000). Under local climatic conditions red alder stands would continue to persist until about age 90 years followed by a rapid decline shortly thereafter. Few live alder would remain by stand age 130 years (Newton and Cole 1994). Conifers would be present, provided either that conifers established before the alder or if conifers established in sizeable gaps between alder (Newton et al. 1968). In the absence of disturbance, additional conifers are unlikely to become established under a fully stocked alder stand. The understory conifers are at risk of competition related mortality until they emerge above the alder. Conceptually, the conifers could emerge after stand age 40 years when the alder grows to near their maximum height (Newton and Cole 1987). However, conifers that reach up into the alder canopy would have difficulty growing past the red alder into a free-to-grow position because storm winds cause the stiff lateral alder branches to whip the adjacent conifers, thus damaging and breaking off the terminal buds or damaging the leaders of the understory conifers. This keeps many conifers from emerging above the alder even after the alder has reached its potential height (Kelty 1986; Wierman and Oliver 1979).

Alder stands with a dominant conifer component, or shade tolerant conifers that successfully emerged through the alder following a canopy-opening disturbance, would have a somewhat different trajectory. After 130 years, these stands will transition into a low-density conifer stand with large individual trees (Stubblefield; Oliver 1978, Newton; Cole 1987). Without disturbance, a well-established shrub layer under the low-density conifer stand can preclude recruitment of understory trees.

On a watershed scale, alder stands would contribute to landscape scale diversity by providing contrasting conditions to that found in conifer stands.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE

The action alternative would meet the objective of enhancing the growth and vigor of trees within GFMA stands, and improving stand structure within the Riparian Reserve. Treatments would also provide economic returns in jobs and wood products. In the long term, there would be an increase in the quality of wood products available in the GFMA and larger trees would be available in the Riparian Reserve for future sources of large woody material and snags.

SPECIES AND STRUCTURAL DIVERSITY

The variation of prescriptions among stands would contribute to landscape scale diversity. There is also a mix of untreated areas adjacent to proposed stands that would contribute to landscape diversity. These stands would be retained in current condition indefinitely due to inaccessibility or current structural attributes. Approximately 650 acres have already been withdrawn from proposed treatment after project scoping. Variation would be introduced by differences in residual stand density and stand structure. Stand level diversity would also be improved by use of variable width tree retention to emulate natural variation of spacing, gap creation, and by sustaining the overall stand species composition among minor species. Within-stand density would change with the passage of time. As the increased amount of light reaches into the canopy, leave trees would rapidly recapture the growing space and eventually result in the resumption of the effects of overcrowding. Barring stand disturbance, the relative densities inside the stand would increase as the average tree diameters increase until density enters into the range of imminent competition mortality. The effects of the proposed action on stand densities is consistent with the intent of creating stands that have structure important to wildlife, while still maintaining adequate stand-level growth rates for timber production.

By removing trees of reduced vigor, there would be a short-term reduction of suppressed and intermediate trees for small snag and down wood recruitment. Minor damage to bark of some residual trees is expected during harvest activities. A seasonal restriction for yarding during the spring when bark is loose is expected to minimize residual tree damage. Trees that do become damaged may be utilized to develop into snags for wildlife habitat objectives. There is only a slight chance that black stain disease (*Leptographium wageneri*) could infect some damaged trees resulting in additional small snags. However, most trees in the project area are older than 30 years and not considered to be susceptible to black stain (Hessburg et. al. 1995).

The overtopped conifers with the better potential for release from shade competition are those with both a height-to-diameter ratios of 100 or less, and a live-crown to tree height ratio of 30 or greater (Emmingham et al 2000 pg 22). Conifers with height-to-diameter ratios above 100 will be at risk of blowdown until they can take advantage of the increased growing space and develop favorable diameter to height ratios and expanded root systems (Oliver & Larson 1996, pgs. 83-88, 223-224). Depending on site conditions, pre-treatment crown and root mass of the leave trees, thinning may result in a short-term increased risk of blowdown. With increases in crown size and a corresponding increase in root mass and bole thickness, the risk of blowdown or snap out decreases.

Sample tree falling would emulate the effects of the thinning treatments by only falling trees that would be designated for removal in the stand prescription. If sample tree falling occurs within an area that is later removed from the planned sale unit, the gap creation and variation of spacing may increase structural diversity within the stand.

There would be minimal or no effect on Port-Orford-cedar or spread of the root rot fungus (*Phytophthora lateralis*) by selection of the Proposed Action Alternative. The project design features require vehicle washing for all logging and road construction equipment. This is also effective in preventing the introduction of any fungal spores, including those of the root rot fungus. Even if the spores of *Phytophthora lateralis* were deliberately introduced, the lack of hosts present would not allow the spores to persist in the area of the proposed project. There are only very scattered individual POC present creating discontinuous populations. POC would be retained and managed where conditions are likely it will escape infection. These conditions include, but are not limited to, ridge tops, uphill from creeks, and on well-drained sites. Where applicable, site specific measures would provide ways to minimize the potential for introduction/spread. These include incorporating tree spacing to facilitate discontinuous populations and not retaining POC within 25 feet of an existing road or stream in the unit.

There would be minimal or no effect on Swiss Needle Cast presence or spread by selection of the Proposed Action Alternative. Recent studies have shown that "even Douglas-fir trees severely infected with SNC showed some response to thinning, on average, because their growth ratio tended to be greater than if no thinning was performed." A positive growth response to thinning was observed at all levels of infection, although less so at high infection levels (Mainwaring et al. 2005). Project design features to favor retention and/or planting of disease resistant species would be implemented if stands are identified as having moderate to high levels of SNC (needle retention 2.5 years or less) present in the stand.

RIPARIAN RESERVES

Research by Bailey and Tappeiner (1998) and Newton and Cole (1987) demonstrate that thinning dense stands can encourage development of overstory structure similar to that of old-growth forests described by Spies and Franklin (1991) with concomitant benefits for species associated with older forests (McComb et al. 1993). Thinning young stands may also stimulate development of understory structures through a combination of stimulating regeneration in the understory, increasing the survival and growth of suppressed and intermediate trees, and fostering the development of diverse shrub layers.

As these treated stands age, secondary structural characteristics such as understory canopy development and large trees are likely to develop sooner than if no treatments are made. Tappeiner et al. (1997) observed old-growth trees that averaged 20 inches in diameter at age 50 years and often were 40 inches at age 100 years. This individual tree growth rate is higher than observed in similar unmanaged plantations.

Thinning would remove mainly trees that would have died in the coming 20 years, from competition mortality, had there been no thinning. The no-treatment buffer would assure attainment of small wood entering the stream for short-term recruitment needs. As the stand grows and competition or natural disturbance causes mortality, the trees that die would be larger in the treatment area. Although, the dead trees would be larger than those recruited from the unthinned area, few of those dead trees would be large enough to provide long-lasting large structure until the stands are at least 80-years of age (USDI, BLM 2001).

Coniferous Stands

Thinning would result in increased tree growth and vigor of individual trees by concentrating growth on fewer stems and increasing the growing space for the trees left on the site. As the trees increase photosynthetic surface to take advantage of the growing space, more food becomes available for the leave trees to maintain or increase crown length and volume, root mass, diameter growth, and the ability to produce the pitch and protective chemicals used by the trees to ward off insect and disease.

Thinning would decrease the time each stand is in the competitive exclusion stage thus moving each stand more rapidly into the maturation stage of stand development. Thinning would promote a more vigorous understory and allow plants with lower shade tolerance to better maintain a presence in the stand. Along with this successional progression is a more rapid attainment of average stand diameters of 20-inches and larger. This corresponds to a shift from secondary habitat to primary habitat conditions for several mammals and attainment of nesting conditions for several birds associated with late-successional forests (sources summarized by Harris 1984, pgs. 59-64 and displayed in figures 5.11- 5.13 of the same).

The proposed thinning would reduce stocking levels from about 100 to 260 TPA down to between 50 and 90 TPA. The treatments would consist of thinning from below with retention of under-represented hardwoods and healthy shade-tolerant conifers that typically occupy lower canopy positions. The intent is to leave the trees that have the greatest potential for rapid response with allowances for maintaining species diversity. These trees are most capable of shading the forest floor, deflecting wind, and buffering temperatures within the treated stands. The removal of the smaller co-dominant trees increases the light level inside the canopy, allowing for deeper crowns, and increases light at the forest floor allowing understory vegetation establishment and growth.

These treatments would allow favorable growing conditions to exist for several decades after harvest. Growth modeling using the FVS growth model shows that after thinning to an RD of 35, the average stand RD would increase to over 40 after 30 years of growth.

Cutting red alder in the thinning units would increase available growing space for the coniferous trees left on the site and promote increased tree growth and vigor of individual trees. Existing small red alder patches prevent the lateral expansion of the conifer crowns into the growing space within the stand. Gaps between the alder trees created by thinning would allow some understory conifers, when they occur, to break through the alder canopy into full sunlight. Alder are near their maximum height at age 40 years (Newton and Cole 1987), whereas conifers will continue to grow, nearly doubling their heights between the ages 40 and 160 years (McArdle et al 1961, pg. 12). The increased light levels at the forest floor would result in more vigorous growth of the herb and shrub layers. Some red alder are expected to regenerate from stump sprouts or seed and reestablish themselves as an understory component following treatment.

Red Alder Dominant Stands

Under the action alternative, the reduction of the alder component would increase available growing space for the coniferous trees left on the site and for newly planted trees filling gaps. Some stands would retain a diverse mix of stand components including thinned clumps of conifer, residual large hardwoods such as bigleaf maple and Oregon-myrtle, and residual understory trees such as western redcedar. Thinning the hardwood component in the areas that contain releasable conifers would promote a conifer presence in those parts of the units currently occupied by large hardwood patches, and augment species diversity within stands. Overtopped conifer, which can be released and survive the logging operations, would go through a period of shock until their shade needles are replaced by sun needles. Conifers that are not capable of releasing may either die of shock or fail to regain epinastic control. Conifers that are successfully released would contribute to the structural diversity of the new stand.

Site preparation would temporally reduce herb and shrub cover and reduce interspecies competition enough to allow successful conifer regeneration and establishment. Treatments increase the sunlight reaching the forest floor resulting in higher photosynthesis rates for the residual vegetation and conifer regeneration. Following site preparation, the herb and shrub layer plants and stump sprouting species, or those that can regenerate from rhizomes or other asexual means, will rapidly recolonize the site. Pioneer plants, with light wind-disseminated seeds, will germinate throughout the treated area; however, only those seedlings that sprouted on open ground away from the highly competitive re-sprouting plants have a reasonable chance of adding to the species composition of the new stand. Logging debris would provide a pulse of fine and coarse wood debris to the forest floor. In the near term, this debris will add to the fuel loads, will pin down some residual plants capable of vegetative propagation through layering, reduce plantability, provide small mammal and amphibian habitat, and moderate the microclimate near the ground. In the longer term, the decomposed logging debris would add organic matter to the soil and release nutrients for recycling. The increased sunlight would warm the soil increasing microbial activity. This will result in increased decomposition rates and nutrient cycling, and increased root growth and efficiency of nutrient and water uptake by vascular plants (Kramer and Kozlowski 1979 pg. 197.)

Cutting the alder from sites would remove that source of nitrogen fixation; however, nitrogen levels under alder stands reach equilibrium before age 20 (Newton et al. 1968). Thus, cutting the older alder stands would have little effect with respect to accumulation of nitrogen in the soil. The eventual restoration of late-successional conifer stands would restore conditions favorable for nitrogen fixing lichens and asymbiotic nitrogen fixation in dead wood. Both of these mechanisms provide a low but constant input of nitrogen resulting in large amounts of fixed nitrogen over the hundreds of years that a late-successional old-growth forest occupies a site (Hicks and Harmon 2002).

Alder conversions across the landscape would increase the area and continuity of conifer cover, and would restore forest type patterns more typical of the late-successional habitat that dominated the landscape prior to intensive management for wood products and wildfires. This will increase the habitat area and connectivity that benefits certain late-successional forest associated species, and would meet one of the intended functions of the Riparian Reserve (USDA-USDI 1994 pg. B-13). Site-level reestablishment of conifers near small and medium sized stream reaches would, in time, provide those reaches with sources of large durable wood that can provide in-stream structure.

Thinning thru the larger patches of red alder within Riparian Reserves would provide more growing space for the alder left on the site and may result in a growth response where young trees comprise the patches. However, unlike many tree species, red alder height growth is sensitive to rapid changes in stand density. Thus while thinning young alder stands can produce a large increase in basal area growth increment following thinning, this is initially counterbalanced by a decline in height growth resulting in little net change in volume growth (Hibbs et al. 1989). Thinning will have little effect on growth of alder in the older high-density alder patches (Hibbs and DeBell 1994). The primary benefit of thinning older high-density alder patches would be to increase the light penetration though the alder canopy and by that increase the light available for any understory trees, shrubs and herbs that may be present. Where existing alder stands also support other hardwood species, this hardwood component would likely develop into mixed stands. Within the reserve land-use allocations, the regenerated conifer stands would eventually supply habitats for species associated with late-successional forest conditions.

The conversion process curtails the short-term contributions of small nondurable alder wood to the forest floor, and forgoes attainment of a pulse of large nondurable alder snags and down material that would have been produced when the alder stand breaks up about age 90 to 130 years. With successful conversion to a conifer or mixed stand, conversion sites would begin to produce small nondurable conifer wood following canopy closure at age 10 to 15 years. Random mortality would begin recruiting larger diameter snags and down wood, sometime between the year 2060 and 2080. This corresponds to the window in which the alder stand breakup would occur under the No Action Alternative. The conifer stand would continue to supply large durable snags and woody material until the Douglas-fir component is exhausted 500 to 1,000 years in the future.

Alder stands with a dominant conifer component, or shade tolerant conifers that successfully emerged though the alder following a canopy-opening disturbance, would have a somewhat different trajectory. After 130 years, these stands will transition into a low-density conifer stand with large individual trees (Stubblefield; Oliver 1978, Newton; Cole 1987). Without disturbance, a well-established shrub layer under the low-density conifer stand can preclude recruitment of understory trees thus delaying attainment of the structural complexity associated with late-successional forests. An underburn, either natural or prescribed fire, could set back the shrub layer facilitating understory tree recruitment. However, that carries a risk of loss of the overstory trees, because the overstory trees will be predominately fire intolerant hemlock and redcedar with few fire tolerant Douglas-fir (sources summarized by Minore 1979). These sites would develop some attributes associated with late-successional forest but will lack others. Stands with a disproportionate number of western hemlocks would be at higher risk of loss to fire. The low-density conifer stands would have only a limited ability to contribute large wood to the stream channel and forest floor while maintaining some capacity to provide shade to the stream when compared to moderate to well-stocked conifer and mixed stands. Since alder wood is nondurable, alder produces snags with a very short useful life for cavity using wildlife. However, excavator species that use decay class 4 and 5 conifer snags may also use hardwood snags (Chambers et al 1997).

Red alder is well suited to facilitate primary succession on young soils, such as glacial outwash, and rebuilding soils damaged by erosion and repeated hot fires (Bormann et al 1994). Under some conditions during secondary succession, alder can improve growth of associated species. However, recent work suggests that nitrogen inputs by alder stands on sites that are already nitrogen rich can reduce soil calcium and magnesium availability (Compton et al 2003; Perakis et al 2006). Alder regenerated directly back on site that had previously supported an alder stand will exhibit reduced growth due to the higher soil acidity. This is because one generation of red alder can change the acidity of the underlying forest soils by as much as 50 years of acid rain (research note on page 9 of the April 1991 Journal of Forestry). Bormann and coauthors (1994) noted that: *"On nitrogen rich sites with deep, highly weathered substrates, a negative feedback may develop to reduce growth of pure alder stands and the potential productivity of subsequent ecosystems."*

AFFECTED ENVIRONMENT AND EFFECTS BY ALTERNATIVE

The water resources analysis area consists of the eight subwatersheds containing the proposed harvest units (Table III-4).

Table III-4. Proposed harvest acres by subwatershed (approximate values based on GIS data)

Watershed	Subwatershed	Subwatershed acres			Proposed harvest acres		Thinning acres as % of total acres	Conversion acres as % of total acres
		BLM	Other	Total	Thinning	Alder Conversion		
North Fork Coquille River	Hudson Creek	7,812	15,198	23,010	4,080	112	17.7%	0.5%
	Middle Creek	19,390	13,063	32,453	137	0	0.4%	0.0%
	Johns Creek	3,170	15,602	18,772	41	0	0.2%	0.0%
Coquille River	Cunningham Cr.	2,049	19,297	21,346	1,076	257	5.0%	1.2%
	Beaver Slough	430	12,879	13,309	129	289	1.0%	2.2%
Coos Bay Frontal Pacific Ocean	Isthmus Slough	60	21,556	21,616	12	46	0.1%	0.2%
	Catching Slough	3,091	13,740	16,831	553	270	3.3%	1.7%
South Fork Coos River	Daniels Creek	4,015	21,459	25,474	342	0	1.3%	0.0%

Almost all precipitation in the proposed harvest units (54 to 78 inches annually, OCS (1995)) occurs as rainfall from October to May and is due to frontal storms originating over the Pacific Ocean. Annual stream flow is closely correlated with annual precipitation. Fall rains recharge soil moisture depleted by summertime evapotranspiration[6] and stream flow. In winter, rainfall is rapidly converted to runoff because soils remain wet between frequent storms and evapotranspiration diminishes. During spring, runoff decreases due to less rainfall, increasing transpiration by plants, and increasing canopy interception and evaporation of precipitation. Both rainfall and discharge drop to seasonally low levels in the summer.

Stream locations in the analysis area were identified with Light Detection and Ranging (LiDAR)[7] for the purpose of establishing accurate channel and riparian buffer maps. Field surveys and/or use of LiDAR contour elevations and other LiDAR derived data were used to establish the upstream end or inception point of each stream originating in or flowing through the proposed harvest units. These streams were ordered and labeled with flow and fish presence information from field surveys and existing maps (Table III-5).

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[6] Evapotranspiration is defined as the water lost to the atmosphere from the ground surface, evaporation from the surface of vegetation, and the transpiration of groundwater by plants.

[7] Light Detection and Ranging is an optical remote sensing technique using laser pulses from a plane to calculate the position of an object (e.g. the ground, the top of a tree) by measuring the time delay between transmission of the pulse and detection of the reflected signal.

Because rain is infrequent in the summer, many tributaries within the proposed harvest units exhibit extremely low base flows (gallons per minute), discontinuous pools or they dry entirely. Intermittent channels with seasonal flow, a definable channel, and evidence of annual scour and deposition account for approximately 75% of the entire channel network within the proposed harvest units. Approximately 89% of the streams are non-fish-bearing.

Table III-5. Channel characteristics within the proposed harvest units

Stream Type	Stream Order[8]	Channel Length (miles)
Intermittent (seasonal flow), no fish present	1	40.3
	2	9.8
	3	0.4
	Total	**50.5**
Perennial (year around flow), no fish present	1	0.6
	2	4.2
	3	4.3
	4	0.3
	Total	**9.4**
Perennial, fish present	2	0.7
	3	5.3
	4	1.4
	Total	**7.4**

STREAM TEMPERATURE

The Oregon Department of Environmental Quality develops water quality standards that protect the beneficial uses of rivers, streams, lakes and estuaries. Section 303(d) of the Federal Clean Water Act requires that Oregon develop a list of water bodies that do not meet water quality standards. Two stream reaches in the analysis area, lower Woodward Creek and lower North Fork Coquille River, are listed for exceeding the 64.4 °F temperature standard[9] designated to protect salmon and trout rearing and migration. The majority of energy for summertime stream heating comes from solar radiation, and wider waterbodies such as main stem Woodward and North Fork are more susceptible to heating because they are not fully shaded.

No Action Alternative

Past federal timber sales in the analysis area would have incorporated no-harvest buffers to protect against stream temperature increases. Since the inception of the Northwest Forest Plan in 1994, approximately 2,130 acres of thinning and 135 acres of regeneration harvest have been planned and completed in the analysis area.

Water temperature increases are possible on private forest land within the analysis area because the Oregon Forest Practices Act allows removal of shade producing vegetation on small (two cubic feet per second or less average annual flow) and medium sized (2 to 10 cubic feet per second average annual flow) non-fish-bearing streams. Temperature increases would be dependent on the length, width and orientation of the affected streams, shrub cover over the channel post-harvest, and other factors.

Settlement and agricultural activities in the valleys of the analysis area have led to water temperature increases in lowland streams. Higher stream temperatures will likely persist because of the loss of riparian vegetation and changes brought about by channel dredging and straightening (e.g. loss of floodplains, loss of in-channel large wood).

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[8] First-order headwater streams have no tributaries. When two first-order channels join they form a second-order stream. When two second-order channels come together they form a third-order stream, and so on. If two streams with different orders join then the higher order is retained. The main stem always has the highest order (Strahler 1957).

[9] The value given for the temperature standard, 64.4 °F, is the 7-day average maximum temperature. The 7-day average maximum is the average of the daily maximum stream temperatures for the seven warmest consecutive days during the summer.

Construction of the proposed Pacific Connector Gas Pipeline would have little lasting effect on the water temperature of any one stream in the analysis area. The Jordan Cove Energy and Pacific Connector Gas Pipeline Project Final Environmental Impact Statement states that "any changes in water temperature, related to vegetation clearing at waterbody crossings, are likely to be very small and undetectable through measurements, except for possibly the very smallest and often intermittent flowing streams. Any temperature changes that may occur would gradually be reduced or eliminated over time as most riparian vegetation, from plantings and natural vegetation growth, increases in size increasing stream shading (FERC 2009, p. 4.5-105)."

The proposed pipeline crosses 52 streams in the analysis area between the South Fork Coos River and the North Fork Coquille River, including two intermittent streams within the proposed harvest units (FERC 2009). The 75 to 95-foot construction right-of-way would intersect some streams (e.g. Coos River, Catching Slough) that are already poorly shaded; therefore, little riparian vegetation would be lost during construction. At least 38 of the 52 stream crossings would be less than 10 feet wide, and trees and shrubs would be permitted within 5 feet of the pipe centerline in all riparian areas following construction.

Proposed Action Alternative

Density management thinning and alder conversion in the Riparian Reserves would not measurably increase the water temperature of any stream. The proposed harvest unit boundaries are all greater than or equal to 100 feet slope distance from occupied coho habitat and coho critical habitat. On other perennial stream reaches, no-harvest buffers greater than or equal to 60 feet slope distance would protect the primary shade zone and portions of the secondary shade zone. The primary zone provides shade from 10 a.m. to 2 p.m., the period of greatest solar loading, and the secondary zone provides shade during the less critical morning and afternoon hours. Additional or redundant shade would come from thinned areas outside the no-harvest buffers with greater than 50% canopy closure, and upslope conifers and hardwood species reserved from cutting in alder conversion units. Light Detection and Ranging data was used to establish no-harvest buffers because this tool can accurately delineate the trees and shrubs that are tall enough to provide shade when the sun is high in the sky and direct solar radiation is the most intense. Therefore, there would be no added temperature effects above those identified in the no action alternative.

Similarly, sample tree falling outside of the no-harvest buffers would have no effect on stream temperature in the proposed harvest units. Sample trees are a subset of those trees marked for removal and would be well outside of the primary shade zone. Sample tree felling would not have a discernable effect on secondary shade as well. The stand density within the commercial thinning units averages approximately 176 trees per acre. The felling of one tree per 2.5 acres, or one tree out of 440, would not measurably reducing canopy closure within the secondary shade zone.

There are nine proposed harvest units upstream of the two stream reaches in the analysis area that are listed for exceeding the State's water temperature standard. The streams that drain these proposed units are narrow (1-2 meters wetted width), well shaded by trees and dense shrubs, and cool. Continuous summer stream temperatures were recorded in 2010 at eight different sites within one of the proposed units draining to the North Fork Coquille River and the 7-day average maximum temperatures ranged from 55.8 to 57.1 °F.

Cable yarding corridors would not measurably increase stream temperatures. The proposed corridors would be far narrower than the maximum corridor width specified in the Coos Bay District Resource Management Plan (1995, p. D-5) (approximately 12 feet wide versus 50 feet), the spacing between corridors would be greater than the minimum corridor spacing of 50 feet listed in the Plan, and there would be far less than 250 feet of corridors within any 1,000 feet of stream. Eighty-eight percent or 371 of the 420 possible yarding corridors would cross small, relatively brushy, intermittent streams that have discontinuous flow or no flow during the time of the year when water temperature is a concern. Projected yarding corridors that cross intermittent streams are dispersed over 34 different harvest units and the corridors overlap just 1.7% of the 50.5 miles of intermittent streams within the proposed harvest units.

Forty-nine yarding corridors would cross 0.7% or 588 feet[10] of the 16.8 miles of perennial streams within the proposed harvest units. These corridors would be spread between 11 different harvest units, and no corridor would be closer than 800 feet from occupied coho habitat and 830 feet from coho critical habitat. These stream crossings would be analogous to gaps created naturally in riparian buffers. In a recent study of riparian and aquatic habitats of the Pacific Northwest, Everest and Reeves (2007) state that although little research has been done on gap dynamics in riparian buffer strips, gaps created by both stem snap of weakened trees and uprooting of healthy trees probably have minimal effects on summer and winter water temperatures.

LARGE WOODY DEBRIS DELIVERY TO STREAMS

Wood enters streams via chronic and episodic processes (Bisson et al. 1987). Chronic processes such as tree mortality and bank erosion generally deliver single pieces or relatively small numbers of trees at frequent time intervals (Reeves et al. 2003). Episodic or infrequent events including windthrow, severe floods, landslides and debris flows[11] can rapidly add large amounts of wood to streams. Windthrow and flooding happen on a scale of years to decades. Landslides and debris flows are highly variable in space and time and they have a recurrence interval of decades to centuries (May and Gresswell 2004).

Tree fall from mortality and windthrow, landslides and debris flows are most responsible for the delivery and distribution of wood in first and second order headwater channels. These channels account for 83% or 56 of the 67 stream miles within the proposed harvest units. Larger 3rd and 4th order streams receive wood from these processes as well. Bank erosion and flooding also deliver wood to these lower gradient streams.

Wood of all sizes from small fragments to entire trees is important to stream function. However, because decay rate and probability of displacement are a function of size, large pieces have a greater influence on habitat and physical processes than small pieces (Dolloff and Warren 2003). In first and second order streams, wood that is large relative to the channel can store large volumes of sediment in the interval between debris flows (May and Gresswell 2004). The distribution of wood in these low order channels is mainly determined by the pattern of local wood recruitment because small streams have insufficient flow to transport large pieces downstream (May and Gresswell 2003a). In higher order perennial streams, wood that is large relative to the channel decays slowly and resists downstream transport, creates pools and backwaters, and stores sediment and smaller wood.

Only one Oregon Department of Fish and Wildlife (ODFW) stream habitat survey has been completed on a stream within the proposed harvest area. Steele Creek, a 3rd order tributary to the North Fork Coquille River, was surveyed in 1998. Survey Reaches 2 and 3 describe main stem habitat in Unit 1, and Reach 5 characterizes the main stem habitat in Unit 3. Pieces of large woody debris (LWD, 15 centimeters x 3 meters minimum piece size) per 100 meters of stream length are undesirable in Reach 3 according to ODFW Aquatic Inventory and Analysis Project habitat benchmarks (Foster et al. 2001). Pieces of LWD per 100 meters in Reaches 2 and 5 are intermediate (i.e. they are above the number specified as

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[10] 49 yarding corridors x 12 feet per corridor = 588 feet.

[11] A landslide is a mass of soil, rock or debris that breaks free on a steep slope. A debris flow is a rapidly moving slurry of rock, soil, wood and water that travels down a steep stream channel.

undesirable but below the number specified as desirable). All reaches are undesirable for volume of LWD per 100 meters of stream length and key pieces per 100 meters of stream length. Key pieces of large wood are a minimum of 60 centimeters in diameter and 10 meters in length, and they represent the long-term wood retention ability of the stream.

It is not surprising that Steele Creek rates intermediate or undesirable in the three LWD categories. Benchmark values are partially derived from habitat conditions in streams draining relatively undisturbed forest, and Units 1 and 3 contain second growth that is less than 50 years old. Past harvest of streamside trees all but eliminated delivery of LWD while decay and downstream transport reduced in-stream LWD.

No Action Alternative

Protection of riparian forests established after logging ensures continued delivery of wood to streams draining District lands. Streamside stands in the proposed harvest units are old enough to contribute functional or pool-forming LWD based on modeling of wood recruitment by Beechie and coauthors (2000). According to their study, 13 centimeter diameter wood is functional in streams with a bankfull width of 5 meters. The estimated time from stand establishment to first recruitment of wood of this size is 7 years following alder regeneration and 15 years following conifer regeneration. The estimated time to the first increase in wood abundance (i.e. recruitment > depletion) is 10 years and 30 years following alder and conifer regeneration respectively. Existing stands in the proposed harvest units are 40 to 75 years old, and almost all of the streams draining the units have bankfull widths less than 5 meters.

In the foreseeable future, most wood delivered to streams crossing BLM-managed lands would likely come from tree fall due to mortality and windthrow, bank erosion, and overbank flooding. Continuous forest cover coupled with relatively gentle (<70%) topography typical of the proposed harvest units reduces the chance of landslides and debris flows. In their analysis of the storm impacts of 1996, Robison and others (1999) found that the highest hazard for shallow rapid landslides in their western Oregon study sites was found on slopes of over 70% or 80% depending on landform and geology. Robison and coauthors also found that stands between 10 and 100 years in age typically had lower landslide densities and erosion volumes as compared to younger and older forest stands. Recent landslide and debris flow activity was not found within the proposed harvest units during field work for this environmental assessment. Large wood that is partially buried in the stream bed and the stream bank was routinely encountered when shade and water temperature measurements were being made in various units and stream inception points were being verified on the ground. This material is legacy wood that is unrelated in size class to the surrounding forest (May 2002), and it is stabilizing stream channels while wood recruitment recovers following past harvest.

Alder stands perpetuated on sites subject to disturbance such as stream banks and floodplains would continue to deliver wood to the channel network. Larger diameter, persistent stream structure would need to come from conifers, and upslope alder stands transitioning into shrub-dominated communities would exclude conifers from sites that they once occupied.

Proposed Action Alternative

The analysis of the environmental consequences of the Proposed Action Alternative on LWD delivery to streams begins with the following description of stream buffers.

Figure III-3 shows the various buffers associated with the perennial (thick blue line) and intermittent (thin blue line) streams in a portion of thinning Unit 1. The green shading to the south of the east-west running perennial reach and to the west of the north-south running perennial reach is the primary shade zone as defined using LiDAR. The thin black line that parallels the east-west perennial reach represents a 60-foot horizontal buffer. The thin black line outside of the 60-foot line shows the extent of a 100-foot horizontal buffer. Thin black lines surrounding the intermittent reaches represent 35 and 100-foot horizontal buffers. The tan area shows the Riparian Reserves based on a site potential tree height of 240 feet. The jagged black line is the outer edge of vegetation that is taller than the slope distance to the stream. First return LiDAR elevations that map the canopy were compared with slope distances to the stream to develop this layer. This layer does not show individual trees and shrubs.

Based on the LiDAR shade analysis the east-west perennial stream in Figure III-3 would receive a 90-foot no-harvest buffer on the south side and a 60-foot no-harvest buffer on the north side. The perennial reach to the northeast would receive a 90-foot no-harvest buffer on the west side and a 60-foot no-harvest buffer on the east side. The 35-foot horizontal buffers surrounding the intermittent reaches capture a percentage of the vegetation that is taller than the slope distance to the stream (i.e. the buffers include some but not all of the trees that could fall directly into the stream). Figure III-4 shows the percentage of the total acres of this vegetation that is contained within 35-foot and 100-foot buffers by harvest unit. The 35-foot buffers average 31 percent (range 12 to 51 percent) of the total acres and the 100-foot buffers average 93 percent (range 80 to 100 percent) of the total acres. Actual on the ground 35-foot slope distance buffers may capture more of the area where trees could fall directly into the stream because average buffer widths may exceed 35 feet. The marking goal for intermittent streams is to retain all trees within 35 feet slope distance of a stream bank, or identifiable topographic near the bank, or within 35 feet of a floodplain, or within 35 feet of the streamside vegetation, whichever is greater.

Trees that are as tall or slightly taller than the slope distance to the stream may contribute small wood to the stream if they fall directly towards the channel, but they may not contribute LWD. Large woody debris usually consists of pieces of wood or tree boles that exceed a specific diameter and/or length (e.g. 20 centimeters x 1.5 meter (Robison and Beschta 1990), 20 centimeters x 2 meters (May and Gresswell 2003a), 15 centimeters x 3 meters (Foster et al. 2001)). Therefore, more than just the tip of the tree would need to contact the channel to provide LWD. Robison and Beschta (1990) use the term effective tree height to mean the height to the minimum diameter and length necessary for the wood to qualify as LWD. Because LWD dimensions are variously defined in scientific publications, effective tree height can vary.

Recruitment of LWD to streams is influenced by slope steepness adjacent to channels. Sobota and coauthors (2006) measured fall directions of riparian trees (40 to >200 years old) in the Pacific Northwest and found that trees were more likely to have fallen towards the channel on steep hillslopes (>40%) than on moderately sloped landforms (<40%). The authors believe that undercutting of root masses by channel erosion processes, light exposure to the natural canopy opening over a stream, and soil movements on hillslopes influenced tree fall direction by shifting a tree's center of gravity towards the stream. Use of the authors field data in a wood recruitment model showed that 1.5 to 2.4 times more large wood (number of tree boles) would be recruited to stream reaches with steep hillslopes than to reaches with moderate hillslopes. Figures III-3 and III-5 show the same channel network in Unit 1. In Figure III-5, note that the LiDAR stream shade layer has been removed, and a slope steepness layer has been added. The 60-foot and 90-foot perennial buffers encompass much of the stream-adjacent steeper ground. Intermittent buffers capture some but not all of the ground greater than 40% slope.

Figure III-3: Buffers associated with perennial and intermittent streams in a portion of thinning Unit 1

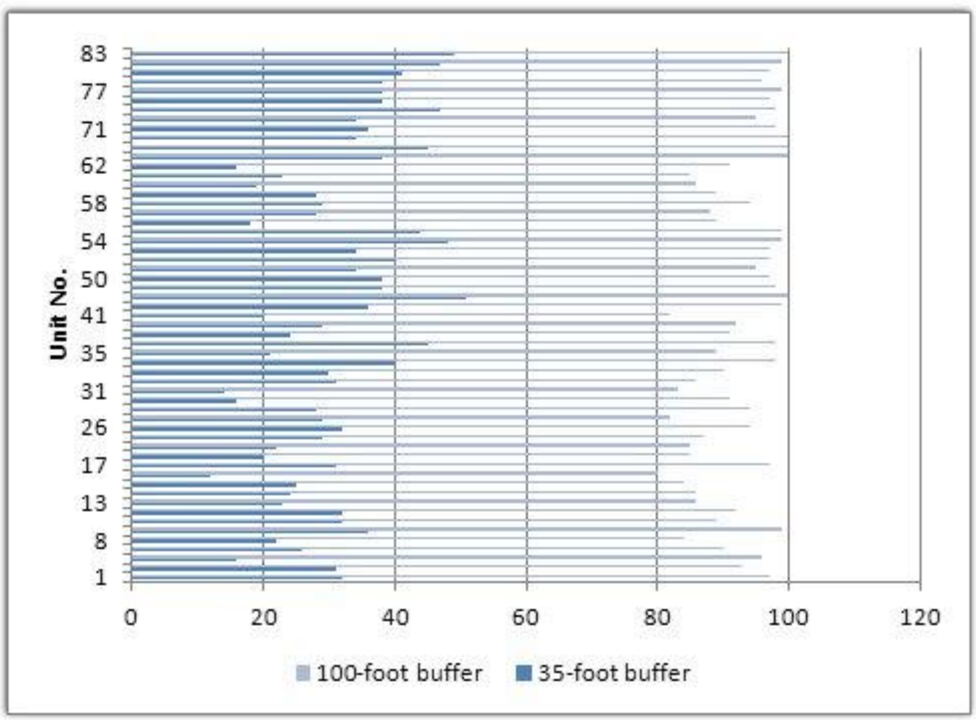

Figure III-4: Percentage of the total acres where vegetation height is greater than the slope distance to the stream by buffer width and harvest unit. All unit numbers are not displayed on the graph, but the data represents all proposed units that contain intermittent streams.

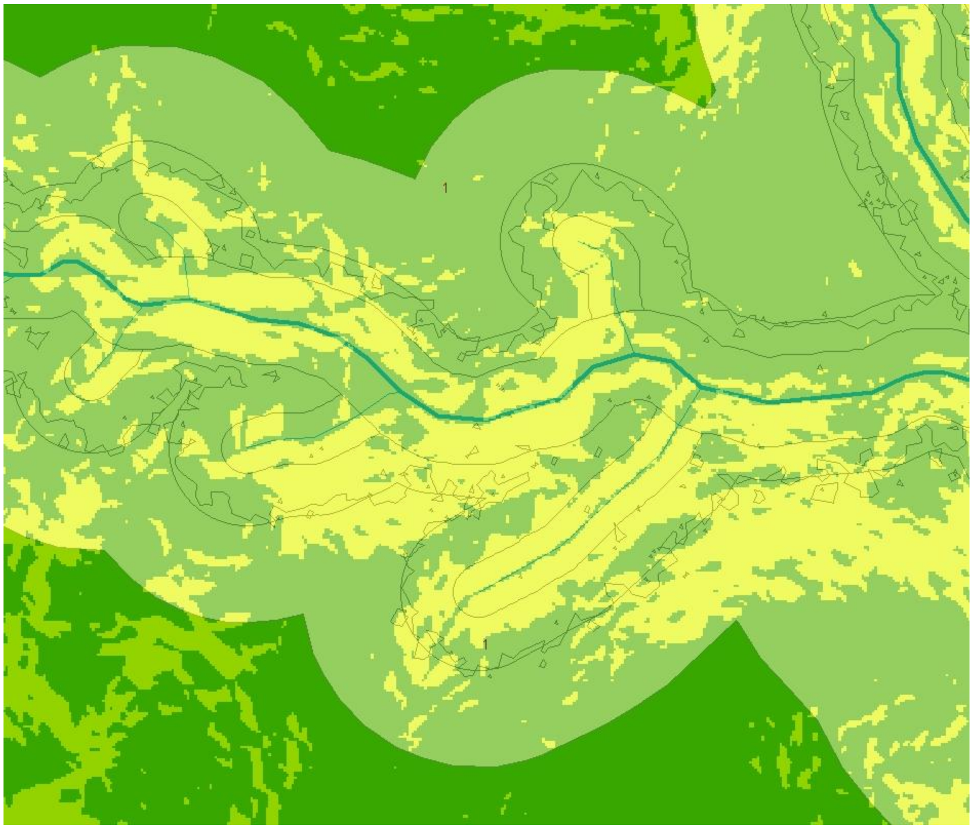

Figure III-5: Slopes less than 40% (green) and greater than 40% (yellow) in a portion of thinning Unit 1.

No-harvest buffers would protect stream bank and floodplain source areas for wood, and harvest activities would not likely trigger landslides or debris flows. No-harvest buffers and trees remaining within the units would stabilize the soil, new roads would be disconnected from drainages, and existing roads would be renovated/improved and maintained.

One hundred foot (30 meter) buffers on occupied coho streams and coho critical habitat, and 60 to 100-foot buffers on other perennial stream reaches would protect a majority of the LWD source areas in the Fairview riparian stands that are typically 60 to 120 feet tall. The effectiveness of riparian forests to deliver LWD is low at distances greater than approximately one tree height away from the channel (FEMAT 1993). Exceptions include trigger trees or trees that fall and knock other trees into a stream but do not fall into the stream themselves (Reid and Hilton 1998) and trees that slide downslope. Depending on site conditions, there may be an increase in "triggering" and LWD delivery if residual conifers in thinned stands outside of the no-harvest buffers have height-to-diameter ratios greater than 100. The incidence of blowdown or snap out would decrease in a few years as the remaining conifers increase their crown size, root mass and bole thickness. McDade and others (1990) found that the downslope movement of LWD along 1st through 3rd order streams in western Washington and Oregon was greater on steep slopes and greater in old-growth (> 200-year-old) conifer stands than shorter mature (80- to 200-year-old) conifer stands and mature hardwood stands. The authors also found that more than 83% of hardwood pieces delivered to streams originated within 10 meters of the channel as compared with 53% of conifer pieces, and all hardwood pieces were delivered from within 25 meters of the channel. Greater than 90% of debris pieces from mature conifer stands came from within 30 meters of the stream bank.

Thinning to within 35 feet of intermittent channels to maintain or increase the growth and vigor of dominant trees would result in decreased delivery of some LWD to channels due to the harvest of suppressed and intermittent trees. However, not all of the smaller and shorter trees removed from beyond 35 feet would reach the stream in the absence of harvest. Some trees would die standing, decay, and fall as pieces on the forest floor, and some trees would not fall towards the channel. Some trees would fall in the channel and be large enough to influence stream hydraulics at the site scale. Dominant trees remaining after harvest would be available to provide the largest possible pieces of LWD that the site has to offer. Trees that are felled for cable yarding corridors would be dropped in intermittent channels to provide a pulse of LWD. No-harvest buffers would contain those areas where tree mortality rates and in turn LWD contributions may be increased by channel erosion, seasonally saturated soils, increased presence of shorter-lived hardwood species, and locally steep banks associated with inner gorges (Reid and Hilton 1998). Landslides and debris flows resulting from harvest activities are not expected. Should they occur, thinning leaves trees in upslope source areas and no-harvest buffers contain those areas most likely to be scoured. May (2011) collected width information on 53 post-1996 debris flows in the Siuslaw National Forest and found that the average eroded surface width in first through third order streams was 9 meters (+/- 7 meters standard deviation), and the debris flow impacted width was 10 meters (+/- 8 meters standard deviation).

Alder conversion beyond the 35-foot no-harvest buffers would reduce the number of hardwood trees that may provide LWD to streams. No-harvest buffers however would include those areas most likely to provide hardwood pieces (McDade et al. 1990), and conversion would reestablish conifers in slope positions they once occupied and eventually replace contributions of relatively nondurable alder wood with larger and more decay resistant conifer wood. As stated in Chapter 3 "With successful conversion to a conifer or mixed stand, conversion sites would begin to produce small nondurable conifer wood following canopy closure at age 10 to 15 years. Random mortality from this cohort would begin recruiting larger diameter snags and downed wood sometime between the year 2060 and 2080. This corresponds to the window in which the alder stand breakup would occur under the No Action Alternative. Residual conifers and hardwoods in the conversion units beyond the 35-foot buffer would still be available to provide LWD.

The ability of LWD to stabilize channels and store sediment in the headwaters and form pools and backwaters, provide cover, and trap spawning gravels in downstream perennial reaches is determined by the input rate, species composition, and size distribution of trees recruited to the channel (Reid and Hilton 1998). Harvest within the Riparian Reserves outside of the no-harvest buffers, especially along intermittent channels, has the potential to retard the timing and reduce the amount of LWD input, but increase the size of trees that may eventually fall in the channel. Beechie and coauthors (2000) modeled LWD recruitment and concluded that thinning of the riparian forest does not increase recruitment of pool-forming LWD where the trees are already large enough to form pools in the adjacent channel and that thinning reduces the availability of adequately sized wood. This study did not address the influence of no harvest buffers on recruitment of functional or pool-forming wood, and it is unlikely that the potential loss of some recruitment would change the overall character of the low-order streams draining the proposed harvest units. Headwater channels are confined by topography and bedrock and therefore resist change in channel form. Harvest unit streams contain legacy wood, wood recruited since the last harvest, and there is no evidence of recent debris flow activity. Also, thinning with buffers ensures continued inputs of LWD on federally-managed land, and conversion restores source areas for large, durable wood. Wider no-harvest buffers on perennial streams are a tradeoff. These buffers would protect shade and existing inputs at the expense of growing larger conifers closer to the stream. Larger pieces of wood that enter larger streams are more effective at maintaining a stable position in the channel and creating and sustaining habitat.

SEDIMENTATION

Sediment input to stream channels is a result of both natural and management related processes. Primary sediment sources include episodic landslides and debris flows usually associated with intense winter storms, hillslope erosion, stream bank erosion, and roads. Forest management related increases in sedimentation are most often the result of poorly designed and/or poorly maintained forest roads. These roads can be a major contributor of fine sediment to streams (Reid and Dunne 1984).

There are no streams in the analysis area listed by the Oregon Department of Environmental Quality as impaired by excess fine sediment. However, some roads in the analysis area show evidence of surface erosion, inadequate drainage, inadequate stream crossings or unstable cut banks and fill slopes. These roads are likely to provide excess fine sediment to adjacent streams.

No Action Alternative

Under this alternative, project-related roads identified in the analysis area as potential sources of sediment to streams would not be renovated or improved in the next few years. Future maintenance activities would depend on road use priorities and District budgets. Throughout the analysis area and on all ownerships, present-day road design, construction and maintenance practices would benefit water quality.

The proposed Pacific Connector Gas Pipeline (PCGP) crosses 52 streams in the analysis area. According to the environmental impact statement issued for the project, construction of the pipeline could result in minor, short-term impacts to waterbodies. Impacts including increased sedimentation could occur because of in-stream construction activities, use of access roads, or construction on slopes and riparian areas adjacent to stream channels.

The Proposed Action Alternative and the PCGP Project share relatively few road segments and the segments are located upslope away from streams. The pipeline follows approximately 2,900 feet of a road to be renovated in Unit 1, 2,200 feet of a road to be improved in Unit 3, and 900 feet of a new ridge-top road in Unit 8.

Proposed Action Alternative

Project design features would prevent or greatly minimize sediment delivery to all streams within and adjacent to the proposed harvest units.

The Proposed Action Alternative excludes the following from harvest: stream-adjacent slumps, inner gorge areas, and vegetation within at least 35 feet of intermittent streams, 60 feet of perennial streams, and 100 feet of occupied coho habitat and coho critical habitat. In a recent two year study of surface erosion and sediment routing following clear cut logging in western Washington, Rashin and others (2006) found that stream buffers were most effective at preventing sediment delivery when timber falling and yarding activities were kept at least 10 meters from streams and outside of steep inner gorge areas.

No-harvest buffers would adequately protect bank stability because the contribution of root strength to maintaining stream bank integrity declines at distances greater than one-half a crown diameter (Burroughs and Thomas 1977; Wu 1986, both cited in FEMAT 1993, p. V-26). Also, no-harvest buffers would make effective filter strips because most undisturbed forest soils in the Pacific Northwest have very high infiltration capacities and they are not effective at overland sediment transport by rain splash or sheet erosion (Harr 1976; Dietrich et al. 1982).

Sample tree falling operations outside of the no-harvest buffers would not cause sediment to enter the streams in the proposed harvest units. Ground disturbance would be negligible from felling trees and the trees would not be removed during the sampling process.

The use of cable yarding corridors would cause negligible stream bank erosion and sedimentation. Riparian trees in all yarding corridors would be directionally felled away from the channels. Full log suspension would be required over perennial streams and would typically be achieved over intermittent streams because of the steep terrain. Bare mineral soil exposed by skidding logs would be covered with slash within 50 feet of any channel to trap sediment and prevent erosion.

Sedimentation would not have an effect on occupied coho streams and coho critical habitat because of the felling and yarding project design features and the relatively long distances between coho habitat and the proposed yarding corridors. The average distance between yarding corridors over intermittent streams and coho and coho critical habitat is greater than 3,300 feet, and the average distance between perennial stream corridors and coho and coho critical habitat is greater than 3,600 feet. Only four yarding corridors over intermittent streams are within 1,000 feet of occupied coho streams and they are 390 feet, 590 feet, 625 feet, and 970 feet upstream. Seven yarding corridors over intermittent streams are within 1,000 feet of coho critical habitat, and the closest corridor is approximately 270 feet upstream. Corridors over perennial streams would be at least 800 feet upstream from occupied coho habitat and coho critical habitat.

Road Construction

The Proposed Action Alternative includes construction of approximately 31 miles of new roads (Table III-6). New roads would occupy roughly 61 acres or 0.04% of the analysis area[12]. Approximately 11.6 miles or 48% of the new rock roads would be closed to traffic by a gate, and seventy-four percent or 5.5 miles of new dirt roads would be closed to traffic by a gate. There are two intermittent stream crossings proposed in Unit 11, and they are located approximately 1000 feet upstream from perennial flow and 5000 feet upstream from occupied coho habitat and coho critical habitat. With the exception of these crossings, new road segments are 55 to 1,170 feet (374 feet average) from the nearest intermittent channel.

Roads have the potential to increase sediment delivery to stream channels; however, Reid and Dunne (1984) found that the amount of sediment produced by a road is highly variable depending on the traffic intensity and surface type. In a study of sediment production from forest road surfaces in siltstone and sandstone geology, the authors measured 130 times as much sediment coming from a heavily used road compared with an abandoned road, and a paved road yielded less than 1% as much sediment as a heavily used gravel road. In addition and especially important, the road drainage network must be connected to a stream channel in order to deliver sediment-laden runoff. Heavily used roads with poor surfaces that are adjacent to a stream channel have the highest capacity to deliver sediment and reduce water quality.

[12] Acreage estimate based on a 16-foot compaction width.

Table III-6. New road construction

Categories	New Dirt	New Rock	Total
No. of segments	62	157	219
Outside units	1.4 mi.	0.9 mi.	2.3 mi.
Inside units - upland	5.2 mi.	21.2 mi.	26.4 mi.
Inside Riparian Reserves	0.9 mi.	1.6 mi.	2.5 mi.
Total	7.5 mi.	23.7 mi.	31.2 mi.
No. of segments to be decommissioned	22	70	92 (42 %)
Miles to be decommissioned[13]	3.0 mi.	10.2 mi.	13.2 (42 %)
Miles of full decommissioning[14]	0.3 mi.	0 mi.	0.3 mi.
No. of segments gated	42	65	107 (49%)
Miles on gated road system	5.5 mi.	11.6 mi.	17.1 mi. (54%)
No. of segments on or near ridge	54	154	208 (95%)
Miles on or near ridge	6.5 mi.	23.7 mi.	30.2 mi. (96%)
Haul season	Summer	Year Round	N/A
No. of stream crossings	2 (intermittent)	0	2

As mentioned above, most new roads would be located on or near ridge tops and all new roads would be disconnected from the drainage network except for two seasonal use temporary crossings; therefore, road construction, haul, and decommissioning would not cause sedimentation. Road surfaces and drainage features would be maintained during active hauling and seasonally during non-hauling periods. Aside from harvest activities, new roads would have little or no traffic. Over half of the proposed road segments are behind existing gates or they would be closed with a barrier following harvest. The installation and removal of the two stream crossing culverts and fills would not cause sediment to enter surface water because construction would occur in intermittent channels during the dry season.

Road Renovation, Improvement and Haul

Older, minimally maintained roads are a greater risk to aquatic resources than the proposed new roads built to current standards. The proposed renovation, improvement and decommissioning would allow the Coos Bay District BLM to correct erosion problems across a relatively large geographic area, and provide a long-term (many years) benefit to water quality in the affected areas.

A negligible amount of sediment would be delivered to streams as a result of road renovation and improvement. Renovation and improvement activities would be limited to the dry season, nearly 88% of the renovation and improvement road miles would be located in the uplands away from stream crossings (Table III-7), and half of the renovation and improvement road miles would be behind existing gates and these gated roads have greater than 80% of the stream crossings. Outside of sporadic timber haul, half of the roads and many of the crossings would receive little traffic.

Three stream crossings on 2.6 miles of existing road to be decommissioned would be removed during the dry season and the channels would be restored to a natural gradient. Removing the entire fill placed when the culverts were installed, and establishing native vegetation on the disturbed slopes would prevent or minimize downstream sedimentation.

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[13] A decommissioned road segment, according to the Western Oregon Districts Transportation Management Plan (TMP), will be closed to vehicles on a long term (> 5 years) basis, but may be used again in the future. Prior to closure with an earthen barrier or its equivalent the road will be left in an erosion resistant condition.
[14] A fully decommissioned road segment, according to the Western Oregon Districts TMP, will be closed permanently. Prior to closure with an earthen barrier or its equivalent cross drains and stream crossing culverts and fills will be removed to restore natural hydrologic flow. The road will be seeded and mulched and will not require future maintenance.

Approximately 101 miles of forest road in and adjacent to the proposed harvest units would be used for haul. This includes 26 miles of summer haul only roads and 75 miles of roads that could be used year round depending on the weather and the condition of the road surface.

Table III-7. Road renovation and improvement

Categories	Renovation	Improvement
Upland miles	48.7 mi. (88%)	12.7 mi. (88%)
Riparian Reserve miles	6.4 mi.	1.8 mi.
Total road miles	55.1 mi.	14.5 mi.
Miles behind existing gates	27.2 mi. (51%)	8.3 mi. (56%)
Miles to be decommissioned	3.0 mi. (5%)	5.7 mi. (38%)
No. of intermittent crossings	29	7
No. of perennial crossings	18	1
No. of crossings behind gate	38 (81%)	7 (88%)
No. of crossings summer haul only	17 (36%)	0
No. of crossings over coho critical habitat	5	0
Distance to CCH for non-CCH crossings	0.1 to 2.3 mi.	0.1 to 1.6 mi.
No. of crossings over occupied coho habitat	3	0
Distance to occupied coho habitat for other crossings	0.1 to 3.3 mi.	0.2 to 4.0 mi.

The proposed haul route crosses several streams (Table III-7). Dry season haul and year round haul on paved routes would introduce a negligible amount of sediment to streams. Design features listed in Chapter 2 would minimize the potential for increased sediment delivery due to wet season haul on gravel roads. Additional ditch relief culverts that direct runoff to the forest floor below the road and/or sediment control devices would be installed in the ditches draining to flowing streams on winter haul routes. Sediment control devices would receive frequent inspection and maintenance during the sale, and they would be removed at the completion of haul. Sediment deposited behind the filters would be disposed of in upslope areas.

PEAK FLOW AND ROADS

Roads affect peak flows by intercepting subsurface flow and converting it to surface flow, effectively increasing the density and runoff efficiency of streams in a watershed. Rapid delivery of water to stream channels during a storm via this expanded network can decrease the time until peak flow and increase the magnitude of peak flow (Wemple et al. 1996). The direct transport of inboard ditch flow to a stream channel and the transport of ditch relief culvert water to a stream via a channel or gully are two processes that increase road and stream connectivity (Gucinski et al. 2001, Croke and Hairsine 2006). Midslope road segments perpendicular to subsurface flows paths with cutslopes that intersect most of the soil profile are especially problematic (Jones 2000, Wemple 1998 cited in Jones 2000).

No Action Alternative

Roads constructed to access private forest lands would be less likely to be connected to streams or to increase peak flows because road design and construction practices required by the Oregon Department of Forestry have been improved in the past decade.

The Pacific Connector Gas Pipeline Project would modify existing federal, state, county and private roads and construct new roads. Little to no peak flow increase is expected because new roads would be constructed using appropriate best management practices to minimize potential impacts, and several existing roads would be reconstructed to ensure all-weather access. Reconstruction would likely lead to improved road drainage.

Proposed Action Alternative

Road-related peak flow increases detrimental to fisheries and aquatic habitat are not expected because the proposed project incorporates design features, management direction (USDI BLM 1995, p. 69, 70), and best management practices (USDI BLM 1995, p. D-3, D-4) to keep new roads hydrologically disconnected from streams and unstable slopes.

Three design features would be used to prevent continuous surface flow between new roads and streams. First, 95% or 208 of the 219 proposed road segments would be located on or near ridges to prevent or reduce the capture of hillslope runoff. Roads constructed near ridges pose less of a risk because they intercept shorter flow paths (Croke and Hairsine 2006, Royer 2006).

The second design feature to prevent continuous surface flow between roads and streams involves preferentially outsloping road segments to disperse runoff and facilitate infiltration. Outsloping eliminates the need for ditches and ditch relief culverts, and reintroduces intercepted water back into slow (subsurface) pathways. In areas where outsloping is not feasible, ditch relief culverts would be installed to drain to vegetatively buffered areas.

The third design feature to prevent continuous surface flow between roads and streams consists of minimizing the number of stream crossings. There are only two new intermittent crossings proposed. The new pipes would be sized to accommodate a 100-year flow, and culvert installation and eventual removal as well as haul would be restricted to the dry season.

Older, minimally maintained roads are a greater risk to aquatic resources than the proposed new roads built to current standards. The proposed renovation, improvement and decommissioning would allow the Coos Bay District BLM to correct drainage problems and provide a long-term (many years) benefit to flow routing in the affected areas. Higher priority treatment sites include midslope road segments with high cut slopes and ditch lines that discharge directly to streams.

PEAK FLOW AND HARVEST

Peak stream flow increases detrimental to fish and fish habitat are not expected as a result of thinning and alder conversion. Sample tree falling outside of the no-harvest buffers would have no discernable effect on peak flows. The following reasons support this conclusion.

1. Grant et al. (2008) reviewed the effects of forest practices on peak flows and the subsequent channel response in western Oregon. According to the authors, thinning has a low likelihood of increasing peak flows, the instantaneous maximum discharges generated by individual storm events. The authors state that "Peak flow effects on channel morphology can be confidently excluded in high gradient (slopes > 10%) and bedrock reaches, and are likely to be minor in most step pool systems." Steeper headwater step pool channels typical of the proposed harvest units are resistant to changes in slope and sinuosity because they are confined by narrow valleys and bedrock. Wood and rock recruited from adjacent hillslopes is large in relation to the size of these channels and is therefore resistant to movement, even with increasing flow.

2. In much of the western Cascades and elsewhere in western Oregon and northern California, the largest post-harvest water yield increases have occurred during the fall months when maximum differences in soil water content exist between cut and uncut areas. In the fall, a smaller

proportion of rain is required for soil moisture recharge in cut areas, so a larger proportion can go to stream flow (Harr 1976). The first fall rains and the resulting stream flows are usually small and geomorphically inconsequential in the Pacific Northwest (Ziemer 1998). By winter, when soil moisture levels are similar in cut and uncut areas, relative increases in peak flows from harvest units are considerably less than those produced by storm events.

Differences in soil water content between the proposed cut areas and the uncut areas would be small. Reiter and Beschta (1995) state that "where individual trees or small groups of trees are harvested, the remaining trees will generally utilize any increased soil moisture that becomes available following harvest. Because of such 'edge effects', partial cuts, light shelterwoods, and thinnings are expected to have little effect, if any, on annual water yields." Similarly, in a summary of water yield response to forest cutting outside the snow zone, Satterlund and Adams (1992, p. 253) found that "lesser or nonsignificant responses occur… where partial cutting systems remove only a small portion of the cover at any one time."

3. Alder patch cuts averaging approximately 39 acres would not likely push any one subwatershed over a harvest threshold and lead to detectable peak flow increases. Grant and coauthors (2008) concluded that, in the rain-dominated zone, 29% of a watershed would need to be harvested in order to generate a detectable peak flow. Twenty-one proposed red alder harvest units with buffers and leave trees are spread between five subwatersheds, and they represent 0.2% to 2.2% of the acres in any one subwatershed (Table III-4).

4. Rain is the predominant mechanism of peak flow generation in Oregon's Coastal region (Reiter and Beschta 1995, Greenberg and Welch 1998). Although rain-on-snow can occur in the Coast Range, it is more common in the lower and middle elevations of the western Cascades of Washington and Oregon (Harr and Coffin 1992). Peak flow augmentation resulting from rain-on-snow events is unlikely because the proposed harvest units are all below 1,800 feet, the approximate lower limit of the transient snow zone on the Coos Bay District (Price 2006).

5. Based on a review of regional harvest and stream flow studies the National Marine Fisheries Service Northwest Fisheries Science Center issued a memo (Collier 2005) stating that "it is difficult to argue convincingly (based on the literature) that changes in peak or low flows due to timber harvest alone will have significant effects on habitat and salmon populations."

CONSISTENCY WITH AQUATIC CONSERVATION STRATEGY OBJECTIVES

Components of the Aquatic Conservation Strategy

There are four components to the Aquatic Conservation Strategy (ACS): Riparian Reserves, Key Watersheds, Watershed Analysis and Watershed Restoration.

1) Riparian Reserves

The widths of the Riparian Reserves within the analysis area are two site potential tree heights for fish bearing streams and one site potential tree height for perennial and intermittent streams. The site potential tree height in the North Fork Coquille River 5th field watershed is 240 feet, 220 feet in the South Fork Coos River 5th field watershed, 200 feet in the Coquille River 5th field watershed, and 240 feet in the Coos Bay-Frontal Pacific Ocean 5th field watershed.

2) Key Watersheds

The proposed action is not located in a Key Watershed.

3) Watershed Analysis
The project area is covered by four watershed analyses as referenced on page 3. Relevant findings were incorporated into the Proposed Action Alternative. The South Fork Coos, North Fork Coquille, and Catching Beaver watershed analyses include ACS and Attaining Riparian Reserve Function chapters that contain analysis of how density management and alder conversion may affect riparian functions. Table DM-1, in the Attaining Riparian Reserve Function chapter, provides the riparian functions identified by FEMAT (root strength provided stream bank stability, large wood delivery to streams, large wood delivery to riparian areas, leaf and particulate organic matter input to streams, water quality: temperature as affected by shade, riparian microclimate, water quality: sediment, and wildlife habitat), details affected ACS objectives, and provides results of analysis for how they may be affected by potential no action, alder conversion, and density management prescriptions. Information from the watershed analyses is incorporated into the discussion below. The watershed analysis documents are available for public review at the Coos Bay District office or they can be viewed under Plans & Projects/Inventories on the Coos Bay District website (http://www.blm.gov/or/districts/coosbay/index.php).

In summary, these watershed analyses recommend conducting active treatments within the Riparian Reserves to achieve ACS objectives. "Density management affords a means to do both active management (speed or assure attainment of late-successional stand attributes and large trees that are suitable for recruitment as large riparian/instream structures), and provide passive restoration through maintenance of continuous forest cover (thus assuring the benefits of root strength for streambank and hill slope stability, nutrient cycling, and shade). Density management treatments can redirect stand trajectories from that of producing high volume of a comparatively uniform product for commercial use to one of developing late-successional characteristics" (page 166 USDI, BLM 2010). A wide no-treatment buffer would delay attainment of large diameter trees that would likely to fall into the stream. Retaining a half tree height no-treatment buffer to meet other passive restoration objectives would delay attainment of large wood delivery to the stream (Table DM-1 USDI, BLM 2001 and 2010). Relying solely on a passive restoration strategy can greatly delay attainment of some Riparian Reserve functions and perpetuate stand conditions associated with densely stocked plantations (page 214 USDI, BLM 2010).

In addition to density management, these analyses recommend conversion of alder dominated sites to restore conifer where disturbed by past management. Alder's value for instream structure or terrestrial down wood habitat is short-term. The reasons are that alder is not decay resistant, and alder wood is comparatively weak allowing it to more readily break under the force of high stream flows compared with Douglas-fir (Niemiec et al 1995, pgs. 95-96). Alder conversion prescriptions, which include streamside buffers on both sides of the channel intended to provide shade for the stream, will assure attainment of leaf litter into the stream, stream temperature protection through shading, and water quality protection with respect to sedimentation but may retard attainment of other Riparian Reserve functions on some sites (Table DM-1 USDI, BLM 2001 and 2010). Restoring a conifer component would meet future instream wood needs, provide a longer-term snag component, and restore tree species diversity (and structural diversity which would benefit ultimate attainment of late-successional habitat.

4) Watershed Restoration
Watershed restoration is a comprehensive, long-term program of watershed restoration to restore watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms. The program's most important components are control and prevention of road-related runoff and sediment production, restoration of the condition of riparian vegetation, and restoration of in-stream habitat complexity.

The Management Actions/Direction for the program (USDI BLM 1995, p. 8) includes:

"Preparing watershed analyses and plans prior to restoration activities." This has been completed for the project area.

"Focusing watershed restoration on removing some roads and, where needed, upgrading those that remain in the system." The Proposed Action Alternative gives the Coos Bay District BLM the ability to proactively renovate and improve existing roads.

"Applying silvicultural treatments to restore large conifers in Riparian Reserves." The Standards and Guidelines (USDA and USDI 1994b) elaborate on the riparian vegetation restoration component as follows: "Active silvicultural programs will be necessary to restore large conifers in Riparian Reserves. Appropriate practices may include planting unstable areas such as landslides along streams and flood terraces, thinning densely-stocked young stands to encourage development of large conifers, releasing young conifers from overtopping hardwoods, and reforesting shrub and hardwood-dominated stands with conifers." One purpose of the project, as stated in Chapter 1 of this EA, is to improve the stand structure in Riparian Reserves by thinning out excess trees in overstocked stands to enhance the growth and vigor of the residual trees. This would provide larger and healthier trees for future management objectives while maintaining native species diversity. Alder conversion would restore conifers to sites that previously supported conifers. These actions implement the management direction for Riparian Reserves (USDI BLM 1995, p. 13): "Apply silvicultural practices for Riparian Reserves to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives."

"Restoring stream channel complexity." One purpose of the Riparian Reserves is to maintain the structure and function of intermittent streams (USDA FS and ISDI BLM 1994, p. B-13), and the proposed thinning would accelerate conifer growth in streamside areas that supply large, durable wood to headwater channels. Small headwater streams function as one of the dominant storage reservoirs for sediment in mountainous terrain given an adequate supply of in-stream wood (May et al. 2004). Studies in the Oregon Coast Range (May and Gresswell 2003a and 2003b) and Cascade Range (Swanson et al. 1982 and Grant and Wolff 1991) indicate fluvial transport of sediment and wood in low order, high gradient streams is minimal in the interval between debris flows. Large wood recruited from adjacent hillslopes and riparian areas is typically large in relation to the size of the channel and therefore resistant to movement. As wood continues to accumulate, the water storage capacity of low order channels increases (May and Gresswell 2003b). Sediment stored behind in-stream wood increases streambed roughness and decreases local channel gradient reducing the capacity for sediment transport. Subsurface flow becomes more important and surface water velocities decrease as a greater proportion of the streambed becomes covered by sediment.

Existing Watershed Condition

The following acreages are approximate values based on GIS data.

Existing conditions in the **North Fork Coquille River** 5th field watershed:

- The BLM manages 36,816 acres out of 98,365 acres or 37.4% of the watershed.
- Approximately 18,810 acres or 51.1% of the BLM managed land in the watershed is in Riparian Reserves.
- The BLM controls 255.2 miles or 32.6% of all road miles in the watershed.
- Approximately 94.2% of the BLM forest in the watershed is greater than 21 years old. Stream flow increases following logging generally decrease over time and eventually disappear in about 20 to 30 years in western Oregon as maturing stands begin losing as much water to the atmosphere as the original forest (Adams and Ringer 1994).

- Small headwater streams that have intermittent or seasonal flow account for 75.7% of the stream miles in the watershed.
- Fish presence has been verified in 17.1% of the stream miles in the watershed.

Existing conditions in the **South Fork Coos River** 5th field watershed:

- The BLM manages 32,623 acres out of 160,066 acres or 20.4% of the watershed.
- Approximately 17,282 acres or 53.0% of the BLM managed land in the watershed is in Riparian Reserves.
- The BLM controls 210.6 miles or 14.7% of all road miles in the watershed.
- Approximately 92.7% of the BLM forest in the watershed is greater than or equal to 21 years old.
- Small headwater streams that have intermittent flow account for 79.8% of the stream miles in the watershed.
- Fish presence has been verified in 11.1% of the stream miles in the watershed.

Existing conditions in the **Coquille River** 5th field watershed:

- The BLM manages 2,736 acres out of 111,607 acres or 2.5% of the watershed.
- Approximately 1,308 acres or 47.8% of the BLM managed land in the watershed is in Riparian Reserves.
- The BLM controls 5.4 miles or 0.5% of all road miles in the watershed.
- Approximately 98.7% of the BLM forest in the watershed is greater than or equal to 21 years old.
- Small headwater streams that have intermittent flow account for 70.3% of the stream miles in the watershed.
- Fish presence has been verified in 10.0% of the stream miles in the watershed.

Existing conditions in the **Coos Bay-Frontal Pacific Ocean** 5th field watershed:

- The BLM manages 5,402 acres out of 151,556 acres or 3.6% of the watershed.
- Approximately 3,075 acres or 56.7% of the BLM managed land in the watershed is in Riparian Reserves.
- The BLM controls 30.2 miles or 2.5% of all road miles in the watershed.
- Approximately 90.4% of the BLM forest in the watershed is greater than or equal to 21 years old.
- Small headwater streams that have intermittent flow account for 70.3% of the stream miles in the watershed.
- Fish presence has been verified in 4.4% of the stream miles in the watershed.

AQUATIC CONSERVATION STRATEGY OBJECTIVES

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.

Site Scale Evaluation

Short-Term/Long-Term

Maintenance and restoration of the Riparian Reserves ensures protection of the aquatic systems on federally managed land. Under the proposed action, several functions of the Riparian Reserves including stream bank stability, leaf and particulate organic matter input to the stream, shade, erosion control, and microclimate would be maintained at the site scale in the short-term and long-term via the network of no-harvest buffers and upslope trees remaining after harvest.

Thinning in Riparian Reserves affords a means to do both active management to speed attainment of late-successional stand attributes and large trees that are suitable for recruitment as large riparian and in-stream structures, and provide for passive restoration through maintenance of continuous forest cover, thus assuring the benefits of root strength for stream bank and hillslope stability, nutrient cycling, and shade. Moving forests in the Riparian Reserves outside the no-harvest buffers into the understory reinitiation stage of stand development sooner would result in greater vegetative species diversity, multi-canopy structure, and larger average tree size with subsequently larger snags and down wood.

Project design features would maintain diverse habitat features. Snags would be reserved from cutting and down logs in certain decay classes would be left on site. Dominant conifers including remnant individual trees and groups of trees which contain platforms suitable for marbled murrelets would also be reserved. Dominant, co-dominant and shade tolerant conifers and larger hardwoods would be kept in alder conversion units to provide species, spatial and structural diversity.

The natural distribution of alder within the proposed harvest units would be maintained even though alder conversion is proposed. Alder stands contribute to diversity by providing contrasting conditions to those found in conifer stands. Alder stands are naturally renewed and perpetuated on sites subject to disturbance such as slide tracks, channel migration zones, and floodplains and terraces. The proposed action excludes these areas from harvest and instead concentrates on previously harvested upslope sites that once supported conifers.

5th Field Evaluation

<u>Short-Term/Long-Term</u>

Maintenance and restoration of the Riparian Reserves in the proposed harvest units is important to aquatic systems and wildlife at the site scale. Benefit to the distribution, diversity and complexity of landscape scale features is limited because the proposed action treats less than 2% of the acreage in the watersheds that contain the analysis area.

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.*

Site Scale Evaluation

<u>Short-Term/Long-Term</u>

The BLM can maintain connectivity between stream reaches and the adjacent uplands, but not the connectivity within and between watersheds. This is because BLM lands in the analysis area are surrounded by private parcels and the BLM does not manage entire streams from headwater to mouth. Forested BLM lands are typically higher in the watershed where streams are smaller and mostly characterized by intermittent or seasonal flow.

Connectivity between the streams and adjacent uplands in the proposed harvest units would be maintained in the short-term and long-term by buffering all streams, retaining greater than 50% canopy closure in thinning units, and retaining upslope conifer and hardwood species in conversion units. Riparian-dependent organisms would continue to utilize habitats within the no-harvest buffers, and the release of understory shrub and tree species upslope would, over time, provide habitat at several canopy levels.

Accelerating the growth of stream-adjacent conifers by thinning would hasten the recovery of riparian and aquatic habitats. Larger trees would produce larger logs that would positively influence habitat and physical processes for years and decades.

No permanent roads or culverts would obstruct routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. The two culverts installed on intermittent channels would match the channel shape and gradient, and they would pass a 100-year flow. Following harvest, these pipes and their associated fills would be completely removed.

5th Field Evaluation
Short-Term/Long-Term
The BLM manages nearly 15% of the watersheds that contain the analysis area. Limited acreage and scattered federal parcels preclude the maintenance and restoration of connectivity within and between watersheds. Different management objectives and methods between agencies, corporations and smaller private landowners also make it challenging to maintain and restore connectivity.

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

Site Scale Evaluation
Short-Term
The physical integrity of the aquatic system would be maintained at the site scale in the short-term. No-harvest buffers would prevent sediment delivery and protect bank stability. Full log suspension would be required over all perennial streams and would typically be achieved over intermittent streams because of the steep terrain. Harvest-related peak stream flow increases detrimental to bank and bottom configurations would not occur.

New road construction would occur away from stream channels except for two intermittent crossings in one proposed unit. The culverts would be sized appropriately and the pipes and associated fill would be completely removed following harvest. There would be no lasting change to the size and shape of the channels.

Long-Term
Large wood delivered to channels from the no-harvest buffers and from the thinning and conversion areas would provide several restorative benefits to the aquatic system over the long-term. Large wood would facilitate sediment storage in headwater reaches and create low gradient depositional stream reaches that are narrow, deep, and connected to the floodplain in the larger third and fourth order channels. These areas would increase the availability and quality of spawning and rearing habitat and they would be less susceptible to heating. Log jams would moderate peak flows and sediment would store water for gradual release during the summer low flow period.

5th Field Evaluation
Short-Term/Long-Term
The proposed action would not affect the short-term physical integrity of the aquatic system inside or outside of the harvest units. Large wood recruitment over the long term would benefit few stream reaches in the watersheds that contain the analysis area. There are approximately 67 miles of intermittent and perennial channels within the proposed harvest units versus approximately 4,862 miles of intermittent and perennial channels in the four 5th field watersheds.

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.*

Site Scale Evaluation
Short-Term/Long-Term
Water quality necessary to support healthy riparian and aquatic ecosystems would be maintained at the site scale in the short-term and long-term.

The proposed action would not measurably increase water temperatures, lead to more than negligible sedimentation of streams, or result in the release of hazardous materials.

Thinning in the Riparian Reserves would not measurably increase water temperature because vegetation in the primary shade zone and portions of the secondary shade zone would be protected in no-harvest buffers, and canopy closure would be greater than 50% in upslope areas that provide shade during the less critical morning and afternoon hours. Natural openings would be used for cable yarding corridors as much as possible, and a majority of the corridors would cross intermittent streams that have discontinuous flow or no flow during the summer when water temperature is a concern.

Alder conversion in the Riparian Reserves would not increase water temperatures because critical shade zones identified with LiDAR would be protected in no-harvest buffers. Shrubs, wood in and over the channels, and local topography would provide redundant layers of shade.

Road renovation, improvement, decommissioning, maintenance and construction would occur during the dry season. If haul occurs on gravel roads during the wet season, sediment control devices would be located in ditchlines where road-generated sediment has the potential to degrade aquatic and riparian habitats.

Refueling of gas or diesel-powered machinery would not be allowed in close proximity to stream channels, and contractors would be required to have spill prevention containment and countermeasures plans to minimize the likelihood of contamination reaching a waterway.

5th Field Evaluation
Short-Term/Long-Term
Water quality in the 5th fields would be unaffected by the proposed action. Four water quality limited stream reaches that are in the analysis area but outside of the proposed harvest units would remain on the 303(d) list or be delisted independent of federal forest management actions.

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.*

Site Scale Evaluation
Short-Term
Harvest activities would not accelerate mass soil movement or stream erosion at the site scale in the short-term. No-harvest buffers would provide bank stability and sediment filtering, and partial cutting would maintain live roots that bind the soil. The roots of different trees in a stand are intertwined unlike the tree crowns which are spatially distinct. Consequently, thinning does not kill all the roots in the discrete areas of soil below the cut trees (Stout 1956 cited in Oliver and Larson 1990). Eis (1972) found that 45% of the selectively cut Douglas-firs in a stand were root grafted and half of the stumps were still alive 22 years after logging. Alder conversion units would contain comparatively fewer trees than thinning units post-harvest, but they would be buffered and they would typically contain residual conifers and hardwoods.

New preferentially outsloped roads with few crossings located primarily on ridges would cause little disruption to local sediment storage and transport. All culverts for new road construction stream crossings would match stream channel sizes and alignments and they would be removed following harvest.

Long-Term

Thinning and alder conversion within Riparian Reserves, outside the no harvest buffers, would increase conifer growth rates in streamside areas that deliver wood to channels via windthrow, landslides, and debris flows. Delivering large, decay resistant wood to project area streams would maintain the local sediment regime over the coming decades and centuries. Small headwater streams can function as one of the dominant storage reservoirs for sediment in mountainous terrain given an adequate supply of in-stream wood (May et al. 2004).

The proposed action would use renovation, improvement, decommissioning and maintenance to improve road drainage and reduce sediment delivery to stream channels in the long-term. A limited number of existing culverts that create a physical barrier to sediment transport would be removed and the stream channels would be restored.

5th Field Evaluation

Short-Term/Long-Term

Activities implemented to improve road drainage and reduce sediment delivery at the site scale would provide negligible benefit at larger scales. The BLM controls just over 12% of the roads in the watersheds that contain the analysis area and relatively few road miles would be treated within the analysis area.

6. *Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetlands habitats 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.*

Site Scale Evaluation

Short-Term/Long-Term

The proposed action would maintain in-stream flows sufficient to create and sustain site scale riparian and aquatic habitats in the short-term and long-term. Any increase in flow resulting from harvest-related reductions in interception and evapotranspiration would be small (i.e. not measureable at the drainage (stream), subwatershed and watershed scales), and inconsequential to channel morphology. Vegetation remaining after thinning and patch cutting is expected to utilize soil moisture that becomes available following harvest. If soil water content happens to be greater in the cut areas, then small increases in site scale low flows are possible. Low flow increases may benefit aquatic species during the summer if wetted width and stream volume increase and stream temperatures are reduced (Reiter and Beschta 1995).

Step-pool streams found in the proposed harvest units are resistant to change in their size and shape, even as flows increase.

New roads would not affect the timing, magnitude and duration of flows because they would be preferentially located on or near ridges, and they would be outsloped or made to drain to vegetated areas away from streams. Road renovation, improvement, decommissioning and maintenance would improve road drainage and reduce the amount of water that roads direct to stream channels.

5th Field Evaluation

Short-Term/Long-Term

The proposed action would not create measureable change in the timing, magnitude and duration of flows at the 5th field scale for at least three reasons. First, harvest would produce a small stream flow response, and the ability of individual small catchments to affect downstream discharge decreases as small streams form increasingly larger drainage networks (Garbrecht 1991). Second, the temporal and spatial variability of precipitation and the variable timing of flows from drainages across the analysis area complicates change detection. Finally, inter-annual flow variability would be greater than the magnitude of any flow increase, and the size of any increase would be less than the 5 to 10 percent error associated with stream flow measurements (USGS 1992).

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

Site Scale Evaluation

Short-Term/Long-Term

The timing, variability and duration of floodplain inundation would be maintained in the short-term at the site scale. No-harvest buffers and log suspension during yarding eliminate the risk of stream bank soil compaction; therefore, infiltration rates and the capacity of floodplains to store water would remain unchanged.

The timing, variability and duration of floodplain inundation would be restored in the long-term at the site scale. The Proposed Action Alternative seeks to ensure a long-term supply of large, durable wood to streams. Large wood in higher gradient reaches (4 to 20%) creates steps and flats that store relatively large volumes of sediment and near surface ground water. Over time, large wood would capture enough substrate in some lower gradient reaches to reconnect downcut channels with their floodplains and terraces and reestablish subsurface water storage capacity. Streams that have large amounts of deep gravel and well-connected terraces would typically have cooler water temperatures (IMST 2004). Alluvial gravels in floodplains store cold water from periods of high runoff and release the water gradually as flows recede in the summer (Coutant 1999 cited in IMST 2004).

The timing, variability and duration of water table elevation in meadows and wetlands would be maintained at the site scale in the short-term and long-term. There are no known meadows within the proposed harvest units and pocket wetlands (< 1/10 acre) are widely scattered. Selective cutting of trees would produce a negligible change in the soil moisture of stands containing these small wetlands, and the proposed action does not include water diversions or well drilling, activities usually associated with lowering water tables.

5th Field Evaluation

Short-Term/Long-Term

The maintenance and restoration of the timing, variability and duration of floodplain inundation along discrete stream reaches higher in the watershed would have limited benefit at the 5th field scale now or in the future. The BLM manages a relatively small portion (<15%) of the watersheds that contain the analysis area and the proposed harvest units account for a relatively small portion (<5%) of the analysis area. The larger streams with larger floodplains are primarily located on private lands downstream of federal ownership, and the morphology of some of these streams has been greatly altered due to dredging and diking, large wood removal, channel straightening, etc.

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

Site Scale Evaluation

<u>Short-Term/Long-Term</u>

The proposed action incorporates no-harvest buffers and upslope leave trees to maintain the structural diversity of riparian plant communities and the associated benefits of these communities over the short-term and long-term.

No-harvest buffers would protect bank stability, litter inputs and shade, and prevent harvest-related sediment delivery in riparian zones (i.e. "Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics." (USDI BLM 1995)).

Studies indicate that the proposed 35-foot to 100-foot no-harvest buffers would capture much of the hardwood litter input potential in streamside alder stands 60+ feet tall. According to FEMAT (1993, pgs. V-26, V-27), the effectiveness of riparian floodplain forests to deliver leaf and other particulate organic matter declines at distances greater than approximately one-half a tree height away from the channel. In a study of source distances for coarse woody debris entering small streams (1st through 3rd order) in western Oregon and Washington, McDade and others (1990) found that more than 83 percent of hardwood pieces originated within 10 meters (33 feet) of the stream channel, and all hardwood pieces were delivered from within 25 meters (82 feet) of the channel. In a study of riparian litter inputs to streams in the central Oregon Coast Range, Hart (2006) reports that deciduous sites provided significantly more vertical litter inputs at the stream edge than coniferous sites, and that there was no indication that annual litter inputs were moving more than 5 meters (16.4 feet) down slope at ground level.

No-harvest buffers that contain inner gorge areas and begin at the edge of the stream or floodplain and extend upslope 35+ feet would provide adequate summer thermal regulation. Anderson et al. (2007) studied thinning of 30 to 70-year old stands in western Oregon and concluded that buffers of widths defined by significant topographic breaks or the transition from riparian to upland vegetation appear sufficient to mitigate the effects of upslope thinning on the microclimate above topographically constrained first and second-order streams. The authors found that microclimate gradients in headwater riparian zones were strongest within 10 meters of the stream center, "a distinct area of stream influence within broader riparian areas."

Thinning and conversion in Riparian Reserves outside of the no-harvest buffers would reduce competition mortality and decrease the number of smaller snags and down logs in the short-term. In the long-term, thinning and conversion would accelerate the development of large conifers and the recruitment of understory vegetation. Stand components that currently provide structural diversity such as minor tree species, snags, and down wood would be sustained during harvest.

The proposed yarding corridors and new roads within the Riparian Reserves would not prevent riparian plant communities from benefitting streams. Yarding corridors would be relatively narrow and dispersed across the harvest area, and new roads that cross into the Riparian Reserves would primarily be located in the upper half of the Reserves.

5th Field Evaluation
<u>Short-Term/Long-Term</u>
The proposed action would have no effect on the species composition and structural diversity of riparian plant communities outside of the proposed treatment areas. In the distant future (tens to hundreds of years) coarse woody debris delivered to the streams in the proposed units may be deposited downstream via high flows and landslides. The water storage and sediment trapping ability of coarse wood jams would benefit water quality and quantity.

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

Site Scale Evaluation
<u>Short-Term/ Long-Term</u>
No-harvest buffers would provide site scale refugia for riparian-dependent plants and animals in riparian zones, and selective cutting upslope in the Riparian Reserves and beyond would restore habitat characteristics of an older forest sooner.

Chan and authors (2004) state that "Exclusion of timber harvest from Riparian Reserves has been assumed to maintain species diversity, ecosystem integrity and protection of ecosystem functions. The 'hands-off' assumption may have been valid in an ecological context when humans had little impact on disturbance regimes and ecological processes in forests. However, many of the forests designated as Riparian Reserves under the Northwest Forest Plan were previously managed for timber production and are characterized by relatively dense, uniform, 30 to 70 year-old even-aged stands of Douglas-fir and western hemlock. These young stands are typically lacking in structural and biological diversity. Lack of complexity makes these stands poorly suited for supporting many riparian-dependent species, the northern spotted owl, and many other wildlife species (Carey 1995; Lindermayer and Franklin 2002). A passive management option is to assume that over time young stands within Riparian Reserves would naturally develop desired characteristics and functions while forgoing timber harvest for commodity production. However, these stands typically remain in the stem-exclusion stage (Oliver and Larson 1996), and therefore depauperate of desired structural characteristics, for extended periods of time (potentially exceeding 100 years)."

Thinning would decrease the time that stands are in the stem exclusion stage thus moving the stands more rapidly into the understory reinitiation stage of development. Thinning in stands that have already entered the understory reinitiation stage would promote a more vigorous understory and allow plants with lower shade tolerance to maintain a better presence in the stand. Along with this successional progression is a more rapid attainment of average stand diameters of 20 inches and larger. This corresponds to a shift from secondary habitat to primary habitat conditions for several mammals and attainment of nesting conditions for several birds associated with late-successional forests (sources summarized by Harris 1984, pgs. 59-64 and displayed in figures 5.11- 5.13). Wildlife habitats associated with large diameter trees include large diameter snags, large diameter down wood, prey substrates provided by large surface areas of coarse deep-fissured bark, deep canopies, large limbs and platforms, and cavities and other structures found in damaged or injured large trees (Neitro et al. 1985, Weikel and Hayes 1997).

Thinning would reduce the numbers of small diameter snags and small down wood material derived from boles that the stands would have otherwise produced through suppression mortality. Thinned stands, however, would produce larger diameter snags and down wood sooner than if the stands were left unthinned. Further, the larger diameter snags and wood material would provide habitats for a longer period, and they would meet the habitat requirements for more species than would small diameter material (Kimmey and Furniss 1943, Bartels, et al. 1985, sources summarized in Neitro et al. 1985).

5th Field Evaluation

Short-Term/Long-Term

Forest growth would be accelerated in relatively few stands through implementation of the proposed action. Roughly 52% of the BLM managed acres in the watersheds containing the analysis area are in Riparian Reserves, and the proposed action would treat less than 10% of this acreage.

AQUATIC SPECIES

AFFECTED ENVIRONMENT

AQUATIC SPECIES OCCURRENCE

A variety of aquatic vertebrate and invertebrate species can be found within the analysis area. For this discussion, aquatic species are defined as those species that reside within the aquatic environment for their entire life or during a critical part of their life history. Aquatic vertebrates found in the analysis area include several species of fish and amphibians. Aquatic invertebrates present within the analysis area include a variety of insects, mollusks, and at least one species of crayfish.

From a fisheries standpoint, streams in the analysis area contain a relatively diverse assemblage of salmonids species including coho salmon, steelhead trout, and coastal cutthroat trout. Oregon Coast coho salmon are currently listed as "threatened" under the Endangered Species Act. Oregon Coast coho salmon and Oregon Coast steelhead are currently considered Special Status Species by the BLM (Table III-8).

Anadromous and resident salmonids are dispersed widely across the analysis area. For the most part, the upper distribution limits of fish populations are limited by long standing natural barriers or increasing stream gradient. Culverts within the planning area may also limit upstream and / or downstream passage for some life history stages. Map I within Appendix A displays anadromous and resident fish distributions within the analysis area.

Streams in the analysis area also provide habitat for a variety of non-salmonid fish species including, Pacific lamprey, western brook lamprey, speckled dace, Millicoma dace, largescale sucker, redside shiner, coast range sculpin, reticulate sculpin, prickly sculpin, and threespine stickleback. Millicoma dace, a morphologically distinct species of longnose dace, are currently considered to be a Special Status Species by the BLM (Table III-8).

Amphibians expected to be found within the analysis area include two species of salamander, four species of frogs, one toad species, and one species of newt. Salamander species include Pacific Coast salamander and southern torrent salamander, with the Pacific Coast salamander being the most abundant. California slender salamander may also be present, but are highly unlikely to occur in the planning area. Native frog species found in the planning area include tailed frog, foothills yellow-legged frog, Pacific tree frog, and red-legged frog. It is probable that non-native bullfrogs have also been introduced into the analysis area. Western toads are believed to be present within the analysis area. Rough-skinned newts have been observed and are considered abundant. California slender salamander and foothills yellow-legged frogs are considered to be a Special Status Species by the BLM (Table III-10).

While they have not been documented within the analysis area, Western pond turtles may be present within lower elevation ponds or inhabiting slower water areas along channel margins within the mainstem rivers. Western Pond Turtles are considered to be a Special Status Species by the BLM (Table III-10).

There are a wide variety of aquatic macro-invertebrates (insects) present within the analysis area. Aquatic insect varieties include stoneflies, mayflies, caddisflies, dragonflies, alderflies, true flies, and beetles. These species can be found in both ponds and stream / river habitats. Three Special Status Species caddisflies are suspected to be present in the analysis area (Table III-8).

The snail species (Juga), has been observed in the watershed. This species is abundant and often present to the end of perennial flow within stream channels. Rotund lanx, robust walker, pacific walker, and Newcomb's littorine snail are suspected or have been documented in the analysis area. These snail species are currently listed as Special Status Species by the BLM (Table III-8).

EFFECTS OF THE NO ACTION ALTERNATIVE

Direct Effects

There are no direct effects anticipated to aquatic species populations as a result of no action.

Indirect Effects

An indirect effect of this alternative would be that young riparian conifer stands within the proposed thinning units would continue to develop under conditions of high competition and growth suppression. This would result in stands that are more susceptible to disturbance and that have an overall smaller tree size. As a result, contributions of woody material to the aquatic environment would be likely to occur, but the wood would be of a relatively small size and would decompose quickly. Aquatic habitat conditions would remain simplified until trees in riparian stands grow to larger sizes and enter stream channels through disturbance events or through death and decay. Larger wood pieces have been shown to be more stable in streams and provide a greater benefit to instream habitat conditions.

Conifers within proposed red alder conversion stands would also continue to develop under conditions of high competition and growth suppression. This would similarly be expected to slow the development of riparian and stream conditions that benefit aquatic species. Alders that are recruited into streams would provide some structural complexity in the meantime. However, alders are less stable in streams because fallen alder tends to be shorter due to breakage, smaller in diameter, and less well anchored than larger conifers.

An additional indirect effect of this alternative would be that opportunities to reduce management related impacts/risks to aquatic habitats through road renovation and improvement would be foregone.

Aquatic habitats would remain on their current developmental trajectory, barring any large disturbance events. Overtime, gradual changes in riparian and aquatic habitat conditions should be of benefit to aquatic species populations, as these areas recover from past natural and anthropogenic disturbances. Past land management practices in the analysis area have contributed to degraded aquatic habitat conditions. Under the No Action Alternative, no riparian silvicultural treatment or road improvement activities would occur. Aquatic habitat quality would be expected to improve slowly over time on federally-managed lands. Similarly, this alternative would not be expected to improve habitat conditions for aquatic species populations.

Table III-8: Suspected Special Status Fish and Invertebrate Species

Common Name	Scientific Name	Status	Species Information	Step #1 *Species present on district lands?*	Step #2 *Habitat present/ accessible in action area*	Step #3 *Species present in action area?*	Step #4 *Will the proposed action affect this species?*	Step #5 *What will the effects be in scope and intensity?*
Fish								
Chum salmon	*Onchorhynchus keta*	OR-SEN	Anadromous, spawn in fresh water just above tidal influence, juveniles migrate immediately upon emergence.	Suspected	No	No	No	N/A
Coho salmon	*Onchorhynchus kisutch*	FT	Anadromous, spawn and rear in smaller streams before migrating to ocean.	Documented	Yes	Yes	No	N/A
Steelhead	*Onchorhynchus mykiss*	OR-SEN	Anadromous, spawn and rear in medium freshwater streams before migrating to ocean.	Documented	Yes	Yes	No	N/A
Millicoma dace	*Rhinichthys cataractae*	OR-SEN	Coos River Basin, rubble areas in swifter waters.	Documented	Yes	Yes	No	N/A
Invertebrates								
Rotund lanx (snail)	*Lanx subrotundata*	OR-SEN	Freshwater snails found in larger turbulent water of large rivers. Mainstem Rogue and Umpqua Rivers.	Suspected	Yes	No	No	N/A
Newcomb's Littorine Snail	*Algamorda newcombiana*	SEN	Bays and river edges	Documented	Yes	Unknown	No	N/A
Robust walker	*Pomatiopsis binneyi*	OR-SEN	Perennial seeps, shallow mud banks and marsh seeps leading into shallow streams. Documented only in Chetco River drainage.	Suspected	Yes	Unknown	No	N/A
Pacific walker	*Pomatiopsis californica*	OR-SEN	Wet leaf litter and vegetation near flowing or standing water in shaded areas, high humidity. Documented in the Lower Millicoma River sub-basin.	Documented	Yes	Unknown	No	N/A
Hairy Shore Bug	*Saldula villosa*	OR-SEN	Salt Marsh species. One specimen was collected 4.5 miles north of North Bend, Oregon.	Documented	No	No	No	N/A
Caddisfly	*Rhyacophila chandleri*	OR-SEN	Western Cascades Mountain Streams	Suspected	Yes	Unknown	No	N/A
Caddisfly	*Moselyana comosa*	OR-STR	Associated with springs, seeps, and headwater stream channels.	Suspected	Yes	Unknown	No	N/A
Caddisfly	*Namamyia plutonis*	OR-STR	Associated with small, cool, densely forested streams in mature forest watersheds in the Coastal and Cascade Ranges of Oregon.	Suspected	Yes	Unknown	No	N/A

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE:

Direct Effects

There are no direct effects anticipated to aquatic species populations as a result of timber harvest activities. This is because no harvest activities would occur within 35 feet of intermittent streams and 60 feet of perennial stream channels, except for the creation of yarding corridors. A total of 49 yarding corridors are identified to be created across perennial stream in 11 different harvest units. Logs yarded across these streams would be fully suspended and therefore not alter aquatic habitats or have the opportunity to injure aquatic species. Any soil exposed within 50 feet of the stream channel would be covered with slash to prevent sediment delivery. The closest yarding corridor to coho salmon-bearing waters would be no closer than 800 feet. Trees cut in yarding corridors and adjacent to riparian buffers would be directionally felled away from streams therefore preventing effects to aquatic species populations.

Sample tree falling associated with the project was included in the effects analysis for aquatic species. The analysis above reveals that are no direct effects anticipated to aquatic species populations as a result of timber harvest activities, therefore the felling of one tree per 2.5 acres would have no effect on aquatic species as it will occur outside of riparian buffers.

Timber haul would occur over intermittent and perennial streams via culverts and bridges, but this is not expected to have a direct effect on aquatic species populations or their habitats due to haul timing restriction and sediment delivery prevention measures. There would be no road building across perennial stream channels.

No direct effects are expected to aquatic species populations as a result of road renovation or improvement activities. This is because these activities would occur during the dry season when intermittent streams are not flowing. Adequate erosion control of disturbed sites is expected to be well established before seasonal rains that could mobilize sediment and would prevent the potential for sediment to reach aquatic species habitats. No road renovation or improvement activities are proposed to occur in perennial stream channels.

Indirect Effects

An indirect effect of the alternative would be a slight reduction in the amount of small diameter trees available to enter the stream channel through the creation of yarding corridors and thinning within Riparian Reserves. This reduction is likely to have a negligible indirect effect on aquatic habitat through the removal of wood that could be delivered to stream channels, and therefore no effect on aquatic species populations. This is due to the small scale of the reduction, the ability that these small diameter trees have to influence channel morphology, and the small percentage of aquatic habitat that would be influenced. In addition, all fish-bearing and perennial streams within or adjacent to proposed thinning units would have a minimum no entry buffer of 60 feet. All intermittent streams would have a minimum no entry buffer of 35 feet. These areas would serve to maintain streambank stability, shade, and provide a concentrated, short-term source of smaller woody material available to enter stream channels. Along coho salmon-bearing streams buffers would be a minimum of 100 feet (approximately one current tree height) in order to retain available wood delivery to critical habitat.

In the long term, thinning and removing alder in Riparian Reserves is expected to have a long term indirect benefit to riparian conditions through the accelerated development of larger trees outside of no entry buffers. Over time these large trees would be available for recruitment into stream channels where they would influence stream channel morphology, creating complex habitats for aquatic species. These large trees can be expected to be more stable and decay resistant, thereby providing longer lasting benefit to aquatic habitats within the streams affected. The alders within the riparian buffers will continue to provide leaf fall in to streams and would be recruited into streams over time, but the growth and recruitment of large conifers into stream channels from these buffers would be relatively slow due to competition with the more abundant and faster growing alder.

Potential changes in stream flow are not expected to have any indirect effects on aquatic species populations. This is because any changes in annual yield will be short-lived and only detectable at the reach scale, if at all. Small increases in reach scale low flows may influence aquatic species populations as habitat area is increased and stream temperatures are reduced. Flow increases are expected to be too small to be detectable beyond the reach scale, if at that level, and therefore potential changes in flows are not expected to be a benefit to aquatic species populations. Alteration in peak flow would not occur at the drainage, subwatershed, and watershed scales and therefore are not anticipated to have an effect on aquatic species populations.

There would be no indirect effect to aquatic species populations as a result of changes in stream temperatures resulting from management actions. This is because of the retention of 60 foot (minimum) no entry buffers along perennial streams and 35 foot (minimum) no entry buffers along intermittent streams within thinning and alder conversion units. The buffers along many streams would likely be larger than the minimums, due to topography or other operational considerations. Furthermore, the abundant shrub layer within the buffers and over stream channels would provide redundant layers of shade. Outside of these buffers, canopy closures of at least 60% within thinning unit Riparian Reserves would further ensure that stream temperatures are not adversely affected. Alders in conversion units are present in patches with numerous scattered conifers throughout the stands. Conifers remaining after the removal of alder would provide additional redundant stream shade.

Sediment delivery to stream channels is not expected to have an indirect effect on aquatic species populations. This is because of the lack of delivery pathways to stream channels. Timber harvest associated soil disturbance, including post-harvest fuels treatments, would not occur within 35 feet of any stream channel. Post-harvest vegetative stream buffers are expected to be sufficient to preclude overland flows from delivering sediment to streams. The directional felling of trees away from riparian buffer and yarding corridors would further prevent sediment delivery. Additionally, bare mineral soils created by yarding activities within units would be covered with slash within 50 feet of any active stream channel.

The restriction of haul on native surface roads to the dry season, usually June 1 through October 15th, would prevent runoff related sediment from reaching stream channels from these roads. Furthermore, virtually all of these roads to be used for hauling within the planning area are ridge top roads, with one exception. A native surface road in the Steele Creek drainage crosses the fish-bearing portion of Steele Creek twice. If determined necessary, sediment traps would be installed at these culvert crossings to prevent a pulse of sediment from being delivered to Steele Creek at these site as a result of the first few fall rains. Aquatic species populations have the opportunity to be effected by sediment delivery from gravel surface where culverts pass under the road. At sites where measureable road related sediment may be delivered to fish-bearing streams during storm events, sediment traps would be installed to prevent sediment delivery.

Conducting road work during the dry season and improving road drainage may allow for sediment delivery to individual stream reaches during the first fall rains. However, these effects are not expected to be observed beyond the reach scale and therefore would not be expected to impact aquatic species populations. These effects will be minimized to the extent practicable by establishing adequate erosion control prior to the onset of the rainy season. Most of these drainage related improvements are specifically aimed at routing water, and any sediment it may be transporting, off of roads on to the forest floor before it can be delivered to stream channels.

Sediment delivery reduction resulting from road renovation and improvement may have a slight long term beneficial indirect effect on aquatic species at the reach scale. However, significant changes in sediment related water quality are not expected to be detectable at the drainage, subwatershed, and watershed scales and therefore are not anticipated to have a measureable effect on aquatic species populations.

Cumulative Effects:

Cumulative effects of past land management practices in the analysis area have contributed to degraded aquatic habitat conditions. On BLM-managed lands, road and harvest design features and best management practices associated with the Proposed Action Alternative are expected to reduce the influence of past practices on aquatic habitats. The short term impacts of these actions on water quality, and therefore aquatic species, are not expected to occur beyond the reach scale for the reasons stated above. The actions described above will occur over five to six years, spread out over three fifth-field and six sixth-field watersheds. This would further help dilute the potential indirect effects to aquatic species populations, if any were expected.

ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal action agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat (EFH) identified under the MSA. The EFH regulations at CFR section 600.920(e)(l)(i) enable federal agencies to use existing consultation and environmental review procedures to satisfy EFH consultation requirements if they meet the following criteria: 1) The existing process must provide the National Marine Fisheries Service (NMFS) with timely notification (90 days) of actions that may adversely affect EFH; 2) notification must include an assessment of impact of the proposed action as discussed in section 600.929(g); and NMFS must have made a “finding” pursuant to section (e)(3) that the existing process satisfies the requirements of section 305(b)(2) of the MSA (see below).

The NMFS has found that the existing National Environmental Policy Act (NEPA) and Endangered Species Act (ESA) environmental review process, including the Interagency Streamlined Consultation Procedure for Section 7 of the ESA (July 1999), used by the United States Forest Service (USFS) and the Bureau of Land Management (BLM) for federal activities can be used to satisfy the EFH consultation requirements of the MSA provided that the NMFS, along with the USFS and BLM, adhere to the procedural steps outlined in NOAA Fisheries finding that the USFS and BLM existing environmental review procedures for federal actions meet EFH consultation requirements, September 13, 2000.
The USFS and BLM may incorporate an EFH assessment into NEPA documents and public notices pursuant to 40 CFR section 1500. NEPA and ESA documents prepared by the USFS and BLM should contain sufficient information to satisfy the requirements in CFR 600.920(g) for EFH requirements and must clearly be identified as an EFH assessment. The mandatory contents of an EFH assessment are: 1) description of the proposed action; 2) an analysis of individual and cumulative adverse effect of the action on EFH, the managed species, including life history stages, and associated species such as major prey species; 3) a determination of effects on EFH; and 4) a discussion of proposed mitigation, if applicable.

The level of detail in the EFH assessment should be commensurate with the complexity and magnitude of the potential adverse effects of the action on EFH. Adverse impact on EFH will be addressed in ESA and/or NEPA documents in a section or chapter titled "Essential Fish Habitat." The information must be easily found, and should include both an identification of the affected EFH and an assessment of impacts. An EFH assessment may incorporate other environmental assessment documents by reference.

Species Considered: coho salmon

Mandatory contents of EFH assessment

1) A description of activities associated with the Fairview NWFP Timber Sale can be found in this Environmental Assessment.
2) Activities associated with the Fairview NWFP Timber Sale are expected to have no effect on EFH, the species considered, and their major freshwater prey species for the reasons stated in the analysis of the Proposed Action Alternative above.
3) There will be no effect upon EFH.
4) Best Management Practices and Project Design Criteria would minimize impacts to aquatic and riparian habitats and the species of concern. These are outlined in this Environmental Assessment.

Determination:

The MSA defines adverse effects as any impact, which reduces the quality and/or quantity of EFH. Adverse effects include direct, indirect, site-specific or habitat wide impacts, including individual, cumulative or synergistic consequences of actions.
Activities associated with the Fairview NWFP Timber Sale would have no effect on EFH for coho salmon. The rationale for this determination is contained within the aquatic species discussion for the Proposed Action Alternative above.

ENDANGERED SPECIES ACT CONSULTATION

All actions associated with the Fairview NWFP Timber Sale have been determined to have "No Effect" upon Oregon Coast (OC) coho salmon, which are currently listed as a "Threatened" species under the Endangered Species Act (ESA). This is because the causal mechanisms that may influence water quality and/or aquatic habitat conditions in coho-bearing streams would be arrested through the application of Best Management Practices and Project Design Criteria. Since no activities would occur within coho salmon-bearing streams there is no reasonable expectation for any effects to coho salmon to occur. Additional rationale for this determination can be found in the OC coho salmon Biological Assessment for the Fairview Timber Sale (USDI, BLM 2011).

SPECIAL STATUS SPECIES – AQUATIC

All actions associated with the Fairview NWFP Timber Sale have been determined to minimize the likelihood and need for listing under the ESA for the Special Status Species considered in Table III-9. This is because of the inability of these activities to adversely affect these species, at the population level, as determined within the aquatic species discussion for the Proposed Action Alternative above.

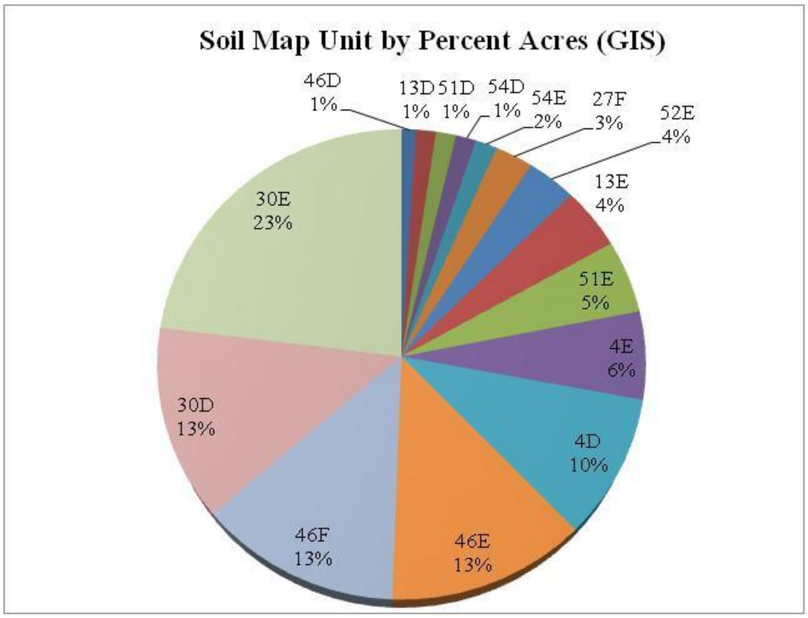
SOILS

AFFECTED ENVIRONMENT

Soils within the analysis area are a combination of colluvium and residuum derived from sedimentary rock, and basalt. The soils in the river valleys and on adjacent alluvial fans formed in recent alluvium derived from mixed sources. Within the Coos County Survey there are more than 180 different kinds of soil. The proposed project area encompasses approximately 24 of the soil map units, with 15 of these units comprising 99.5 % of the proposed treatment acres.

The distribution of acreage by soil map units for the proposed units is represented in Figure III-6 below. The corresponding properties and limitations of these soils are listed in Table III-10. Most of the proposed actions occur on three broad soil units (4, 30, and 46) which incorporate a range of slopes.

Figure III-6. Distribution of Soil Map Units in Proposed Treatment Area



Data derived from Natural Resources Conservation Service (NRCS) soil survey for Coos County was used in conjunction with GIS ArcMap capabilities to determine the characteristics and limitations of the Coos watersheds and develop analysis data for the particular units in this proposed action. From the NRCS data, http://soildatamart.nrcs.usda.gov/Survey.aspx?County=OR011, soil limitations and soil properties were determined for the proposed acres of treatment. Summarized maps are included in Appendix A. Table III-9 provides descriptions of the various NRCS ratings.

The ratings for individual map units are based on a weighted average when two or more individual soil components make up the map unit. Many times the average is a combination of up to three different particular soil types. In some instances, a range of risk or a rating is listed by NRCS. This is intended to demonstrate that the particular soil map unit does not necessarily have the average severity/risk or limitation as listed but rather a percentage of the soil map unit has a higher/lower rating then other soil types making up the map unit. For example, a soil map unit that has a rocky soil type on the ridge but

Table III-9: NRCS Soil Ratings within Proposed Treated Units

Soil Map Symbol	Soil Name	Proposed Acres Treated	Erosion Hazard Rating	Mechanical Equipment Rating (skidders and dozers)	Compaction Resistance	Soil Restoration Potential Rating	Permeability Rating* (Micrometers/sec)	Average Site Index Value** (SI Class)
46D	Preacher-Bohannon loams, 3 to 30 % slopes	71	Moderate	Moderately Suited	Low	High	Very High (373)	126 (2)
13D	Dement silt loam, 12 to 30 % slopes	98	Moderate	Moderately Suited	Low	High	Mod High (9)	111 (3)
51D	Rinearson silt loam, 0 to 30 % slopes	99	Moderate	Moderately Suited	Moderate	High	Mod High (9)	132 (2)
54D	Templeton silt loam, 7 to 30 % slopes	99	Moderate	Poorly Suited	Moderate	High	Mod High (9)	125 (2)
54E	Templeton silt loam, 30 to 50 % slopes	109	Severe	Poorly Suited	Moderate	High	Mod High (9)	125 (2)
27F	Harrington very gravelly loam, 50 to 70 % slopes	188	Very Severe	Poorly Suited	Low	High	High (28)	99 (3)
52E	Salander silt loam, 30 to 50 % slopes	244	Severe	Poorly Suited	Moderate	High	Mod High (9)	125 (2)
13E	Dement silt loam, 30 to 50 % slopes	310	Severe	Poorly Suited	Low	High	Mod High (9)	111 (3)
51E	Rinearson silt loam, 30 to 50 % slopes	362	Severe	Poorly Suited	Moderate	High	Mod High (9)	132 (2)
4E	Blachly silty clay loam, 30 to 50 % slopes	436	Severe	Poorly Suited	Low	High	Mod High (9)	125 (2)
4D	Blachly silty clay loam, 0 to 30 % slopes	710	Moderate	Moderately suited	Low	High	Mod High (9)	125 (2)
46E	Preacher-Bohannon loams, 30 to 60 % slopes	923	Severe	Poorly Suited	Low	High	Very High (373)	126 (2)
46F	Preacher-Bohannon loams, 60 to 90 % slopes	941	Very Severe	Poorly Suited	Low	High	Very High (373)	126 (2)
30D	Honeygrove silty clay loam, 3 to 30 % slopes	962	Moderate	Moderately suited	Low	High	Very High (109)	122 (2)
30E	Honeygrove silty clay loam, 30 to 50 % slopes	1663	Severe	Poorly Suited	Low	High	Very High (109)	122 (2)

* NRSC ratings in Micrometers/ second, classification values moderately high: 1 to 10, High: 10 to 100, Very high: 100 to 705
** Site Index Classes based on 50 year King Index table

deep soils on the sideslopes or depression areas would have low water holding capacity on the ridge and high to very high capacity on the slopes. The breakdown of the percentages of the individual soil types that define the overall soil map unit are found within the soil survey of the county.

The physical soil environment within the proposed action area can be characterized in general as a gravelly or very gravelly loam, silt loam or silty clay loam on slight or moderately steep (30-65%) slopes. This watershed supports forest vegetation and agriculture. The soils are considered erodible if the surface of the land becomes exposed to the open sky at the 50-75% level (NRCS rating criteria). Erosion hazard ratings range from slight to very severe with approximately 5,217 acres rated in the severe and very severe classes. All the soils are rated moderately high to very high for soil permeability with 4,779 acres considered moderately to very high. The soils are considered resilient to management actions as they contain high amounts of organic matter in the upper three inches of soil and losses of approximately 4.5 tons of soil per acre per year on the average can occur and not incur long-term productivity losses. All of the soils are considered well drained when saturated with no underlying limiting horizons at shallow depths that restrict water movement. Of the soils found within units, the 187 acres of the 27F soil map unit is the most limiting for water drainage. However, the restrictive layer is found at a deep (66 inches) rather than at a shallow level.

STABILITY OF LAND SURFACES

Using the modeling capability of GIS LiDAR, some landslides appear where road sidecast has overburdened the slopes in the apex of some curves where the stream crossing occurs. There are less than 12 of these and generally in association with slopes steeper than 65%. This is typical of past construction practices at the time the road was built. Based on the practices of the last thirty years many of the slides will be intercepted by the transportation network and debris removed to more stable waste areas or the sediment load will deliver directly to the channel. For some forested stands, delivery of slides to the stream network with their respective load of wood and soil mixture will still occur. Construction practices employed by most all landowners and managers have trended towards preservation of the roads and the investment they represent and are more stable. Old practices of sidecasting, road abandonment, and weathering over time are not practices of today. Therefore the issue of stability seems to be confined to those failures that have not occurred as of yet on the older roads and landings. As land-management activities continue to renovate old roads in the analysis area, the risk of failure of these potential sediment sources could be reduced.

EFFECTS OF THE NO ACTION ALTERNATIVE

There are other planned federal projects or projects connected with a federal decision within the analysis area. The construction of the Pacific Gas Connector Pipeline would cross both private and federal lands, create a permanent ROW crossing, temporary storage areas, uncleared storage areas, quarry and disposal areas. Some of the pipeline would use the existing road network as the ROW location within the analysis area. The pipeline construction action was analyzed under an EIS and the long-term impacts to soils are not anticipated to be significant within the areas temporarily affected by pipeline construction. Potential impacts on soils would be minimized through measures specified in Jordan Cove's Plan and Procedures and Pacific Connector's Erosion Control and Revegetation Plan (ECRP).

SEDIMENTATION AND EROSION

If the proposed acres are not harvested, the level of sedimentation within the analysis area will depend on harvest from private forestlands using intensive forest management actions. All roads proposed for renovation or constructed as described in Chapter 2 will remain in their current state. Some maintenance (i.e. roadside brushing, grading, and ditch cleaning) may occur on BLM controlled roads as needed to provide safe passage for private timber related haul or public safety by the county. Overall, the analysis area appears to have a low production of sediment from road surfaces. Most roads are covered with gravel or pavement within the wooded environment and County roads adjacent to streams are paved.

LONG TERM PRODUCTIVITY

The average site index for the analysis area is 124 ft.@ 50 years of age (King value). This corresponds to a mid-range site class 2 level of productivity. The average number of cubic feet the forest can produce is 176 cubic feet per acre per year. This is approximately eight times higher than the 20 cu.ft./ac/yr. minimum required for classification as commercial forestland for the BLM. For those stands that are not treated under this action, the effects of competition may lessen the average production per acre. Within the analysis area, the average long-term production is expected to remain the same.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE:

Overlaying the available NRCS soil data with the proposed treatment units provides the physical properties and limitations of the soil (Table III-9) and some context for evaluating the proposed action. Soil map units are generally assigned slope classes (i.e. 30-60%) and for NRCS rating purposes, the upper limit drives the overall rating. Map units can be a single soil type or a grouping of several soil types. Physical processes such as infiltration of one series may produce a higher risk rating for the soil map unit even though it only encompasses 20% of the total of the unit. This level of analysis for each series within the map units and their individual ratings can be obtained from the NRCS soil survey. For the basis of this analysis, the ratings are taken from the steepest slopes or most limiting soils even though the proposed unit may be on gentler grade or on less limiting soil.

SEDIMENTATION AND EROSION

For the proposed action, soil map units 30D, 30E, 46E, 46F, 4D, and 4E make up the majority (78%) of the land area. The most important limitation of these soils is the risk of erosion on exposed soils, especially where the slopes exceed 60%. Between the residual canopy layer, brush and litter layer left after the harvesting, the open sky exposure limit would not be met in the proposed thinning units. Thus, even though the rating is severe or very severe the expected level of erosion would be low. Where the proposed action is to convert the current stand of timber and burn the harvested lands the level of exposure may meet the levels set by NRCS and the hazard rating would apply.

Due to the moderately steep hillsides (30-65% slope) in some of the proposed treatment area, it is necessary to use harvest systems that achieve at least one-end suspension to limit soil disturbance to an acceptable level (15% of the harvest area is normal for these cable systems). Most soils have a high potential for soil restoration following such a disturbance. In areas where the land is less steep (less than 35% slope), some soils support harvest with ground-based equipment. In these particular areas, the soils are capable of supporting harvest equipment or equipment that can operate on a layer of slash in order to prevent impacts to the soil environment. Approximately 10% of the proposed treatment area (691 acres) are on slopes greater than 65%. These areas are distributed across the analysis area with the greatest concentration in the upper north and central areas.

The proposed action would remove a portion of 40-75 yr. old timber from the proposed units principally using skyline cable, and various ground based harvest systems. The ground-based areas may be harvested with a variety of equipment but the RMP limits ground based operations to slopes of 35% or less. Ground based equipment would be limited by a 12% harvested ground area displaced or compacted. Approximately 830 acres of the 7,344 acres are planned for ground based harvesting. This amounts to a minor portion (approximately 11%) of the total acres. One-end suspension of the logs on the incoming end would be obtained on all harvested acres, using either the planned skyline cable or ground-based methods. Due to the volume per acre being low and the diameter of logs is small, similar past actions have not demonstrated the need for increased suspension. Yarding away from riparian reserves and providing full suspension of logs across streams through corridors would prevent sediment delivery to the creek. Infiltration of surface runoff would be rapid with sediment captured within the no harvest riparian buffer. No harvest buffers adjacent to streams range from 35 to 100 feet from the stream center to the harvest edge thereby providing an appropriate zone for capture and filtering of overland sediment from any disturbed areas.

Units or portions of units proposed for a ground based harvest system would be confined to those areas that have slopes less than 35%. Often these areas are moderately to poorly suited to mechanical equipment (rubber tired skidders and dozers) and have a low resistance to compaction which indicates that the soil has one or more features that favor the formation of a compacted layer (reference: Appendix A, Map F) . Using design features that require operations on dry soils and/or provide a slash layer to cushion the soils during harvest operations and limiting the extent of disturbance area as outlined in Chapter 2 would help prevent proposed operations from adversely affecting the soil resources.

The ground-based areas have the highest site index within the proposed action area (King SI 2). They also have a high soil resiliency rating. Both of these indicators demonstrate the soil has the ability to support this type of harvest. Standard rubber-tire skidders and bulldozers are the assumed equipment to be used for ground-based harvesting and transport by the NRCS when developing the ratings.

Commercial Thinning and Density Management Thinning

Erosion hazard ratings on approximately 5,176 acres of the proposed action area are rated by the NRCS as severe or very severe. These ratings are based primarily on percent slope class, the K Factor of the individual soil units, and the expectation that 50-70% of the soil would be bare and exposed to normal climatic events. None of the thinned areas other than the road construction areas would be bared to this level. Road construction would place a lift of rock on the open areas or the road surfaces will be treated to manage infiltration and runoff when the roads are decommissioned. Thereby removing the erosional process and limiting the sediment delivery to a minimal level.

The primary mechanisms that prevent or eliminate sediment delivery from the proposed treatment areas are those design features that reduce soil exposure, such as skyline harvest systems and those that leave debris and vegetation on the soil surface. For the acres in the proposed action area, no soil map units appear to have the potential to deliver sediment for long distances across the map units. There are no soils having a combination of seasonal drainage restrictions and high clay contents. Thus, they are rated well drained for drainage class and permeability is either moderately high to very high. All well drained soils in the proposed action area have the capacity to capture fine sediment within the units through infiltration and not transport it to stream networks. Therefore, it is not expected that fine sediment delivery would be an impact from the proposed action.

Capture of eroded sediment occurs through two principle processes in the affected fifth field watersheds, infiltration and filtering by vegetation or woody material on the ground. Of the severe and very severe erosion rated soils mentioned above, the vegetation within the treated units and the riparian areas prior to the streams would remain intact to filter any derived sediment from bare soils. The distance between the cut area and a stream would be at least thirty-five feet and the vegetation would allow complete infiltration of runoff. Within the units, after treatments, the remaining woody material or slash would provide an additional filtering mechanism to prevent offsite movement of the fine sediment particles. Broadcast burning is not in the proposed action for thinned stands and piles burned around landing areas would occur during wet weather conditions and only consume the piled slash materials.

Sample tree falling would have no effect on sedimentation as the trees would be felled but not removed as part of the sampling process, therefore not exposing soil to erosional processes. Removal of felled sample trees would only occur as part of the overall harvest of the thinning unit.

Alder Conversion

Within the proposed action approximately 974 acres, of predominately alder stands, would be converted to stands of Douglas fir, western red cedar and hemlock species. To accomplish this action, site preparation would be necessary. This is in contrast to the rest of the proposed action where thinning of stands would be implemented. Preparing the site for planting has been evaluated by the fuels specialist and the silviculturist. A plan for broadcast burning and pile burning would reduce the fuel loading on the sites to allow access for planting, setting back the competing brush species, and increasing light and moisture available to the seedlings to ensure establishment success.

Approximately 606 acres are recommended for potential broadcast burning. The majority of these acres are rated highly susceptible damage by fire primarily due to slopes over 50%. According to the NRCS data, susceptibility to fire damage ratings represent the relative risk of creating a water repellant layer, volatilization of essential soil nutrients, destruction of soil biological activity, and vulnerability to water and wind erosion prior to reestablishing adequate watershed cover on the burned site. The ratings are directly related to burn severity (e.g. a low-moderate severity burn would not result in water repellant layer formation). This rating should be used in conjunction with the soil restoration potential rating depending upon the type of regeneration that would be utilized on the site.

All of the units proposed for burning have a high rating for soil restoration potential. With the emphasis on following prescribed burn plans and cooler burns (spring like conditions) the impact to the soil from fire would be eliminated or minimized. Pile burning may concentrate impacts of the burn to the immediate location of the pile however less soil area overall would be exposed to the fire effects. Both cool broadcast burns and pile burning result in incomplete combustion and can leave a cover layer upon the soil surface that would protect the soil from erosion. Requiring some amount of cover when biomass reduction methods are used would also ensure a protective layer. Because of the rapid rate at which vegetation grows in this analysis area, it is expected that the land surface would be covered with new growth within one to two years.

In addition to the regrowth of vegetation after burning, the design of untreated stream buffers adjacent to intermittent and perennial streams is expected to prevent the delivery of sediment to the stream network. The high rate of water infiltration into the soils within the treated units along with the vegetated width of the buffer is expected to capture any overland runoff and erosion.

Specific to the proposed action area, debris torrent or avalanche type slides are the major input of woody debris and soil materials to the stream network. These types of slides are common on the Tyee and Flournoy geologic formation where slopes are greater than 75 to 80%. Because the majority of the proposed treatment acres are on less steep slopes and partial removal of timber would still provide live roots across the hillslope, the risk of promoting landslides is very low. Road building and renovation of older roads would be on stable ridgetops or on previously constructed road locations. The proposed action would employ RMP Best Management Practices for all such work and design features would prevent materials from being side-casted and overburdening the slope. Thus, all slides from road related work would be eliminated or kept to a minimum. Leave areas adjacent to riparian zones would prevent disturbance and potential mass movement of the slopes in these areas.

Road Construction:

New road construction is proposed for approximately 31 miles within the various fifth field watersheds. All roads are on stable soils, with approximately 10 short spurs on steep slopes (greater than 65%). Full bench construction techniques are implemented on these types of roads to reduce the potential to produce large quantities of fine sediment (landslide events). All others are on slopes of 12 to 30% grades with short sections on 45-60% slopes. All roads cross on the contour rather than up or down at steep grades on the mid-slopes. Therefore, all new construction is considered on stable landforms with no impacts for sediment delivery or road failures.

Proposed road work would occur in the dry season to keep sediment delivery at an acceptable minimum. Design features specify routing water around culvert replacement sites if the stream crossings are perennial. All disturbed soil is to be seeded and mulched prior to the onset of winter rains thus the delivery from such installations would be negligible from the first rains of the season. For the Coast Range, this initial flush of fine sediment is normal for all streams. The additional sediment from the construction would not be outside of the normal range of delivery and would be an immeasurable increase.

At the end of use, approximately 13 miles of new construction would be decommissioned from use. Almost 22 miles in total would be closed to traffic by installation of berms, and waterbars to route runoff. Most of the remaining new construction would be behind existing gates to limit vehicle traffic. Closure of any road surface in these watersheds even temporarily allows the surface to be covered with needle cast, leaves, and other organic matter and provides sediment capture and surface protection from precipitation. Any long-term closure such as with a berm or culvert removal allows vegetation to establish on the surface within a couple years, especially dirt surfaces, and provides a greater level of sediment capture and filtering. Implementing these closures is expected to limit the delivery of fine sediment from the constructed roads in the future thus negative impacts to water quality and aquatic habitat are not likely to occur from this portion of the proposed action.

Road Renovation and Improvement:

To transport the harvested timber and provide access for other land management activities, the BLM proposes to do approximately 69 miles of roadwork associated with restoring current or old roads to serviceable condition for summer use or improving them for winter use. Road shaping and blading, in addition to brushing and applying rock where subgrades or surfacing are in poor condition, are expected under this proposed action. Providing proper drainage of runoff during the winter would be accomplished by such actions and implementation of design features would eliminate or minimize the delivery of fine sediment from the road surfaces during winter haul. Sediment capture for stream crossings would be accomplished as needed through the installation and maintenance of sediment trapping mechanisms as part of the timber sale contract when such action occurs.

LONG TERM SITE PRODUCTIVITY

On forested lands, the ability to grow woody fiber every year is an indication of the current site productivity for a given soil map unit. The NRCS has calculated the yearly production of cubic feet of various woody species for the map units and the average site index for most of the map units in the county. The use of Site Index as a long-term productivity indicator has been incorporated into this analysis as a measure to assess the potential to degrade long-term site productivity. Sites with the best growing soil and high production rates are considered Site Class 1; the lower Site Classes are 4 and 5 for this coastal area. The highest Site Class in any of the proposed units is Class 1 and is found on approximately 3 acres of the total proposed acres. The majority of the proposed units are site class 2, approximately 6,710 acres, the remaining acres proposed for treatments are Site Class 3. Land converted from current growing forest to roads calculates to approximately 1.5% of the total proposed unit acres and does not exceed the RMP allowable limits of 100 acres/yr. The construction of the proposed thirty-one (31.2) miles of road would be implemented over the course of three to five years.

The average Site Index for the proposed units is 120 ft./50 yrs. This corresponds to a midrange Site Class 2 level of productivity. The average number of cubic feet the forest can produce is 180, per acre per year. This is nine times higher than the 20 cu.ft./ac/yr. minimum required for classification as commercial forestland for the BLM. For those stands that are not treated under this action, the effects of competition may reduce the average production per acre compared with the treated stands. Within the larger analysis area, the average long-term production is expected to remain the same, as it would be difficult to detect a measurable change from the area proposed for treatment on the total.

A high rate of forest production begets a large amount of organic matter (OM) on the coastal range of Oregon. For all the proposed units the level of organic matter on the surface is high, most are 75% of the surface layer (1-3inches depth). This high level of OM provides protection of the soil from erosional processes but also helps to store water and provides the food source for many of the nutrient cycling processes that in turn generate more forest production. Removal of this OM layer through disturbance of the surface or erosional processes can lead to lower overall forest production. Protection during harvest, using skyline cable systems or ground protection for ground based harvesting is instrumental to ensure soil resiliency and long-term growth. Using the design features proposed during harvest burning and road building, any impacts to soil resources are not expected to reduce the current level of long-term site productivity.

Removing the commercial portion of the vegetation leads to a buildup of small material (slash) that needs to be removed from the landing areas in some manner in order to reduce the risk of fire after harvest operations. This is part of the proposed management activities. Reduced site productivity is not expected from the removal of slash through pile or broadcast burning. The majority of the small limbs and branches would be generally left on site to be returned to the nutrient pool for future growth of the remaining trees.

Sample tree falling would have no effect on site productivity as the trees would be felled but not removed as part of the sampling process. Removal of felled sample trees would only occur as part of the overall harvest of the thinning unit.

Cumulative Effects

Other federal actions in the watersheds include road building and improvement in addition to thinning of 40 to 75 year old stands of timber. Approximately 2,013 acres of thinning type, harvesting has been conducted by the BLM in the North Fork of the Coquille River fifth field watershed and impacts to soil resources have been negligible. The harvest systems in the past have been a combination of skyline cable and ground based as in the proposed action. Therefore, the expected level of disturbance and compaction to soil resources from the proposed action are expected to be less than what is allowed in the RMP.
The potential building of the Pacific Gas Connector Pipeline as stated in the no action alternative may occur within one of the Coos and two fifth field watersheds of the Coquille River systems respectfully, where the proposed action is located.

Private lands are expected to be harvested continually when close to 40 years of age and the market is favorable. This would keep various private landowners harvesting within all of the fifth field watersheds of the analysis area over the next several decades. Private harvest operations and ROW agreements dictate when and where the current transportation system remains open.

Choosing the preferred alternative of this action in combination with other known actions would have no greater effect than the known activities on the future level of sediment delivery, site productivity, or stability of federal lands within the fifth field watersheds.

WILDLIFE HABITAT AND T&E SPECIES

AFFECTED ENVIRONMENT

Proposed units are located between 10 and 20 miles inland from the Pacific Coast. The wildlife analysis area, specific for the wildlife resource, includes all the proposed units and the surrounding area within one mile of the boundary of a polygon encompassing all of the proposed units. The wildlife analysis area encompasses approximately 42,093 acres including 13,802 acres (33%) under BLM management, 28,273 acres (67%) of private lands, and about 18 acres of Oregon State lands. The wildlife analysis area was selected, for USFWS consultation purposes; to more accurately analyze the effects to listed species.

Historic BLM vegetation data from 1930 indicates that the wildlife analysis area contained about 18,068 acres (43%) of conifer stands and 2,430 acres (6%) of hardwood stands. The remaining acres in 1930 were either denuded, burned, or non-forest. Our best available more recent data that includes all ownerships is from the 1993 Western Oregon Digital Image Project (WODIP). The WODIP data indicate that, as of 1993, the wildlife analysis area contained approximately 21,101 acres (50%) of conifer stands and 7693 acres (18%) of hardwood stands under all ownerships. Mixed conifer and hardwood stands were found on 847 acres (2%) in 1993, but mixed stands were not reported on the 1930 data.

The proposed harvest areas are approximately 35 to 70 year-old conifer plantations. The stands are typical even-aged second growth with a high canopy closure, low structural diversity with little to no shrub/herbaceous layer. These stands have canopy closure exceeding 60% and often reach 100% which allows very little ground vegetation. Stands of this type are used by approximately 36 species of wildlife for the primary purposes of feeding and/or breeding. An additional 92 species of wildlife are known to use stands of this type secondarily for feeding and/or breeding (Brown 1985). The expected species composition for this habitat type includes large mammals such as black bears, deer, elk, coyotes, bobcats and mountain lions. Smaller mammal species include: bats, shrews, moles, weasels, squirrels, chipmunks, ground squirrels, porcupines, and mountain beaver. Bird species found in habitats such as these include: Cooper's and sharp-shinned hawks, grouse, owls, and many species of neo-tropical birds. Several species of salamanders, frogs, and snakes also use stands such as the proposed harvest area.

THREATENED AND ENDANGERED WILDLIFE SPECIES OCCURRENCE AND HABITAT

Nearly 100% of BLM land in the wildlife analysis area is capable of becoming suitable habitat for spotted owls and marbled murrelets. Approximately 51% of these habitat-capable acres are currently within the Riparian Reserve LUA. The Riparian Reserve comprises approximately 45% of the proposed treatment units.

Northern Spotted Owl

There are currently no known northern spotted owl sites within the wildlife analysis area and there are no stands currently providing suitable nesting habitat for spotted owls. Spotted owl roosting and foraging habitat occurs in four stands within BLM-managed land of the wildlife analysis area. The four stands provide a total of approximately 65 acres of habitat in three different sections. Nineteen acres occurs in one section in two separate stands and the other two stands are separated by two miles and are five to seven miles from the section containing the two stands. Another section contains a 34 acre stand that is considered roosting and foraging habitat for spotted owls. This 34 acre stand is near a proposed timber sale unit, although separated by a heavily-used hard-surfaced road that passes along and through the stand. This stand also occurs within one mile of the community of Fairview, and is adjacent to private land with multiple residences adjacent to the stand. Because of the fragmentation and low quality of the spotted owl habitat, it is unlikely that spotted owls are nesting anywhere in the wildlife analysis area. Although there is no designated critical habitat within the wildlife analysis area, approximately 88% of BLM administered land within the wildlife analysis area is currently considered dispersal habitat for spotted owls.

Marbled Murrelet

There are no known occupied marbled murrelet stands within the project area. Surveys for murrelets were conducted in 1993 and 1994 in portions of seven sections within the wildlife analysis area for previous projects which did not indicate that murrelets were present. There are no currently valid marbled murrelet surveys for the wildlife analysis area and no suitable marbled murrelet habitat is now present in the surveyed area. If marbled murrelets are found to be occupying the area, potentially disturbing activities would be seasonally restricted in those areas, unless site-specific conditions warrant an adjustment of the restricted area. Any reduction in the area requiring restrictions would be evaluated on a case-by-case basis. Factors to be considered include the type and duration of the disturbance, the probability of the adjacent habitat being occupied (based on habitat quality, including the size and number of potential nesting platforms), prevalence of moss, height and density of secondary canopy trees, and topographic shielding or other factors which may lessen the potential disturbance.

EFFECTS OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, stands in the project area would continue in their current development trajectory. Due to high stand densities, late-successional habitat development would be delayed in comparison with the action alternative. In the absence of future disturbance, it is expected that stands would continue through a series of tree suppression mortality stages before eventually developing late-successional characteristics. A single story canopy with a narrow size and age range would continue to dominate most stands. Vertical stand complexity would remain relatively unchanged over the next several decades which would not be conducive to formation of habitat used by T&E species. Understory tree recruitment would be delayed in comparison to the action alternative.

Untreated alder-dominated stands would generally persist until mortality at the relatively young age of 70-90 years. Natural conifer regeneration in formerly alder dominated stands is generally slow to establish partially because of the dense and persistent cover of the herbaceous/shrub layer. Coniferous tree regeneration would show little development until such time that the stand opens up through competition or disturbance.

Stand projection simulations suggest that it would take unthinned stands 200 years to produce large diameter forest structure associated with late-seral stands (USDI BLM 2001). In contrast, Tappeiner et al. (1997) found that many Coast Range old-growth stands developed under low stocking densities and developed large diameter trees capable of providing large structure by the time those trees were 50 years old.

Some wildlife species associated with mid-seral stands would continue to utilize the project area, and would benefit from the delay of late-successional conditions. Hayes (2001) found that unthinned stands of similar age and structure maintained species such as the Pacific-slope flycatcher (*Empidonax difficilis*) and golden-crowned kinglet (*Regulus satrapa*). Although some species are more common in dense, unthinned stands, no species are known to depend on this development stage (Hayes et al. 1997).

The current trajectory of snag and coarse wood development would continue. Snags and coarse wood recruited would primarily come from the suppressed crown classes and would be generally smaller than the dominant overstory trees. As suppression mortality continued, there would be an increase in species associated with this habitat as flushes of snags and coarse wood become available. Species utilization depends on the size of the material, stage of decay, as well as amount on the landscape. Primary cavity excavators such as the pileated woodpecker (*Dryocopus pileatus*) utilize a variety of size snags for foraging, but generally utilize larger snags for nesting. Due to tree size, most of the snags and coarse wood in the project area would provide foraging substrate, but would not provide nesting habitat except for the smallest of cavity nesting species. Longevity of the snags and down wood would be short due to the overall size of the material and swiftness of decay. Development of large snags and large pieces of coarse wood would be delayed in comparison with the action alternative.

NORTHERN SPOTTED OWL

Under the No Action Alternative, stands in the project area would continue to provide spotted owl dispersal habitat. Late-successional conditions, which would provide suitable nesting habitat for spotted owls, would be delayed because of the current, high stocking levels of the stands.

MARBLED MURRELET AND BALD EAGLE

Except for the few remnant trees, the project area is not currently providing suitable habitat for marbled murrelets or bald eagles. Development of large trees with potential nesting structure would be delayed under the No Action Alternative. Stand development trajectory would remain different than that which occurred in most stands that currently provide suitable habitat.

BIG GAME SPECIES

Moderate hiding and thermal cover would remain in the proposed project area. Forage would remain low in the project area. No disturbance from harvest or road work would occur. Road densities in the watershed would remain at their current levels.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE:

THREATENED AND ENDANGERED WILDLIFE SPECIES OCCURRENCE AND HABITAT

There is no known suitable nesting habitat for northern spotted owls or known occupied or unsurveyed suitable habitat for marbled murrelet within the wildlife analysis area. None of the proposed treatment units are within late-successional reserves or critical habitat units (CHU) for northern spotted owls or marbled murrelets. None of the units are within the 1.5 mile home range radius of any known spotted owl nest site. Two units are approximately 1.5 miles from potential owl sites predicted by the northern spotted owl occupancy map (USDI-USDA 2008).

If nesting spotted owls are found, seasonal restrictions would apply to those portions of units within distances that may cause disruption, unless an evaluation of site-specific conditions indicates that restricted distances may be modified. Examples of site-specific conditions which would be considered include: topographic shielding from noise, local ambient noise levels, duration of disturbance, type and number of disturbances, or other factors that may decrease the level of potential disturbance.

The proposed action would not result in the removal of suitable habitat for spotted owls, marbled murrelets, or bald eagles. There is no critical habitat designated for spotted owls or marbled murrelets within the wildlife analysis area. The habitat within all of the proposed thinning units is considered spotted owl dispersal habitat and would continue to serve as dispersal habitat post-thinning as canopy closure would be maintained well above the minimum level of 40 percent canopy closure for dispersal habitat. Following all activities, 92 percent of current dispersal habitat would be maintained. The alder conversion projects would remove marginally suitable spotted owl dispersal habitat. No removal of dispersal habitat would occur within the home range radius of any known owl site and would take place approximately one mile from the nearest suitable spotted owl nesting habitat. A thorough discussion of the effects of the proposed action to spotted owl dispersal habitat is included in the USFWS Letter of Concurrence (USFWS, 2010), and the associated Biological Assessment dated June 21, 2010, herein incorporated by reference.

Sample tree falling and removal associated with the project was included in the effects analysis of the biological assessment. Sample tree falling and removal would not negatively affect marbled murrelets, spotted owls, or their habitat due to the size and structural class of those being felled. If sample tree falling occurs within an area that is later removed from the planned sale unit, the retention of the felled sample trees may provide beneficial effects for prey species of spotted owls by providing potential down wood habitat in the future, therefore providing indirect beneficial effect to the spotted owls.

Effects Determination for Listed Species and Critical Habitat:

NORTHERN SPOTTED OWL

There are no known historic northern spotted owl sites or suitable nesting habitat within the wildlife analysis area. The habitat within all units is considered spotted owl dispersal habitat, and the more open stand following thinning would continue to provide dispersal habitat. The project may provide a beneficial effect to spotted owls by improving dispersal habitat and accelerating the development of late-successional habitat characteristics, especially within the riparian reserve areas. Improvement of spotted owl nesting habitat in the future may also improve future conditions for barred owls. Because there are no known spotted owl or barred owl sites currently within the analysis area, and future presence of either species is unknown, the "no action" and "action alternatives" would have similar effects on potential future interactions between the species. The project would not affect suitable habitat for spotted owls and would not cause disturbance to spotted owls at known sites. The effects determination would be that the project “may affect, but is not likely to adversely affect” (NLAA) spotted owls and would have “no effect” on spotted owl critical habitat.

The removal of 974 acres of marginal, hardwood dispersal habitat scattered across 8 separate sections is not expected to disrupt dispersal. Forsman et al. (2002) stated that owls were able to move across large areas of unsuitable habitat. With the implementation of proposed actions and the cumulative effects, we expect the dispersal habitat condition to remain similar to current conditions which Forsman et al. (2002) suggests are adequate to accommodate movements of owls between LSRs.

MARBLED MURRELET

Several small areas of the proposed units are within distances which would require seasonal or daily timing restrictions because the units are near individual or small groups of potentially suitable nest trees for marbled murrelets. Suitable habitat includes individual conifer trees which have at least one suitable platform and associated protective cover for the platform on the same tree or on a surrounding tree. Suitable habitat is not located within the boundaries of the proposed units, except as individual remnant trees or in small groups of remnant trees. No suitable habitat trees are proposed for removal as a result of the proposed action. Current guidance provides different recommendations for groups of less than six remnant trees within a five acre moving circle, and groups of six or more trees within the five acre moving circle. There are no known groups of six or more suitable remnant trees within a five acre circle within any of the unit boundaries. In the case of individual or small groups of up to five potential habitat trees, a seasonal and daily timing restriction would be required, because of the proximity of the units to the Pacific Coast.. If any individual or group of suitable habitat trees is discovered within units, the seasonal and daily timing restrictions would be applied, and any areas containing six suitable nest trees within a five acre moving circle would be posted outside of the proposed harvest units, including a ½ site potential tree height (SPTH) no touch buffer around the group of trees with potential nesting structure. These areas would be removed from the unit, and yarding through the protected area would not be permitted. No potentially disturbing activities would occur from April 1 through August 5 within distances where disruption to marbled murrelets might occur (generally 100 yards for most expected activities). Additionally from August 6 through September 15, a daily timing restriction (DTR) would limit potentially disturbing activity to the time period between 2 hours after sunrise and 2 hours before sunset within the restricted area. When stand treatment occurs, near individual habitat trees, any trees which may be interacting with the habitat tree must be protected. A general guideline that would be followed to to accomplish this would be to instruct markers to protect all trees within a 30 foot radius of any tree that is $\geq$ 36 inches in diameter at breast height (DBH). Adherence to these requirements would result in a “no effect” determination for marbled murrelets and marbled murrelet critical habitat.

OTHER WILDLIFE SPECIES, INCLUDING SPECIAL STATUS SPECIES AND HABITAT

Surveys are not currently required for any survey and manage wildlife species in the project area. As directed by the 2001 Record of Decision for *Amendment to the Survey and Manage, Protection Buffer, and other Mitigating Measures Standards and Guidelines* (USDA-USDI 2001), an Annual Species Review was conducted and published in 2001, 2002, and 2003. The Species Reviews resulted in the removal of all of the known terrestrial wildlife Survey and Manage species that occur, or potentially occur within the range of the Coos Bay District BLM.

The previously mentioned ROD removed mitigation measures based on recommendations determined by Annual Species Reviews (ASR). In a more recent ruling, the Ninth Circuit Court of Appeals ruled that the 2001 and 2003 ASRs were invalid as they pertained to two timber sales on the Medford BLM District. In a further order, on October 11, 2006, the Court amended language in the ruling to state that thinning projects in stands less than 80 years old are exempt from the ruling. The hardwood dominated stands considered for alder conversion are not red tree vole habitat so wildlife surveys are not required. Any change in Survey and Manage guidance as a result of the Survey and Manage settlement agreement will be followed as appropriate.

There are no known sites for any former survey and manage wildlife species. Although survey and manage species restrictions are not required, the proposed project is expected to have long-term beneficial effects to habitat for former survey and manage species. The proposed thinnings would not reduce canopy closure below 60 percent which has been considered the minimum level for red tree voles and previous survey and manage mollusk species. Hardwood stands are not suitable habitat for any Special Status wildlife species. No negative impacts are expected to any Special Status wildlife species and none of the proposed actions would contribute to the need to list any Special Status wildlife species under the Endangered Species Act.

There are no known caves, mines, or abandoned wooden bridges or buildings, which are used as bat roosts within any of the units. No other known sites of any special status wildlife species occur within the proposed units.

There are no known unique or special habitat areas within the proposed units. There are very few large snags in any of the units. Most of the existing snags and down logs do not meet the Coos Bay District Record of Decision/Resource Management Plan (ROD/RMP) recommendations due to small size or advanced decomposition class (USDI BLM 1995). Stand development following the proposed action would provide increased availability of larger trees and improved potential to provide larger snags or wildlife trees and coarse woody material in the future.

The proposed action would reduce crown cover which would allow development of additional ground vegetation. Many of the same wildlife species would continue to use the stands. Commercial thinning would replace the slower, natural thinning process and would remove many of the trees which would have eventually become small snags and small down woody material. A stipulation in timber sale contracts would result in leaving standing, any non-merchantable, defective, or small trees thereby increasing the short-term availability of these habitat features. Cavity nesting habitat would develop more rapidly as a result of thinning, due to some snag recruitment during the logging process. There would be an expected increase in down coarse woody material in the near future because of large diameter non merchantable material not removed during the thinning operation.

Recommendations for snag or wildlife tree creation following the thinning operation will be based on the availability of conifer trees of sufficient diameter to provide nesting habitat for primary excavator bird species. Stand diameters following thinning generally would not allow meeting the habitat requirements for all of these species. Therefore recommendations within the units that meet minimum size requirements in the smaller two-thirds of the trees in the stand following thinning would be for snag or wildlife tree creation of the largest available of these trees in total numbers of snags or wildlife trees to attempt to support 40 percent of the species needs. This approach may require creation of snags or wildlife trees and retention of all existing snags. Prescriptions for snag or wildlife tree creation would depend on the analysis of stand exam data on a unit-by-unit basis. The general recommendation would be to provide an average of 1.5 snags or wildlife trees /acre across thinned units following harvest activity. Recommendations for providing coarse woody material would be based on stand exam data indicating existing levels and availability on a unit-by-unit basis to provide the levels recommended in the watershed analysis (Price et al, 2004).

The wildlife species that may be found in the proposed units are included in a complete list of wildlife species known to occur on the Coos Bay District. This list is in Appendix T of the Final Coos Bay

District Proposed Resource Management Plan and Environmental Impact Statement, Volume II (USDI BLM, 1994). There are several special status birds, mammals, and amphibian species which could occur in the proposed units. Special status includes Bureau Sensitive, Bureau Assessment, and Bureau Tracking categories. An explanation of these categories may be found in the footnote following table 3-32 of the Final Coos Bay District Proposed Resource Management Plan and Environmental Impact Statement, Volume I (USDI BLM, 1994). Table III-10 lists Special Status Species that occur on the Coos Bay District and the project-specific effects to the species.

Table III-10. Special Status Wildlife Species on the Coos Bay District (includes Bureau Sensitive and Federally Threatened, Endangered, and Proposed, does not include marine or coastal species)

Common Name	Scientific Name	Key Habitat, Presence on Coos Bay District	Project Specific Impacts or Effects, comments
Birds			
Marbled Murrelet	*Brachyramphus marmoratus*	Late-seral forest	No effect, not present, habitat not affected
Aleutian Canada Goose (wintering)	*Branta canadensis leucopareia*	Coastal grass lands	None, not present
American Peregrine Falcon	*Falco peregrinus anatum*	Cliffs, no potential nest sites in analysis area	None, habitat not present
Harlequin Duck	*Histrionicus histrionicus*	Primarily east and west Cascades whitewater streams winter coastal migrant	None, habitat not affected
Upland Sandpiper	*Bartramia longicauda*	Open coastal grasslands, very rare migrant	None, not present, habitat not affected.
Bald Eagle	*Haliaeetus leucocephalus*	Late-seral forest	None, not present, habitat not affected
Dusky Canada Goose	*Branta canadensis occidentalis*	Open grasslands, wet meadows	None, not present
Northern Goshawk	*Accipiter gentilis*	Late-seral forest, rare but potentially present	None, no known sites near project area
Northern Spotted Owl	*Strix occidentalis caurina*	Late-seral forest, known occupied sites near proposed units	NLAA, beneficial effect on dispersal habitat. Suitable habitat not affected
Bobolink	*Dolichonyx oryzivorus*	Grassland	None, habitat not present
Lewis' Woodpecker	*Melanerpes lewis*	Recently burned forest, oak/pine habitats	None, habitat not present
White-tailed Kite	*Elanus leucurus*	Pastures, open grasslands; typically low elevations	None, habitat not present
Oregon Vesper Sparrow	*Pooecetes gramineus affinis*	Grassland	None, habitat not present
Purple Martin	*Progne subis*	Snags in early-seral habitats	None, habitat not affected
Streaked Horned Lark	*Eremophila alpestris strigata*	Open beach; open ground with short grass or scattered bushes	None, not present
Trumpeter Swan	*Cygnus buccinator*	Marsh, wet meadows, bogs, ponds	None, not present
Amphibians			
California Slender Salamander	*Batrachoseps attenuatus*	Late-seral forests, large down logs (especially class 3-4)	None, presence very unlikely
Foothill Yellow-legged Frog	*Rana boylii*	Perennial streams with rock or sand substrate.	None, habitat not affected
Reptiles			
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	Lentic water (ponds, slow sections of rivers). Nests in open areas adjacent to water, can overwinter in forest	None, habitat not affected
Mammals			
Fisher	*Martes pennanti*	Forest w/shrub layer and riparian, snags and large live branches	None, presence unlikely
Fringed myotis	*Myotis thysanodes*	Caves, mines, rock crevices, and large snags and buildings	None, habitat not affected
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Caves, mines, buildings, bridges	None, habitat not affected
Invertebrates			

Common Name	Scientific Name	Key Habitat, Presence on Coos Bay District	Project Specific Impacts or Effects, comments
Hoary Elfin Butterfly	*Incisalia polia maritima*	Maritime?	None, not present
Insular Blue Butterfly	*Plebejus saepiolus littoralis*	Open areas, clover	None, habitat not present
Mardon Skipper	*Polites mardon*	Grass openings with Idaho Fescue and serpentine	None, habitat not present
Green sideband	*Monadenia fidelis beryllica*	Mixed stands with deciduous trees & brush in wet, undisturbed forest at low elevations. Curry County only known sites.	None, presence highly nearest documented site 35 miles SW.
Salamander Slug	*Gliabates oregonius*	Mature conifer forest w/leaf litter	None, nearest documented site 20 miles SE, habitat remains suitable
Oregon Shoulderband	*Helminthoglypta hertleini*	Rocky & talus substrates	None, habitat not affected
Spotted Tail-dropper	*Prophysaon vanattae pardalis*	Moist, mature forests w/deciduous/shrub layer or coastal fog zone.	None, presence unlikely, habitat remains suitable

Bald Eagle

No bald eagle nest sites have been identified within the wildlife analysis area. No suitable habitat for bald eagles would be removed in this action. If bald eagles are found to be nesting in the wildlife analysis area, potentially disturbing activities would be seasonally restricted to reduce potential disturbance to bald eagles. There are no known bald eagle roosts within or near the wildlife analysis area.

Although the bald eagle was removed from the list of threatened species in 2007, current BLM policy is to continue to maintain protection measures where eagles are present. There are no known eagle nests within the wildlife analysis area or within two miles of any of the proposed units. No known current or historic bald eagle nest trees, perch trees, or roost trees would be cut in any of the proposed actions. The project would have no effect on bald eagles.

MIGRATORY BIRDS

In the recently signed (4-12-2010) Memorandum of Understanding to Promote the Conservation of Migratory Birds between the Bureau of Land Management and the U.S. Fish and Wildlife Service, the BLM committed to evaluate the effects of planned actions on migratory bird populations.

Management direction for migratory birds on BLM lands stems from three sources: the Migratory Bird Treaty Act (MBTA) of 1918, which legislated agreements on bird conservation in the United States, Canada, Japan, Mexico and the former Soviet Union; Executive Order 13186 which identifies the responsibilities of federal agencies to protect migratory birds; and the North American Bird Conservation Initiative (NABCI) which strengthens bird conservation among the United States, Mexico, and Canada. These measures direct the BLM to integrate bird conservation principles and practices into land management planning and to analyze proposed actions for their effects on migratory birds and their habitat.

The NABCI, by facilitating the development and exchange of information, established a relationship between entities concerned with the status and protection of birds and federal land management agencies. For example, Partners-In-Flight (PIF) developed a Continental Landbird Conservation Plan (Rich et al, 2004) that provides information on bird habitat associations and conservation concerns and opportunities. Regionally, PIF developed Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington (Altman, 1999). The plan bases its assessment on selected focal species whose habitat relationships may be used to represent a larger array of birds. The plan provides the framework from which agencies may assess impacts from proposed projects, including timber sales.

Using the regional plan, the BLM assessed the potential effects of the proposed actions on focal species that may occur within forested stands on the project area. In general, there are two types of stands proposed for treatment: 1) conifer stands that are heavily stocked, of even-age (approximately 50 years old), and with single canopies and few shade-tolerant shrubs or trees in the understory, and 2) hardwood stands predominantly composed of red alder.

Overall Objective and Trend:

The objective of the project in regards to land birds is to increase stand habitat variability across the planning area. The conifer harvest prescriptions would result in more rapid tree growth, deeper crowns, and more light in the understory. Hardwood prescriptions would result in the availability of early seral habitat in the short-term. As a result of these actions, birds associated with shrubs and multi-layered canopies will benefit while those associated with high canopy closures and deciduous trees will be displaced. However, given the preponderance of the latter habitats across the landscape, the proposed actions represent a net benefit to land birds, at least in the short-term (10 years). Canopy closure in the treated conifer stands is expected to return to pre-project levels within 10-15 years.

Within stand habitat variability would be increased through the following actions:

1. Harvest prescriptions to provide variable thinning densities.
2. Retention of minor tree species.
3. Creation of small canopy gaps.
4. Retention and creation of down logs and snags or wildlife trees.

Of the 11 focal species, the proposed action is expected to have the following effects within treated units in the next 10-15 years (Table III-11):

- Improve populations of five focal species
- Maintain populations of three focal species, and
- Decrease populations of three focal species.

Because each focal species represents more than one bird species, the numbers above represent overall trends for a variety of species that share similar habitats (Altman, 1999).

Reports from a large study on the effects of commercially thinned and unthinned 40 to 55 year old Douglas fir stands in the Oregon Coast Range indicate that bird detections and bird species richness have increased in thinned stands (Hagar et. al., 1996). Weikel (1997) found that thinning for old-forest characteristics would likely have a positive impact on populations of cavity nesting birds in both the short and long term.

Table III-11: Focal Species and Expected Outcomes within the Project Area Units, Based on Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington

Focal species	Key Habitat	Current long-term*/ short-term** population trends	Expected No Action Trend	Expected Proposed Action Trend
Hermit Warbler	Closed conifer canopy	Increase/increase	Increase	Decrease
Pacific-slope flycatcher	Deciduous canopy trees	Decrease/decrease	Increase	Decrease
Hammond’s flycatcher	Open mid-story conifers	Stable/stable	Stable	Stable
Black-throated Gray Warbler	Deciduous canopy trees	Stable/stable	Stable	Decrease
Wilson’s Warbler	Deciduous shrubs and trees	Stable/decrease	Decrease	Increase
Winter Wren	Forest floor complexity	Stable/decrease	Stable	Increase
Hutton’s Vireo	Deciduous subcanopy/understory	Stable/stable	Decrease	Increase
Olive-sided flycatcher	Large residual open conifer canopy trees	Decrease/decrease	Stable	Stable
Western bluebird	Snags in early seral	Decrease/decrease	Stable	Stable
Orange-crowned warbler	Deciduous vegetation	Decrease/decrease	Decrease	Increase
Rufous hummingbird	Nectar-producing plants	Decrease/decrease	Decrease	Increase

Source: Altman, 1999
* Long-term trends from 1966-1996
**short-term trends from 1980-1996

OTHER IMPACTS ON WILDLIFE AND HABITATS:

Activities involved with the proposed action would cause disturbance to a variety of wildlife species and could affect normal activities and expose individuals to additional risk. The smaller, less mobile species such as mollusks, amphibians, and small mammals, would be particularly vulnerable on a local level, but should not be seriously affected on a population scale.

Yarding of logs across large down logs in advanced stages of decay would cause damage to an important habitat feature which would not be replaced in the short term. Some existing snags would also be damaged as a result of the proposed action.

Timber harvest in the proposed areas would decrease the amount of thermal cover and hiding cover for big game species. Thermal cover rejuvenates in approximately five to seven years in a commercially thinned area. Increased understory growth following the proposed action may benefit elk and deer populations. Elk populations are currently at a low to moderate level with good growth potential. Improved foraging conditions would exist for big game animals in the hardwood conversion units until newly planted conifers become established and provide canopy closure. Limiting factors may be forage availability because of reduced harvest in the area over the past several years. Deer populations are lower than in the 1970s and 1980s and are stable or slightly decreasing (J. Toman, pers. comm.).

Cumulative Effects

Implementation of the proposed action would not have any appreciable negative impacts to any wildlife species including those listed as threatened or endangered because no suitable habitat would be removed and 92 percent of current spotted owl dispersal habitat would be maintained. While the proposed action would reduce existing canopy density, it would accelerate progression to late-successional stand characteristics, including more complex forest structure in the future including larger trees with larger crowns. The resultant stand would be more similar to late-successional forest due to variation in density and distribution of overstory and understory vegetation. The growth of leave trees at lower densities would decrease the time needed for the creation of large diameter trees, snags, and large woody material.

BOTANY

AFFECTED ENVIRONMENT

The federal lands within the analysis area exhibit various plant associations of mostly coniferous forest with some hardwood woodlands and some open grassland. The most extensive plant associations are the early to mid seral stage western hemlock conifer stands. Early to mid seral stages portray 15- 40 year forest whose canopy closure has rapidly lowered brush density and where trees are just reaching first merchantability (USDI 1995). The main geographical feature of the watersheds is the mountainous ridgelines that support timber stands intermixed with sporadic rock bands and waterfalls. Some of the steep rock bands support grass/forb communities that could be considered special habitats.

Lichen diversity is often low in dense young stands due to limited light. Lichens typically are more abundant on the edges of these stands, along ridge lines, in riparian areas where there are hardwood components, and in areas where there are canopy gaps and sunlight can penetrate the lower canopy and forest floor. Also, where older trees prevail, lichen populations tend to exist in abundance in both the upper and lower canopy vegetation. Previous wind storms produced numerous amounts cyano-bacteria lichens on the ground many of which are old-growth influenced. Older mature hardwood shrubs such as ocean spray (*Holodiscus discolor)* contain the greatest species richness for macrolichens and bryophytes (Muir et al. 2002).

Large (class 3, 4, & 5) logs and stumps on the forest floor can be quite abundant in some units. These structures generally provide excellent habitat for a diverse array of bryophyte and lichen species particularly when they are uncharred from past post-harvest slash burning. A study shows that bryophyte cover appeared to be the greatest on older shrub stems (Muir et al. 2002).

Fungi quantity and species diversity is often fairly high in closed canopy stands. Habitat is present for special status fungal species as indicated by three species documented within the project area. See Table 3 in Appendix E. Various-sized patches of larger remnant trees which serve as suitable host species for many fungi, are scattered throughout the proposed project area. Studies show that when older trees are present, the number of fungi species associated with it not only increases, but the variety of species also changes (Molina et al. 2001). Many fungi form mycorrhizal connections (ectomycorrhizal) with the surrounding vegetation via root hair tips contributing to soil structure maintenance, lessening low moisture stress factors and provide a buffer from toxic metals (Amaranthus and Perry, 1994). Most trees species within the Pacific Northwest are ectomycorrhizal (Amaranthus and Perry, 1987) and can have up to eight species of fungi attached to one tree or shrub.

Fungi occupy a wide range of habitats including: dead and down coarse woody debris, undisturbed soils, and suitable host species which are prevalent within most units. They also provide many ecosystem roles including: decomposition of coarse woody debris; making nutrients available for many other species that depend on woody debris as a substrate; and help hold soil together which aids soil porosity and stability. The presence of larger remnant trees scattered throughout the project area would potentially serve as suitable host species for fungal habitat. As plant species composition changes during forest succession, the fungi community also undergoes change. Fungi succession is in response to changes in tree composition, tree age, and soil qualities, such as accumulation of organic matter (Molina et al. 1993). Retention of downed and decayed woody debris in the stand would provide continued support for ectomycorrhizal fungal activity (Amaranthus and Perry 1994). Decayed wood contain 25% higher moisture than the adjacent forest soil and existing fungus mycelium would potentially aid in the stands transformation. The potential for future snags and coarse woody debris creation is greater in thinned stands than unthinned stands (Bailey and Tappeiner, 1998).

SPECIAL STATUS SPECIES - BOTANICAL

Background

The BLM is warranted to conserve Special Status Species (SSS) and ecosystems upon which they depend (USDI 1995). SSS include federally proposed species, species listed as Threatened or Endangered (T&E), Candidate species, State listed species, and sensitive species. Vascular plants, lichens, bryophytes, and fungi are included in some or all of these categories. Field Office Managers are ultimately responsible for implementation of the Special Status Species program (USDI 2008). SSS are those designated by a State Director as sensitive, usually in cooperation with the State agency responsible for managing the species and State Natural Heritage programs. SSS are those that: (1) could become endangered in or extirpated from a State, or within a significant portion of its distribution; (2) are under status review by the Fish & Wildlife Service; (3) are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution; (4) are undergoing significant current or predicted downward trends in population or density such that federal listed, proposed, candidate, or State listed status may become necessary; (5) typically have small and widely dispersed populations; (6) inhabit ecological refugia or other specialized or unique habitats; or (7) are State listed but which may be better conserved through application of BLM sensitive species status (USDI 2008).

The Oregon Natural Heritage Information Center (ORNHIC) publishes lists of rare, threatened, and endangered plants and animals of Oregon every three years (ORNHIC 2007). Four ranks or lists are recognized by ORNHIC: (1) List 1: taxa that are threatened with extinction or presumed to be extinct throughout their entire range, (2) List 2: taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon, (3) List 3: taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range, and (4) List 4: taxa which are of concern, but are not currently threatened or endangered).

Decisions are based on Bureau policy and management of Bureau sensitive species follows the SSS policy (USDI 2008). Botanical surveys are also deemed practical only if they meet the criteria established in the "Practical Pre-Disturbance Surveys" section of the Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (USDI and USDA 2007, Vol. 2 p. 26). We evaluate the species-habitat association, presence of suitable or potential habitat, review the existing survey records, inventory, and spatial data, review scientific literature, and use professional judgment. Determinations for surveys are grounded in substantiated professional knowledge, research and conservation strategies, and staffing and funding constraints. Sensitive species require pre-disturbance surveys if the project is within the range of these species, if there is potential habitat within the project area, or the project may cause significant negative effect as determined by environmental analysis on the species' habitat or persistence.

Three potential special status plant association habitat areas:

1) Some grassy open areas adorn the landscape in various places of the analysis area. These sites have a high probability of containing special status plant species habitat. Table 1 in Appendix E provides a complete list of all Special Status plant species known or suspected to occur on the Coos Bay BLM District that have potential habitat within the project area. The majority of the rock bands characterize many southern exposures of the steep mountainous terrain while

sustaining thin soil structure dominated by mosses and forbs and delineated by hardwoods covered with epiphytic lichens. The moisture gradient of these open steep areas can range from very dry to extremely wet habitat creating ideal conditions for a wide variety of bryophytes, lichens, forbs and some shrubs. Mosses such as *Bryum* spp., *Homalothecium* sps., and *Racomitrium* sps are some of the common varieties prevalent in such sunny, thin-soiled habitat. Forbs such as hound's tongue (*Cynoglossum grande*) and fawn lily *(Erythronium sps.)* along with *Saxifrage sp.*, *Lomatium sp.*, *Phacellia sp.*, *Nemophilla sp.* and Gold-backed fern (*Pentagamma triangularis)* are drier habitat indicators on the rock band. Persistent moisture seeps that generate rich mossy hollows on open rocky balds are potential habitat for three Sensitive vascular plant species: California maiden-hair fern (*Adiantum jordanii)*, Thompson's mistmaiden (*Romanzoffia thompsonii*) and coffee fern (*Pellaea andromedifolia*). Thompson's mistmaiden occurs on rocky balds at Slater Creek and Kenyon Mountain near Remote. Coffee fern occurs at Cherry Creek Ridge and Irwin Rocks. California maiden-hair fern is located at Lower Rock Creek and within the Bear Creek recreation site on the Coos Bay District.

The rock bands give support to a prolific legacy of older shrubs that serve as hosts to epiphytic macrolichens scattered throughout the open and forested areas. Cyano-lichen and alectroid lichen species associated with old-growth stands are prevalent in tree branches along the rock band edges. Older tree branches and older shrub stems provide ideal substrate for several SSS lichens. Forests edges and openings are potential habitat for some SSS lichens such as; (*Bryoria subcan*a) and (*Loberia linita*). *Bryoria subcana* is known from several sites in late-seral Douglas-fir forests on district.

2) Patches of older remnant trees (in excess of 80 years) exist scattered or clumped throughout the analysis area. These older trees are potential host sites for lichens (particularly along ridgelines), bryophytes and fungal species. Remnant older trees serve as important substrate for epiphytes and habitat for other species as well (Muir et al. 2002). These huge remnant tree boles on ridgelines provide substratum for macrolichens such as *Bryoria subcana*, which has more than one site located on older trees within the project area. Older tree branches and older shrub stems provide ideal substrate for several SSS lichens.

3) There are several open patches of concentrated hardwood / mixed shrub gaps called hotspots containing a high diversity of epiphytic nitrogen-fixing macrolichens scattered throughout portions of the analysis area. These areas potentially sustain the greatest species richness of both macrolichens and bryophytes on shrubs in open hardwood habitat. Hotspots typically have a higher rate of cyano-lichens and can host a number of species not typically located in other areas of the stand types (Muir et al., 2002).

   Other habitat areas of interest for surveying within the project area are forest edges and the riparian areas. Forest edges particularly along ridgelines are sharp contrasting transitional eco-zones and where a higher variety of floras occur.

The riparian zone is a higher moisture gradient regime and contains a medium to high probability for containing special status plant species habitat. Typically the plant associations present within the above described areas are different from the rest of the young densely stocked coniferous stand. These areas would have a higher probability of containing special status plants.

Current Presence of Special Status Species

Of the 103 known or suspected special status plant species on the Coos Bay District, there are 45 Bureau Sensitive species either known or suspected of occurring in the Fairview project area. See Table 1 in Appendix E. As of July 2007, the Interagency Special Status/Sensitive Species (ISSSS) Program staff developed a new criterion for two categories of SSS: Sensitive and Strategic. (IM OR-2007-072)

Sensitive Species policies as described in the BLM National manual 6840 apply to just sensitive listed species. Sensitive species are those that: (1) corresponds to Oregon Heritage List 1 or List 2 (for Oregon); (2) are documented on at least one OR/WA BLM District or Region 6 Nation Forest; and (3) includes all documented or suspected federal candidates, state listed T&E, or de-listed federal species (IM OR-2007-072). To comply with Bureau policy to assess the effects of a proposed action on Sensitive species, the District may use one or more of the following techniques: (1) evaluation of species habitat association, (2) application of conservation strategies, plans, or other conservation tools, (3) review existing survey records, inventories, and spatial data, (4) use professional research and literature, (5) use professional judgment, and (6) complete pre-project surveys. Surveys are warranted if the project is within the range of these species, if there is potential habitat within the project area, or the project may cause significant negative effect as determined by environmental analysis on the species' habitat or persistence. Strategic species are not considered as SSS for management purposes; however, if sites are located, field units are required to collect occurrence data on these species.

THREATENED AND ENDANGERED (T&E) PLANTS

One endangered plant occurs within the Umpqua Field Office – *Lilium occidentale*. The Fairview NWFP Project Area is located outside the range of this species. However, even though the project area is outside its range, surveys conducted for Special Status plants during the appropriate survey season would detect and document any other endangered plants if they were present in the project area.

FIELD REVIEW

One Bureau Sensitive species; Bureau Sensitive (BS) liverwort, *Metzgeria violacea* has been located in the Fairview NWFP Project Area during preliminary surveys. Potential habitat is prevalent for more sites of above listed species and also other Bureau Sensitive species.

While old-growth forest is the optimal habitat in which some may flourish, many SSS sites have been located in younger thinned stands long after the old-growth stands have been removed. This could be attributed to a number of things found within the analysis area including; presence of residual remnant trees, coarse woody debris retention, landscape aberrations with higher or lower moisture levels, and green tree retention which potentially enable the continued presence of fungal species.

Pre-disturbance surveys are based on whether the proposed project overlaps the known or suspected range of a species as well as the likelihood that potential habitat is present. Potential habitat is determined by aerial photographic interpretation, ground work and review of information on each species habitat requirements. Surveys will not be conducted for species whose known or suspected habitats/ranges do not overlap with the project area. The data for known sites are located in both the GeoBob and the ORNHIC database generated from numerous botanical surveys completed throughout the Northwest Forest plan.

Survey Methods

Field surveys for Special Status Species (SSS) are conducted by professional botanists and would be completed according to approved survey protocols. These typically involve using the intuitive controlled method where high likelihood habitats are surveyed more intensively than other areas within the project (Whiteaker et al. 1998, USDI 1998, USDA 1997, USDA and USDI 1999). This approach may be one of the more reliable methods for locating rare species and it relies on knowledge, experience, observation, and intuition of the surveyor. Surveys are focused on locating Threatened and Endangered and Sensitive plant species. Comprehensive species lists of vascular plants and lichen and bryophytes are also documented during plant surveys. Survey routes, dates of survey, and any suspected sites will be flagged in the field and recorded on data sheets and topographic maps.

Surveys are recommended for some Bureau Sensitive species that are known or suspected to occur in a proposed unit. If a Bureau Sensitive species is known or suspected to occur in the project area, but the management activity is not likely to impact the species, then surveys are not recommended. In addition, surveys are not recommended for species that are considered impractical to survey (USDA and USDI 2001). Surveys are considered practical "if characteristics of the species (such as size, regular fruiting) and identifying features result in being able to reliably locate the species, if the species is present, within one to two field seasons and with a reasonable level of effort" (USDA and USDI 2000, Vol. 1 p. 479). Characteristics determining practicality of surveys include: "individual species must be of sufficient size to be detectable; the species must be readily distinguishable in the field or with no more than a simple laboratory or office examination for verification of identification; the species is recognizable, annually or predictably producing identifying structures; and the surveys must not pose a health or safety risk" (USDA-USDI 2000, Vol. 1 p. 479).

Protection Measures

Protection measures ensure that actions authorized, funded or carried out by the BLM do not contribute to the need to list any Sensitive plant species (BLM Manual 6840.2 page 35). Protection measures of strategic species are not required.

With some species, maintaining canopy cover and micro-site conditions is just as important as establishing buffers to ensure no disturbance of the plant site and its adjoining habitat. If any Bureau sensitive vascular or nonvascular plant species is encountered incidentally while surveying, conservation measures would be applied consistent with the 6840 policy to minimize the likelihood and need for listing using known site management recommendations (Castellano & O'Dell 1997, Brian et al. 2002, Cushman et al 2004) unless directed otherwise by management.

SURVEY AND MANAGE (S&M) SPECIES

On February 18, 2010, the State Director, Oregon/Washington signed an Instruction Memorandum (IM) No. OR-2010-017 for projects subject to survey and management direction in the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USFS et al. 2001)(2001 ROD) Projects would not need to meet survey and manage compliance if they fit one of the four exemptions listed in IM 2010-017 or they comply with the 2001 ROD with Annual Species Reviews.

Only 7 of the 23 survey and manage (S&M) category A & C species are within range of the project area (see Table 2 in Appendix E). Pre-disturbance surveys would be required for the hardwood conversion units for S&M category A & C vascular and nonvascular plant species that are known or suspected to occur in a proposed project area. Surveys are not conducted for species that are considered impractical to survey (USDA-USDI 2004, Derr et al. 2003). Incidental finds such as other S&M plant species such as category B, E or D would also be managed if located in project area. (ROD) 2001. Guidelines for management for any category A or C, S&M species, would be implemented either under the Final Supplemental Environmental Impact Statement (FEIS) or under the Record of Decision (ROD) 2001.

EFFECTS OF THE NO ACTION ALTERNATIVE

VASCULAR PLANTS

Most of the conifer stands are typical even-aged second growth 30 to 70 years old with a high canopy closure. Overall, these stands have low structural diversity due to dense stocking resulting in very little light reaching the forest floor. As a result, there would be less herb and shrub cover in the understory than if the stand were thinned (Bailey & Tappeneir 1998).

High density stands fully occupy the available growing space; which, in addition to limiting light availability at the forest floor, also limits availability of water and mineral nutrients for other plants (Parsons et al. 1994). Over time, the dense canopy cover in the young stands would continue to limit vascular plant growth. Understory shrub and herb cover would be very low in most stands except where occasional gaps or stand edges occur. Under the No Action Alternative, it is probable that the stands would exhibit more suppression related mortality in its current developmental trajectory. The herbaceous/shrub layer would show little development until the stand can be opened up to accommodate other varieties of vegetation through less competition of light, soil, and moisture.

Under the No Action Alternative, Special Status Species (SSS) would tend to persist if they are currently present in the analysis area as the stands continue to follow successional stages of development that are typical of forests in the western hemlock and Douglas-fir vegetation series.

NONVASCULAR PLANTS

Young conifer stands would remain densely stocked with very little light reaching the forest floor. Light levels would remain low in the understory of the stands resulting in a continued decline and mortality of overtopped hardwood trees and legacy shrubs. High stocking levels cause trees to develop short crowns and constrain diameter growth of branches that remain alive. The No Action Alternative would result in a gradual recruitment of new suitable habitats, such as gaps and deep-crowned heavy-limbed trees, and would result in the loss of existing habitats, or hotspots, such as hardwood trees and older shrubs (Neitlich & McCune 1997). Bryophyte abundance would remain low except in areas where coarse woody debris, forest gaps, and hardwoods exist.

The stands with older trees present would continue to act as propagule sources for adjacent timber lands, many of which are younger and would benefit from having a nearby late-successional propagule source for lichen, bryophyte, and fungal plant species.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE: COMMERCIAL THINNING AND DENSITY MANAGEMENT THINNING

Direct/Indirect Effects

VASCULAR PLANTS

Currently many of the thinning units have a dense canopy cover with limited light reaching the forest floor. The lack of light reaching the forest floor reduces the cover of shrubs and forbs (Klinka et al. 1996). Thinning young Douglas-fir stands increases the potential for future development of multistory stands in some instances. Conifer regeneration is recruited while small overstory trees survive and the understory growth increases (Bailey & Tappeiner 1998).

Suspected Special Status plants (e.g. *Eucephalus vialis, Cimicifuga elata* and *Pellaea andromedifolia*) could be affected by ground-based machinery used in timber harvest. Logging equipment could displace soil increasing the potential for establishment of non-native or invasive species into areas not already occupied. Helicopter logging, as proposed for some units, could reduce impacts to those areas that have a higher propensity for supporting Special Status Species described earlier. However, direct effects to the Sensitive status species would be avoided in the project area because known sites would potentially be protected with buffers depending on the species, site conditions and proposed activities.

Variable-density thinning and differences in thinning by aspect would occur to some extent throughout the proposed project which could help develop late-seral characteristics. This could provide some beneficial indirect effects to those Special Status plants that require more light, such as *Eucephalus vialis* or *Illiamna latibracteata* by opening up the canopy providing more light. However, in the areas of evenly spaced retention these methods do not produce a patchy diverse understory that fosters development of late-seral forest characteristics. Also, biological legacies including large live trees, down wood, and tree and shrub diversity are needed (Carey & Curtis 1996) for a more diverse forest ecosystem. Some of these criteria are provided through the retention of both older remnant trees found scattered throughout the project area and variable hardwoods located within the riparian areas.

Sample tree falling would not remove habitat for vascular Special Status plants, as they are not arboreal, and therefore it would have no effect.

NONVASCULAR PLANTS

There would be no direct impact to Special Status Species (SSS) because all potential areas would be surveyed and sites would be protected through known site management buffers. Some indirect effects caused by slash burn treatments might occur through soil displacement and noxious weed intrusions to Special Status Species or native vegetation. Project design features under fuel hazard reduction would reduce these effects by minimizing ground disturbance, seeding with native grass seed, and treating noxious weeds through manual maintenance activities. In riparian reserves, a sufficient number of fire intolerant/shade tolerant species, such as salmonberry or red alder would be retained within the no-harvest buffer to provide continual structure source for SSS epiphytic nonvascular species.

Similarly, sample tree falling would not remove habitat for nonvascular Special Status plants and therefore it would have no effect.

Cumulative Effects

VASCULAR PLANTS

Similarities in understory vegetation between young, unthinned stands and old-growth stands suggest that native vascular plants in the Coast Range are quite resilient to environmental change (Bailey et al. 1998). Species richness, composition, total cover, and individual species frequency and cover have been shown to be indistinguishable to native plant species after severe disturbances such as logging and burning in the Coast Range after more than 50 years (Oliver 1981). Thus, no cumulative effects are expected.

NONVASCULAR PLANTS

The proposed action would provide additional light and potential indirect effects to some Special Status plants such as lichens that require more light than what is currently present. However, all Bureau Sensitive species would need buffers of various sizes depending on species, site conditions, and proposed activities. No cumulative effects are expected.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE: ALDER CONVERSION

Direct/Indirect Effects

VASCULAR PLANTS

Special Status Species are typically located in older stands with a gradient of interior habitat conditions suitable for their survival. Younger timber stands less than 80 years could also potentially provide mixed but improving habitat for Special Status Species. The proposed timber harvest could also potentially add to the risk of habitat loss should any Bureau sensitive sites occur within the proposed project area. The habitat would be surveyed prior to timber harvest and any Bureau sensitive plants located would have conservation measures applied so that the species occurrence would have a greater proclivity of survival.

NONVASCULAR PLANTS

Species associated with hardwood ecosystems would be directly affected by changes to the environmental condition. Canopy removal would influence temperature, light and moisture availability. Nonvascular Special Status Species associated with mature hardwoods trees and salmonberry plant association such as *Diplophyllum plicatum* or *Metzgeria violacea* for some examples could be adversely affected by ground-based machinery used in timber harvest or fuels reduction activities or from burning hand piles. Site surveys for Special Status Species have located a Bureau Sensitive liverwort, *Metzgeria violoacea* within the riparian area of one of the units on salmonberry shrubs of the proposed project. However effects of the proposed activities on SSS plants that occur in the proposed project area would have conservation measures applied to the species and their habitats so that it would not contribute to the species becoming listed (USDI 1995).

Cumulative Effects

VASCULAR PLANTS

Special Status vascular plants that may occur in alder stands are not uniquely associated with red alder, but rather these species have ecological ranges that overlay an array of habitats. There are no populations of Special Status vascular plants documented in the proposed alder conversion units. No action would forego an opportunity to manage for attributes favorable to special status vascular plants associated with mixed stands, conifer stands, or with the understory of multistory-stands.

NONVASCULAR PLANTS

Land ownership within the analysis area is arranged in a checkerboard pattern that includes private land as well as land managed by the BLM. Past management activities have consisted of logging, road building, agriculture, and recreational development. These activities could have likely affected rare plants and resulted in loss of suitable habitat around the project area. In many areas, there was once mature forest with structural complexity, and a diverse species mix, where now exists an early seral single-aged stand due to past activities. Plant communities are typically altered over time due to disturbance and change within the ecosystem.

Some Special Status Species may benefit from active management by opening up areas for those plants that thrive in light. There are some species that require openings in the canopy, earlier seral stages for substrates, or reduced competition from non-native brush or other herbaceous cover. It is expected that timber harvest, road building and other activities would continue in the future on BLM-administered lands. It is also assumed that Special Status Species in the area would be protected only on BLM-administered lands therefore, no cumulative effects are expected.

FUELS

AFFECTED ENVIRONMENT

HISTORY

Before and following euro-American settlement most fire disturbances in the area were anthropogenic in nature and probably were used to clear land for hunting, agriculture and livestock grazing purposes. The last large stand replacement fire to affect much of the analysis area was the McKinley-Fairview fire in 1936 that burned 22,660 acres. As a result of that fire much of the landscape was salvage logged. Most of the area was stocked by the 1950's with relatively uniform stands of "even-aged" conifer. Areas without successful conifer reforestation are dominated by hardwoods, primarily red alder and a variety of competitive brush species.

FIRE REGIME CONDITION CLASS / WILDLAND URBAN INTERFACE

LANDFIRE National Map Data suggests that the analysis area is predominantly in a natural Fire Regime Group V[15] with a mean fire return interval greater than 200 years. Some areas near the ridge tops and on the lower slopes in areas heavily influenced by human settlement and agricultural activity are classified as Fire Regime groups III and IV with more frequent fire return intervals of 35 -200 years. Fire severity in Group V can be of any class (low to replacement) and in III as low to mixed and in IV as replacement type. The Fire Regime Condition Class[16] for the project area is predominantly II, indicating a moderate departure from historical reference conditions. Some locations particularly in the southern portion of the analysis area are FRCC 1, indicating low departure from the expected range of historical reference condition. The dominant fuel models in the project area are fire behavior fuel model 8 and 10. Fuel model 8 is characterized by closed canopy stands with little under growth and a litter layer composed primarily of duff, needles, twigs and wood less than 3 inches in diameter (Anderson 1982). Under normal conditions, fire behavior in these timber stands would be slow burning ground fires with low flame lengths. Fuel model 10 is characterized by heavier loadings of down dead wood greater than 3 inches diameter, result from natural mortality, stem exclusion and other natural events like snow break and wind throw. Landscapes dominated by Fuel Model 10 are prone to more extreme fire behavior including torching; spotting and short crown fire runs (Anderson 1982). Other factors including weather, topography, and aspect may contribute to more extreme fire behavior (crown fire potential) regardless of the fuel model present.

The project area is considered as wildland urban interface[17] and includes critical communication infrastructure for multiple government agencies and private companies in Coos County. The project area

[15] There are five natural fire regime groups. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention but included the influence of aboriginal burning (Agee 1993; Brown 1995)

[16] Fire Regime Condition Classes are a qualitative measure describing the degree of departure from historical fire regimes, possible resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure and fuel loadings. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease and other past management activities (Schmidt et al. 2000)

[17] Wildland Urban Interface has two accepted definitions:

also has a history of very intensive use by the public for both harvest of special forest products such as firewood cutting, mushroom and brush picking and recreational activities including camping, hiking, biking (motorized and non-motorized) and hunting. These activities can, and often do, occur during periods of high fire danger. Because of this high level of non-industrial human use, post-harvest fuel loadings would require some form of treatment for hazard reduction by reducing the volume of logging slash primarily along roads not planned for closure or decommissioning after harvest operations. Dependent upon the final project layout, post-harvest fuel loading and the actual disposition of fuels throughout each project area, burn methods and burning conditions may be necessary that may not fully meet all desired objectives, primarily those with regards to silviculture.

Lands within the analysis area are intensively managed for forest products. Recent harvest activities on both private and BLM managed lands within the analysis area have received some form of site preparation or fuels treatment following harvest operation in order to prepare for reforestation or reduce activity related fuel loadings. These treatments were accomplished using a variety of methods including (1) broadcast burning (2) machine pile and or hand piling and burning and (3) herbicide application (private managed lands only). The resulting effects are stands of conifer, primarily Douglas-fir, which are densely stocked, uniform in age and composition, and generally lacking in diversity.

EFFECTS OF THE NO ACTION ALTERNATIVE

The no action would allow development of increasingly crowded stand conditions that would contribute to increased mortality within the overtopped and suppressed trees. Increased mortality would result in the long-term build up and accumulation of dead or dying fuels on the ground and within the canopy. These conditions could make the stands more vulnerable to damaging wildfire and may hamper fire control efforts during a fire event.

Under the No Action Alternative, the BLM managed lands would remain at a moderate to high risk of loss to wildfire. Stand densities, characteristics, and composition that may help to improve the stand and landscape level fire regime-condition class would not be achieved.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE

Under the proposed action, there would be short-term but manageable increases in activity related surface fuel loadings and short-term increased risk of damaging wildfire in the affected areas. Harvest and other management activities associated with the proposed action would result in short-term and sporadic increases in human activity, which in turn may increase the possibility of human-caused or operational wildfire. These types of fire events occur with low frequency within the District. All operations, using power-driven equipment, are required to operate in accordance with State fire regulations and restrictions. These include having fire-fighting equipment on site during the fire season, and posting of a watchperson for specific periods after mechanical operations cease.

- "the urban wildland interface community exists where humans and their development meet or intermix with wildland fuel." (Federal Register. Vol. 66, No. 3. Thursday, January 4, 2001/Notices.

- "the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel." (NWCG Glossary and the 10-Year Comprehensive Strategy Implementation Plan).

Thinning dense stands may reduce the long-term vulnerability of the stand to a damaging wildfire by removing or reducing accumulated fuel loadings that contribute to extreme fire behavior such as a crown fire. The proposed treatments could facilitate fire suppression activities by providing safer and better access and egress for firefighters as well as for counter-firing opportunities in the event of an extreme fire occurrence (Omni & Martinson, 2002).

Temporary gaps created by converting red alder stands may subtly mimic those gaps caused by natural disturbances like fire. Reducing post-harvest fuel loadings in the conversion units using appropriate site preparation methods would help make the young stand more resistant to wildfire by eliminating fuel sources and would contribute to overall stand productivity by helping to reduce or suppress competing vegetation. The proposed harvest activities would present an opportunity to re-establish watershed level stand diversity and texture which more closely resembles the species composition and disposition that would occur if natural fire were still present on the landscape.

The thinning and alder conversion projects would have a beneficial cumulative effect at the watershed scale by reducing the continuity of standing fuels and consequently lowering risk of damage to fire, increasing stand resiliency to fire, and moderating fire behavior potential. The affects from smoke released from slash disposal would be minor because of the relatively small acreage being burned. Any prescribed burning that takes place would occur spatially over time. All prescribed fire activities would be conducted in compliance with the Oregon Smoke Management Plan as revised in 2008 (OAR-629-048). If biomass utilization becomes more economically and physically feasible; that option may be encouraged over burning.

The Southwest Oregon Fire Management Plan (USDA et al. 2004) addresses Wildland Urban Interface (WUI) criteria. Proposed harvest units are within the Wildland Urban Interface area, and have been evaluated to determine appropriate mitigating measures to protect adjacent public and private property and provide for public health and safety. Hazardous fuels reduction treatments would follow the management direction provided in the Coos Bay Record of Decision and Resource Management Plan, May 1995. Examples of fuel reduction treatments could include hand and/or machine piling, pullback and/or removal of ladder and surface-fuels adjacent to private ownership boundaries, roadside hazardous fuel reduction, and biomass removal.

NOXIOUS WEEDS

AFFECTED ENVIRONMENT

Noxious weeds have the ability to become established easily and can rapidly develop a competitive advantage over native vegetation with their ability to effectively compete for water, sunlight, nutrients, and physical space. Numerous species of noxious weeds can be found within the analysis area, but the primary target species of concern are Scotch broom (*Cytisus scoparius*), French broom (*Genista monospessulana*), and Himalayan blackberry (*Rubus discolor*). The broom species are known for their efficiency at fixing nitrogen and ability to establish themselves on nutrient-poor sites.

Within the analysis area, locations of plants are generally scattered and are relatively small in size, often consisting of individual plants that are fewer than 20 in number and sometimes found in isolated areas. However, there are a few locations of Scotch broom with well over a thousand individual plants along a road system and within some plantations. On private industrial forestland, noxious weeds are often effectively controlled through the application of herbicides. On public land, herbicide use is presently restricted to areas immediately adjacent to existing roads. Within existing BLM plantations, the broom species are generally controlled by hand pulling or cutting until the conifer seedlings outgrow the competitive height of the broom.
Other less competitive noxious weeds, such as Canada thistle, Klamath weed, tansy ragwort and bull thistle also are present; however, they do not occur in sufficient numbers to be of management concern, are managed through biological control efforts, and are not expected to increase to a level that would jeopardize management objectives.

Weeds may be spread by human activities, such as vehicles and equipment, or naturally, as in wind-borne or animal transported seeds. The noxious weeds of concern are commonly found along roads or within disturbed areas adjacent to roads. The majority of the road systems have been inventoried for weeds since 1997 and treatment applications performed in these areas starting in 2002 through 2007. The BLM control reduces the spread of noxious weeds by requiring some equipment and vehicle washing, conducting annual weed surveys, and treating all target noxious weed infestations along BLM controlled roads.

EFFECTS OF THE NO ACTION ALTERNATIVE

Commercial log hauling, administrative traffic, and recreational driving would continue on existing open roads. BLM would continue to monitor and treat existing and new noxious weed populations using manual and chemical applications on BLM managed lands and along BLM controlled roads. Previously treated noxious weed sites would be slower in returning due to the past treatments. The analysis area has been intensively inventoried, treated, and monitored for weeds in the past and regular treatment of known weed sites would continue as funding remains available. Control of noxious weeds on private lands is expected to continue where needed to ensure survival and growth of plantations.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE

New road construction and renovation routinely exposes bare soil areas, which may allow for the introduction of numerous pioneer species, increasing the chances of some scattered noxious weed populations occurring along these road systems. Application of rock to the road surface may introduce weed seed from the quarry site of origin; however, this rarely occurs unless the gravel is stockpiled for at least one generation of a weed species. Processing of the rocked roads and hauling of logs is not conducive to establishment of noxious weed seedlings and follow up monitoring and treatment is an effective control method on BLM roads in the analysis area. All logging, road construction, and site preparation equipment that operates off of the gravel and natural surfaced roads would be required to be washed prior to entering BLM lands. BLM controlled haul routes and potential landing locations would be inventoried for noxious weeds and treated, either mechanically or chemically, prior to hauling from the harvest units. Under the special provisions of the timber sale contract, the contractor is required to apply a mixture of grass seed and mulch on all disturbed areas establishing a ground cover that is reasonably effective in suppressing noxious weeds. Follow-up monitoring would be performed on a regular basis to identify new invaders and treated using an integrated pest management approach.

No new noxious weed populations are likely to occur within commercial thinning harvest units, however there might be a potential for some to invade into the hardwood conversion units. The design features outlined in the action alternative would help reduce the risk of that noxious weed spread. Other District projects such as manual maintenance, pre-commercial thinning, and site prep activities specifically address prevention and removal of noxious weeds through mechanical methods and would be effective at treating any potential noxious weed invaders. Any new species of noxious weeds that are discovered and identified by the District as a target species for treatment would also be managed using integrated pest management techniques.

Due to the active management of noxious weeds by landowners within the watersheds there should be no cumulative increase in noxious weed infestation within the Fairview analysis area. Most of the existing noxious weeds only thrive in an open canopy environment, particularly in regeneration harvest areas and roadside openings. As the canopy levels increase on all ownerships, existing noxious weed sites would be shaded out more over time. Annual inventories would continue to identify any new populations and weed treatments would continue using mechanical or chemical methods to control the spread along BLM controlled roads as well as privately controlled roads on BLM.

RECREATION RESOURCES

AFFECTED ENVIRONMENT

VISUAL RESOURCES MANAGEMENT

The entire project area is within Class IV designation with the management objective to "allow for major modification of the existing character of the landscape." Class IV would be maintained after the project is completed, and the project does not compromise a Class IV designation.

RECREATION

The only developed recreation in the project area is the Blue Ridge Trail System. The rest of the project area is open to dispersed recreation and the most common activities are believed to be adventure driving, bird watching, hunting, gathering Special Forest Products such as fern, mushrooms, salal, firewood, and target shooting. Illegal dumping is a known problem. This area is very popular for these activities due to its close proximity to town.

There are 12 miles of designated trails in the Blue Ridge Trail System that intersect the project area. The trail system was built in the late 1990's. Most of this multi-use trail system was developed using old logging roads and skid trails. The intended use for the trail system was hiking, horseback riding, and motorcycle riding. Use of all-terrain vehicles (ATVs) is currently prohibited on the Blue Ridge trail system, however, some unauthorized use does occur. Efforts to block such traffic have been partially successful. Estimates of use for the Blue Ridge trail system are about 4,000 people per year.

Annual trail maintenance is done on the Blue Ridge Trail System to prevent erosion and run-off. Most of this multi-use trail system was developed using old logging roads and skid trails. Maintaining trails in the forests of the Coast Range is a challenge due to steep slopes, thick vegetation, wet winters, and muddy conditions. The trails have a lot of man-made devices used to limit erosion, such as boulders to block unwanted access, concrete pavers, water bars, bridges and turnpikes. Gravel has been spread in wet areas to prevent erosion, along with the other man-made structures mentioned above. There are currently at least 160 man-made structures of varying complexity on the trail system. There is a small gravel parking lot on the 26-12-35.4 road. The trails are currently signed with both temporary (laminated paper) and permanent signs. There are no restrooms, water, or other developments.

Motorized use visitors are asked to avoid the trail during the wet season and are not permitted to use the trail during fire season, leaving a relatively small window of time during the year when the trail is suitable for motorized use. Pedestrians and horseback riders are permitted to use the trail throughout the year.

EFFECTS OF THE NO ACTION ALTERNATIVE

Direct/Indirect Effects

There would not be any direct or indirect impacts to the recreation resources on Blue Ridge under this alternative. The trail and the improvements would continue to be maintained at the level they are now. Continued addition of gravel and man-made improvements to the trail would eventually result in many hardened sections of non-native materials. No damage would occur to the man-made structures due to equipment activity.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE:

Direct/Indirect Effects

The direct impacts of the proposed action on the trail system would primarily be to one stretch of trail less than one mile in length, in Section 35 of T26S, R12W. This stretch of trail is called "Mud Bog Alley" and it would be converted to a gravel road. This would potentially become a road open to the public that connects two paved routes. There are five other portions of the trail where logs would be hauled over the trail, potentially causing damage to the trail. There would be openings created by the removal of trees which may provide enhanced viewing opportunities. The trail system was created using logging roads and skid trails. The lay-out of this sale uses many of the same roads and skid trails and some damage to the trails is expected. Damaged sections of trail would be restored after logging operations are completed.

The public can expect some access restrictions during some logging operations in order to ensure public safety. During logging operations, the recreating public can expect noise from harvest activities which may disrupt the quality of some recreational experiences such as bird watching or hunting.

Post-harvest roads that are no longer needed for administrative purposes, deemed unnecessary for forest management purposes in the near future or have a high probability of causing resource damage, would be decommissioned. Other roads improved for the project would be monitored for unauthorized vehicle use and blocked where appropriate.

Cumulative Effects

Recreation and visitor related cumulative impacts anticipated as a result of this project are expected to be continued unauthorized motorized use and illegal dumping. Increased access and alteration of trails would provide for an increased opportunity for these activities to occur. Gating, barricading, and decommissioning roads would help minimize these activities. Monitoring and law enforcement presence should further help minimize the occurrence of these actions.

CARBON STORES AND CARBON FLUX

Carbon flux is the rate of exchange of carbon between pools, the net difference between carbon removal and carbon addition to a system. For the atmosphere this refers to carbon removed by plant growth and other processes balanced by carbon added through respiration, biomass decay, burning, volcanic activity and other volatilization processes. Forest management can be a source of carbon emissions through deforestation and conversion of lands to non-forest condition, or stored carbon through forest growth or afforestation (2008 Final EIS, pg. 220).

Analysis of carbon flux quantifies the net effect of the proposed action on greenhouse gas levels by comparing changes in carbon storage that would occur under the proposed action to the carbon storage that would occur under the No Action Alternative, as suggested in IM-2010-012 (USDI 2010). Specifically, this analysis estimates the carbon flux associated with implementation of the proposed action roughly fifty years from the present, incorporating differences in carbon storage in live and dead carbon pools as well as the mid-term flux from wood products produced by the proposed action through this period.

Analysis of carbon flux associated with the proposed action used the Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS), available at http://www.fs.fed.us/fmsc/fvs. FFE-FVS predicts changes in stand and fuel dynamics over time, in the context of stand development and management, and provides a detailed accounting of stand carbon stocks and carbon released from fire or decay. This model does not directly incorporate microclimatic effects or the C flux associated with actual harvest equipment. Site specific data from stands exams was input into the FVS Growth and Yield Model (Dixon 2002), modeled with the action or No Action Alternative prescriptions, and the FFE-FVS output was used to determine the amount of carbon that would be released or sequestered and the resulting net carbon balance that would result under the alternatives. The values presented in this analysis are estimates based on modeled outputs and should be considered approximations. Values, in terms of carbon stored and carbon released, are expressed as tonnes (metric tons). This is the unit of measure that is most commonly used in scientific literature to express carbon storage and release. One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA, 2005). The BLM has selected fifty years as the analysis period of carbon storage for this project, because it encompasses the duration of the direct and indirect effects on carbon storage. In fifty years, stands in the project area would have nearly returned to current carbon storage levels, and carbon storage would have offset carbon emissions resulting from harvest. The 10-year time period for short term impacts would encompass the duration of all of the direct emissions from the proposed action.

EFFECTS OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, carbon would be released through the decay of snags, woody debris, and dead vegetation but it would also be sequestered as through growth of forest vegetation. Carbon stored in live trees would not be converted to the harvested wood carbon pool and a portion of the carbon currently stored in live trees would be converted over time through ongoing processes of tree mortality. No carbon release would be created from harvest operations or fuels treatments. After 50 years of growth, live tree carbon would increase 256,010 tonnes.

EFFECTS OF THE PROPOSED ACTION ALTERNATIVE:

Short-term Impacts (0-10 years after timber harvest):

The proposed action would thin approximately 7,344 acres of forest volatilizing some carbon, moving carbon from live tree pools to detritus, and storing some carbon in forest products. Live trees would be removed, decreasing live tree carbon from 489,131 to 361,708 tonnes, and transferring 127,423 tonnes of live tree carbon storage to other pools. The FVS model predicted the stands would transfer approximately 60 percent of tree carbon to wood product storage. Life cycle assessment (LCI) mill survey data shows that approximately 50–70% of the aboveground biomass in a sustainably managed forest is currently utilized in product processing mills to make solid wood products along with paper and biofuel co-products (Lippke, Oneil, Harrison, Skog, Gustavsson & Sathre 2011). Fuels treatments to burn logging slash would create some short term emissions totaling 51,812 tonnes during post-harvest periods. Emissions from equipment activities necessary to harvest these units ("secondary emissions"[18]) have been estimated at 0.1429 MG CO_2/ mbf (WRI 2010). Although the forecast of harvest equipment emissions is highly uncertain and speculative, applying this equation to the proposed action suggests an additional 12,487 MG CO_2 release, translating to 3.408 tonnes carbon, attributable to the proposed action. This is consistent with Sonne (2006), who predicted a relatively small C flux associated with harvest equipment.

Carbon emissions and storage over the 50 year analysis period resulting from the alternatives are displayed in Table III-12, below.

Table III-12. Carbon Emissions and Storage, Comparison of Action and No Action Alternatives

Source	Proposed Action (MTC[19])	No Action Alternative (MTC)	Notes
Live tree storage, 2062	711,234	745,141	50 years of stand growth
Live tree storage, 2012 (current conditions)	489,131	489,131	51 year average age, 2012
Net change, live trees	222,103	256,010	Live tree carbon from growth 2012 -2062
Harvested wood storage	78,189	0	60% of harvested tree carbon[20]
Total storage	**300,292**	**256,010**	Storage: live trees and harvested wood
Emissions, 2012-2062	51,812 3,408	0 0	Fuel treatments (pile/broadcast burning) Secondary emissions
Net Carbon Storage, Proposed Action	**245,072**[21]	**256,010**	**Storage minus emissions, 2012-2062**

[18] Secondary emissions are defined as emissions from equipment consuming fuel employed to harvest, yard,load, and haul logs to the mill.
[19] MTC = metric tons carbon
[20] Based on FFE-FVS model assumptions for total tree carbon utilization.
[21] Net storage represents an estimate of potential direct sequestration for the action but does not include a life cycle analysis of wood product storage, carbon offset, or substitution strategies as research in this area of analysis is incomplete.

Long-term Impacts (11-50 years after timber harvest):

Making a set of very broad assumptions and using the FFE-FVS carbon model and assumptions similar to those developed in the 2008 RMP FEIS (USDI 2008b), comparing to the no action alternative to the proposed action would result in a small carbon flux of 10,938 tonnes over the time period from thinning until the period just prior to regeneration harvest of Matrix areas (50 model years).

Cumulative effects

At the scale of western Oregon, considering the cumulative effects of both forest succession (a carbon sink) and harvest (a carbon source) under the NWFP in the Plan Area, carbon stores would be predicted to increase by 2106, from 427 to 596 million tonnes (USDI 2008b). U.S. annual CO_2 emissions are approximately 6 billion MG (EPA 2010a). The flux of carbon associated with the proposed action (over 50 years) would represent .00067% of this yearly flux. The difference in carbon storage in 50 years between alternatives would be too small to lead to a detectable change in global carbon storage, and existing climate models do not have sufficient precision to reflect the effects on climate from such a small fractional change in global carbon storage (2008 RMP FEIS, pg. 543). Currently, federal thresholds for carbon flux related to individual actions have not been established. Uncertainty associated with all estimates of carbon flux in this analysis would be predicted to be quite high (circa 30%: 2008 RMP FEIS, pg. 538). The total carbon flux[22] associated with the proposed action would represent approximately .0046% of live tree carbon stored on BLM-managed lands in western Oregon (USDI 2008b). BLM managed lands in western Oregon support approximately 1% of the carbon stored in the western U.S., and 0.02% of global carbon stores in vegetation, soil and detritus (USDI 2008b).

It should be emphasized that, as in most non-empirical carbon modeling exercises, estimates of carbon sequestration or flux are useful mostly for broad generalizations or comparisons, appropriate to convey relative sizes, but not very accurate for specific places and situations (Sharrow 2008). This analysis also does not address substitution: i.e., without change in global demand for wood products, the no action alternative would necessitate harvest in another location resulting in a comparable (or larger) carbon flux. The steady state of this management actually represents no change in landscape-level Matrix C stores ((Harmon and Marks 2002), pg. 873); reserved areas managed from young plantations to old-growth in the analysis area, alternately, would represent increases in landscape C stores.

This EA is tiered to the 1994 RMP FEIS which considered carbon flux and climate change at the Plan scale. The 1994 RMP FEIS considered carbon flux speculative and did not consider the indirect effects of carbon flux associated with the Plan on aspects of the affected environment including wildlife, economies, human health, and other resources ((USDI 1994), Appendix V, pg. 217). The 1994 RMP FEIS concluded that with implementation of any of the alternatives at the Plan level, "the overall impact on the global atmospheric carbon dioxide balance would be much less than 0.01 percent of the total" (USDI 1994), pg. 4-1). Based on the small estimated permanent flux of carbon that would be associated with the cumulative effects of the proposed action following the 1994 RMP, the high uncertainty in any such estimate of carbon flux (and other sources of GHGs), and the response of global climate to these GHG's, conclusions in the 1994 FEIS remain valid and applicable to the cumulative effects of the proposed action.

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[22] Note that the C flux associated with proposed action includes not just change in stores but flux due to harvest equipment.

RESOURCES NOT ANALYZED IN DETAIL

Due to adequacy of existing best-management practices and policy, and the limited intensity and scope of the effects on the affected resource, the items below are excluded from detailed comparative analysis as directed by CEQ regulation § 1500.1(b), 1500.2(b) and other sections. Analysis pertaining to these conclusions is included in the analysis file, which is hereby incorporated by reference.

CLIMATE CHANGE

Substantive new information has been produced regarding climate change since publication of the 1994 FEIS (USDI 1994), to which this EA tiers. Considering information produced since the completion of the 1995 RMP, it is unequivocal that global temperatures have increased (approximately 1°C since late 1800's); it is also likely that temperatures in the PNW have increased (CIG 2004, Clark et al. 2004, IPCC 2007). Human influence on this climatic change, through production of greenhouse gasses, disturbance and land cover change, is likely (IPCC 2007). Temperature increases in the west over the next century may range from 2º C at the low end of the uncertainty range to 6 ºC at the upper end of the uncertainty range (CIG 2007, IPCC 2007). This increase is well (> 2 standard deviations) outside of historic conditions. For context, the shift from the last ice age to the current climate was approximately 9º C. There have also been increases in winter precipitation since 1930 over much of the western United States (US), although patterns vary in different regions within the west (Clark et al. 2004, Salathe et al. 2009). Precipitation changes in the western US over the next century are complex and more uncertain than temperature changes. Western states precipitation may increase by as much as 6% by 2100 (CIG 2009, Hidalgo et al. 2009). This increase would be well within 20th century variability in precipitation (< 1 SD from historic mean), and would again be expected to differ widely by region within the western US.

Indirect changes in western US ecosystems attributable to changes in temperature and precipitation cycles have also been predicted. Most modeled changes describe potential broad shifts in vegetation types (Lenihan et al. 2006, Millar et al. 2006), fire behavior (CIG 2004, Mote et al. 2003) or hydrological cycle (Furniss et al. 2008, Hidalgo et al. 2009). These shifts would have to be considered speculative at the scale of western Oregon and would almost surely be obscured by local conditions at the scale of the analysis area.

There is uncertainty in climate change model predictions due to uncertainty in how the climate actually works as well as uncertainty in future socio-economic and political responses (CIG 2004). Uncertainty in global climate model predictions attributable to physical processes increases at smaller spatial scales, due to the importance of regional climatic patterns (such as ENSO14) and local topography (such as the Coast Range) (CIG 2009). Predictive models of temperature and precipitation have been developed (downscaled) for the Pacific Northwest, but have not been developed specifically for the Coast Range Province or for the analysis area. Application of larger-scale model results to the analysis area directly would be predicted to induce bias, and to have low accuracy. Extrapolating such models to predict future vegetation or animal response would increase bias even further, and would probably have limited utility in describing the cumulative effects of the Action or in differentiating between Alternatives.

Secretarial Order #3226 (2001, amended 2009) directs all Departments to "consider and analyze potential climate change impacts when undertaking long-range planning exercises." The 1994 PRMP FEIS (Appendix V, pg. 217) considered climate change effects as part of long-term planning efforts at the Plan scale (western Oregon). Although the 1994 PRMP FEIS recognized the possibilities of increased incidence of wildfire, insect outbreaks, shifting range of species including Douglas-fir, and forest species composition, it found "no scientific consensus about the extent or rate of global warming nor the probable effect on forest ecosystems in western Oregon" ((USDI 1994) pg. 217). Although new information has been produced since this FEIS, it is still not possible to reasonably foresee or quantify the specific nature or magnitude of changes in the affected environment. Although it is not speculative that changes in the affected environment would occur due to climate change, it is not possible to reasonably foresee the specific nature or magnitude of the changes (2008 RMP FEIS, pg. 488). Consideration of predicted changes in vegetation, fire, hydrological cycles or other responses due to climate change would be speculative at the plan scale; predictions at the scale of the analysis area would be more uncertain. Therefore, potential changes in the analysis area attributable to climate change are not incorporated in the Fairview NWFP Project EA.

AIR QUALITY

Smoke from prescribed fire burning of landing piles and hand piles along road systems would contribute minor short-term increases in particulate matter in the air shed near the project area. With the prescribed fire activities in the region being conducted in compliance with the Oregon Smoke Management Plan, (OAR 629-43-043) burning activities are not expected to result in adverse effects over a widespread area. Based on guidance from Oregon Smoke Management, burning of slash would only be permitted when atmospheric conditions would allow for quick dissipation of smoke away from smoke sensitive receptor areas (local communities).

CULTURAL RESOURCES

A Class I inventory review of project documentation and record checks show no known cultural resources in the immediate vicinity of the proposed project area. The lack of recorded cultural resources and relatively recent, 30 to 60-year old, disturbance history produced during previous logging activities indicate intact cultural resources would not be affected by this project. If potential cultural resources objects or sites of possible cultural value such as historical or prehistoric ruins, fossils or artifacts, are found, all activities in the vicinity of these objects or sites would immediately be suspended and the Authorized Officer would be notified of the findings. Operations may resume at the discovery site upon receipt of written instructions and authorization by the authorized officer.

ENVIRONMENTAL JUSTICE

The proposed areas of activity are not known to be used by, or are disproportionately used by, Native Americans, minorities, or low-income populations for specific cultural activities, or at greater rates than the general population. This includes their relative geographic location and cultural, religious, employment, subsistence, or recreational activities that may bring them to the proposed areas. Thus, BLM concludes that no disproportionately high or adverse human health or environmental effects would occur to Native Americans, and minority or low-income populations as a result of the proposed actions.

HAZARDOUS MATERIALS

The proposed action is subject to applicable provisions for Petroleum Product Precautions under the Oregon Forest Practices Act (reference: OAR 629-57-3600), and Spill Prevention, Control and Countermeasures under Oregon Department of Environmental Quality provisions (reference: OAR 340-108), and State of Oregon Administrative Rule No. 340-108, Oil and Hazardous Materials Spills and Releases. This specifies the reporting requirements, cleanup standards and liability that attaches to a spill or release or threatened spill or release involving oil or hazardous substances. Site monitoring for solid and hazardous waste would be performed in conjunction with normal contract administration. In addition, the Coos Bay District Hazardous Materials Contingency Plan and Spill Plan for Riparian Operations would apply when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

No effects from solid or hazardous wastes are anticipated from the proposed action, unless an accidental release of hazardous materials occurs because of operations. Depending upon the substance, amount, and environmental conditions in the area affected by a release, the impacts could range from short-term to more extensive and longer lasting. Minor amounts, less than 2 gallons, of diesel fuel, gasoline, or hydraulic fluid leaking from heavy equipment onto a road surface, with little or no chance of migrating to surface or ground water before absorption or evaporation would be an example of minimal impact.

Post project access road and skid trail closures would reduce the available area of potential illegal dumping of solid and hazardous waste along roadsides. Based on years of on-site monitoring of timber harvest on other similar projects within the District, there is expected to be no short or long-term cumulative impacts due to the release of solid or hazardous waste materials resulting from this project. In the last decade, the BLM has only recorded one hazardous waste spill associated with timber harvest activity. This spill was the result of a log truck going off the road and leaking a small quantity of diesel fuel adjacent to Moon Creek. These types of events are extraordinary and are not considered to be reasonably foreseeable.

DRINKING WATER PROTECTION

Under the requirements and guidelines of the Federal Safe Drinking Water Act, a Source Water Assessment was completed by the Department of Environmental Quality and the Oregon Health Division to identify the surface areas and/or subsurface areas that supply water to the City of Coquille's Coquille River public water system intake. Potential contaminant sources that may impact the water supply were also inventoried.

Managed forest lands were identified as one of the potential contaminant sources (ODEQ 2003). Potential impacts include increased erosion from the cutting and yarding of trees and road building, maintenance and use, and over application or improper handling of pesticides and fertilizers. The proposed action does not include the application of pesticides and fertilizers; the other potential impacts were analyzed in the Hydrology, Aquatic Species, and Soils sections of this Environmental Assessment.

SPECIAL MANAGEMENT AREAS

There are no areas of critical environmental concern, potential wilderness areas, candidate wild or scenic rivers, or other special management areas in or near the project area.

CHAPTER IV: LITERATURE CITED

Adams, P.W.; Ringer, J.O. 1994. The effects of timber harvesting and forest roads on water quantity and quality in the Pacific Northwest: summary and annotated bibliography. For. Eng. Dept., OSU. P. 147

Agee, J.K. 1981. Fire Effects on Pacific Northwest Forests: Flora, Fuels, and Fauna. In: Conference Proceedings Northwest Forest Fire Council, Nov. 23-24, 1981. Portland, OR. Pgs 54-66.

Altman, B. 1999. Conservation strategy for landbirds in coniferous forests of western Oregon and Washington. Version 1.0. American Bird Conservancy. Prepared for Partners in Flight. 111 pg.

Amaranthus, M. P. and D. A. Perry. 1987. Effect of soil transfer on Ectomycorrhiza formation and the survival and growth of conifer seedlings on old, nonreforested clear-cuts. Can. J. For. Res. 17: 944-950

Amaranthus, M. P. and D. A. Perry. 1994. The functioning of Ectomycorrhizal fungi in the field: Linkages in space and time. Plant and Soil 159: 133-140.

Anderson, Hal E. 1982. Aids to determining fuel models for estimating fire behavior. USDA For. Serv. General Technical Report INT-122, Ogden, Utah: U. S. Department of Agriculture Forest Service, Intermountain Research Station. 22p.

Anderson, P.D.; Larson, D.J.; Chan, S.S. 2007. Riparian buffer and density management influences on microclimate of young headwater forests of western Oregon. Forest Science 53(2):254-269.

Bailey, J. D., C. Mayrshohn,. P.S. Doescher, E. St. Pierre, and J.C. Tappeiner. 1998. Understory vegetation in old and young Douglas-fir forests of western Oregon. Forest and Ecology Management 112: 289-302.

Bailey, J.D., and J. C. Tappeiner II. 1998. Effects of thinning on structural development in 40- to 100- year-old Douglas-fir stands in western Oregon. Forest Ecology and Management 108: 22-63.

Bailey, R.H. 1976. Ecological aspects of dispersal and establishment of lichens. Pg. 215-247. In: Lichenology Progress and Problems. Brown, D.H., Hawksworth, D.L., and R.H. Bailey. New York, Academic Press.

Bartels, R.; Dell, J.D.; Knight, R.L.; Schaefer, G. 1985. Dead and Down Wood. In: Management of Wildlife and Fish Habitats in Forest of Western Oregon and Washington. Part 1–Chapter Narratives, Part 2–Appendices. Publication No:R6-F& WL-192-1985. E.R. Brown, tech. ed. Portland, OR: USDA, FS, PNW Region. pgs. 129-169.

Beechie, T.J.; Pess, G.; Kennard, P.; Bilby, R.E.; Bolton, S. 2000. Modeling recovery rates and pathways for woody debris recruitment in northwestern Washington streams. North American Journal of Fisheries Management 20: 436-452.

Beschta, R.L. 1978. Long-term patterns of sediment production following road construction and logging in the Oregon Coast Range. Water Resources Research 14(6):1011 1016.

Beschta, R.L.; Bilby, R.E.; Brown, G.W.; Holtby, L.B.; Hofstra, T.D. 1987. Stream Temperature and Aquatic Habitat: Fisheries and Forestry Interactions pg. 191-232 in: Univ. Wash. Inst. Forest Resources Contrib. No 57. Univ. of Wash., Seattle.

Bisson, P.A.; Bilby, R.E.; Bryant, M.D.; Dolloff, C.A.; Grette, G.B.; House, R.A.; Murphy, M.L.; Koski, K.V.; Sedell, J.R. 1987. Large woody debris in forested streams in the Pacific Northwest: past, present, and future. In Streamside Management Forestry and Fishery Interactions. Edited by E.O. Salo and T.W. Cundy. College of Forest Resources, University of Washington, Seattle. p. 143-190.

Bormann, B.T.; Cromack Jr., K.; Russell III, W.O. 1994. Influences of Red Alder on Soils and Long-Term Ecosystem Productivity. Pg 47-56. In: The Biology and Management of Red Alder, D.E. Hibbs; D.S. DeBell; R.F. Tarrant eds. Oregon State Univ. Press, Corvallis OR.

Bosch, J.M.; Hewlett, J.D. 1982. A review of catchment experiments to determine the effect of vegetation changes on water yield and evapotranspiration. Journal of Hydrology 55: 3-23.

Boyd, M.; Sturdevant, D. 1997. The scientific basis for Oregon’s stream temperature standard: common questions and straight answers. Oregon Department of Environmental Quality. 29 p.

Brian, N. J., J. Davis, J. Menten, E. Morgan, R. Orazem, M. Oxford, F. Price, T. Rodenkirk, and J. Sperling. 2002. Applications of Known Site Management Recommendations for Survey and Manage Nonvascular Species on the Coos Bay District.

Unpublished report on file at the Coos Bay District Office, 26 p.

Brown, E.R. 1985. Management of Wildlife and Fisheries Habitats in Forests of Western Oregon and Washington. Publ. No. R6-F&WL-192-1985. United States Department of Agriculture, Forest Service, Pacific Northwest Region, Portland, OR. 332 pg.

Burroughs, E.R. Jr.; Thomas, B.R. 1977. Declining root strength in Douglas-fir after felling as a factor in slope stability. Research Paper INT-190. Ogden, Utah: U.S. Department of Agriculture, Forest Service. 27 p.

Cafferata, P., 1992, Soil Compaction Research, in Skaugset (Editor), 1992, Forest Soils & Riparian Zone Management: The Contributions of Dr. Henry A. Froehlich to Forestry, Oregon State University, pp 8-22

Carey, A. B., and R. O. Curtis. 1996. Conservation of biodiversity: a useful paradigm for forest ecosystem management. Wildlife Society Bulletin 245: 610-620pp.

Carey, A.B.; Kershner, J.; Biswell, B.; Dmínguez de Toledo, L. 1999. Ecological Scale and Forest Development: Squirrels, Dietary Fungi, and Vascular Plants in Managed and Unmanaged Forest, Wildlife Monographs No. 142, A Publication of the Wildlife Society. 71 pg.

Carey, A.B. 1995. Sciurids in Pacific Northwest managed and old growth forests. Ecological Applications 5: 648-661.

Carlton, G., 1989. The structure and dynamics of red alder communities in the central Coast Range of western Oregon. M.S. Thesis, Oregon State University, Corvallis, OR, pp. 173

Castellano, M.A., and T. O'Dell. 1997. Management recommendations for Survey and Manage Fungi, Version 2. Unpublished report on file at the Coos Bay BLM District office, North Bend, OR.

Chambers, C.L.; Carrigan, T.; Sabin, T.E.; Tappeiner, J.; McComb, W.C. 1997. Use of Artificially Created Douglas-fir Snags by Cavity-Nesting Birds. Western J. Applied For. 12(3):93-97.

Chan, S.; Mikowski, D.; Weatherly, H. 1996a. Forest Microsite Response and Effects After Thinning Young Douglas-fir Stands. Cope Report 9(2&3):13-16.

Chan, S.S.; Cole, E.C. 2002. Thinning young stands for diversity: Regeneration, stand structure, and microsite. Unpublished presentation at Silvicultural Options for Sustainable Management of Pacific Northwest Forest Symposium, Oregon State University.

Chan, S.S.; Larson, D.; Anderson, P.D. 2004. Microclimate patterns associated with density management and riparian buffers: an interim report on the riparian buffer component of the density management studies. Prepared for the USDI Bureau of Land Management.

Chan, S; Anderson, P.; Cissel, J; Larsen, L; Thompson, C. 2004. Variable density management in Riparian Reserves: lessons learned from an operational study in managed forests of western Oregon, USA. For. Snow Landsc. Res. 78, ½: 151-172.

CIG. 2004. Overview of climate change impacts in the U.S. Pacific Northwest. Climate Impacts Group. University of Washington, Seattle, WA.

CIG. 2007. HB 1303 Interim Report: A comprehensive assessment of the impacts of climate change on the State of Washington. Climate Impacts Group. University of Washington, Seattle, WA.

CIG. 2009. Forecasts and Planning Tools. Climate Impacts Group. University of Washington, Seattle, WA.

Clark, P., T. Cowles, R. Hildreth, M. Hixon, D. Lytle, J. Lubchenco, L. Mahrt, R. Mitchell, A. Mix, B. Steel, D. Turner, R. Vong, E. Goodstein, K. Falkner, M. Abbot, J. Barth, P. Bartlein, S. Bloomer, J. Coakley, S. Coakley, K. N. Johnson, B. Law, N. Mantua, E. Miles, P. Mote, R. Neilson, R. Samelson, P. T. Strub, A. Hamlet, H. Salwasser, S. Heppell, A. Blaustein, J. Bolte, R. Cuenca, S. Ebensen, M. Freilich, S. Gregory, D. Hartmann, M. Kosro, R. Letelier, E. Maloney, S. Radosevich, R. Smith, A. Snover, and M. Unsworth. 2004. Scientific Consensus Statement on the Likely Impacts of Climate Change in the Pacific Northwest. Pages Appendix E in C. Jolly, R. Shultz, D. Van't Hof, S. Schneider, B. Therkelsen, and A. Baker, editors. West Coast Governors' Global Warming Initiative Staff Recommendations to the Governors.

Collier, T.K. 2005 (7 January). Memorandum for Rob Markle from U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northwest Fisheries Science Center, Environmental Conservation Division. On file at the BLM Coos Bay District Office.

Compton, J.E., Church; M.R.; Larned, S.T.; Hogsett, W.E. 2003. Nitrogen Export from Forested Watersheds in the Oregon Coast Range: The Role of N2-fixing Red Alder. Ecosystems. 6:773-785.

Coutant, C.C. 1999. Perspectives on temperature in the Pacific Northwest's fresh water. Environmental Sciences Division Publication 4849. ORNL/TM-1999/44. Oak Ridge National Laboratory, Oak Ridge, TN.

Croke, J.C.; Hairsine, P.B. 2006. Sediment delivery in managed forests: a review. Environ. Rev. 14: 59-87.

Cushman et al. 2004. Cushman, K., T. Dreisbach, R. Exeter, J. McFarland, and M. Mueller. 2004. Management Recommendations for known sites, Additional Survey and Manage Fungi. USDA Forest Service Regions 5 and 6, Oregon and Washington, USDI Bureau of Land Management, California, Oregon and Washington.

Cushman, K., and R. Huff. 2007. The Conservation Assessment for Fungi Included in Forest Service Regions 5 and 6 Sensitive and BLM California, Oregon and Washington Special Status Species Programs. USDA Forest Service Regions 5 and 6, Oregon and Washington, USDI Bureau of Land Management, California, Oregon and Washington. 20 p plus 3 appendices.

Derr, Chiska, Richard Helliwell, Andrea Ruchty, Lisa Hoover, Linda Geiser, David Lebo & John Davis. 2003. Survey Protocols for Survey and Manage Category A & C Lichens in the Northwest Forest Plan Area. Version 2.1, BLM/OR/WA/PL-02/045+1792. U.S.D.A. Forest Service and U.S.D.I. Bureau of Lant Management.

Dietrich, W.E.; Dunne, T.; Humphrey, N.F.; Reid, L.M. 1982. Construction of sediment budgets for drainage basins. In: Swanson, F.J.; Janda, R.J.; Dunne, T.; Swanston, D.N., eds. Sediment budgets and routing in forested drainage basins. Gen. Tech. Rep. PNW-141. Portland, OR: U.S. Department of Agriculture, Forest Service.

Dilworth, J.R. 1976. Log Scaling and Timber Cruising. OSU Book Stores, Inc, Corvallis, OR. 473p.

Dixon, Gary E. comp. 2002. Essential FVS: A User's Guide to the Forest Vegetation Simulator. Internal Rep. Fort Collins, CO: U. S. Department of Agriculture, Forest Service, Forest Management Service Center. 193p.

Eis, S. 1972. Root grafts and their silvicultural implications. Can. J. Forest. Res. 2, 111-120.

Emmingham, B.; Hibbs, D. 1997. Riparian Area Silviculture in Western Oregon: Research Results and Perspectives, 1996. Cope Report 10(1&2):24-27.

Emmingham, W. H., S. S. Chan, D. Mikowski, P. W. Owston, and B. Bishaw. 2000. Silviculture practices for riparian forests in the Oregon Coast Range. Research Contribution 24, For. Res. Lab., Ore. State Univ., Corvallis. 34 pgs.

Everest, F.H.; Reeves, G.H. 2007. Riparian and aquatic habitats of the Pacific Northwest and southeast Alaska: ecology, management history, and potential management strategies. Gen. Tech. Rep. PNW-GTR-692. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 130 p.

Federal Register / Vol. 66, No. 160 / Friday, August 17, 2001 / Notices

FERC. 2009a. Final Environmental Impact Statement Jordan Cove Energy and Pacific Connector Gas Pipeline Project. FERC/EIS - 0223F

Folliard, L.B. 2011. Update on Level 2 riparian thinning elevation. lfolliard@blm.gov. 10 August.

Forest Ecosystem Management Assessment Team (FEMAT). 1993. Forest ecosystem management: an ecological, economic, and social assessment. Portland, OR: U.S. Department of Agriculture; U.S. Department of the Interior (and others).

Forsman ED, Anthony RG, Reid JA, Loschl PJ, Sovern SG, Taylor M, Biswell BL, Ellingson A, Meslow EC, Miller GS and others. 2002. Natal and breeding dispersal of northern spottted owls. Wildlife Monographs 149:1-35.

Foster, S.C.; Stein, C.H.; Jones, K.K. 2001. A guide to interpreting stream survey reports. Edited by P.A. Bowers. Information Reports 2001-06. Oregon department of Fish and Wildlife, Portland.

Franklin, J.F.; F. Hall; W. Laudenslayer; C. Maser; J. Nunan; J. Poppino; C.J. Ralph; T. Spies. 1986. Interim Definitions for Old-Growth Douglas-fir and Mixed Conifer Forest in the Pacific Northwest and California. Res Note PNW-447. USDA, FS, PNW Exp Stat. 7 pgs.

Franklin, J.F.; Spies, T.A.; Pelt, R.V.; Carey, A.B.; Thornburgh, D.A.; Berg, D.R.; Lindenmayer, D.B.; Harmon, M.E.; Keeton, W.S.; Shaw, D.C.; Bible, K.; Chen, J. 2002. Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example.. Forest Ecology and Management. 155: 399-423.

Furniss, M. J., L. M. Reid, and B. Staab. 2008. Water Resources and Climate Change. U.S. Dept. of Agriculture - Forest Service, Climate Change Resource Center.

Garbrecht, J. 1991. Effects of spatial accumulation of runoff on watershed response. J. Environ. Qual. 20:31-35.

Grant, G.E.; Lewis, S.L.; Swanson, F.J.; Cissel, J.H.; McDonnell, J.J. 2008. Effects of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington. Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.

Grant, G.E.; Wolff, A.L. 1991. Long-term patterns of sediment transport after timber harvest, western Cascade Mountains, Oregon, USA. In: Proceedings of the Vienna Symposium. IAHS 203:31-40.

Greenberg, J; Welch, K.F. 1998. Hydrologic process identification for western Oregon. Hydrologic Services Company.

Gucinski, H; Furniss, M.J.; Ziemer, R.R.; Brookes, M.H. 2001. Forest roads: a synthesis of scientific information. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. Gen. Tech. Rep. PNW-GTR-509.

Hagar, J.C., W.C. McComb, and W.H. Emmingham. 1996. Bird communities in commercially thinned and unthinned Douglas-fir stands of western Oregon. Wildlife Society Bulletin. Volume 24(2). pg. 353-366.

Hann, W. J. et al. 2004. Interagency Fire Regime Condition Class Guidebook. Available at: www.frcc.gov

Hann, W.J., Bunnell, D.L. 2001. Fire and land management planning and implementation across multiple scales. Int. J. Wildland Fire. 10:389-403.

Harmon, M. E., and B. Marks. 2002. Effects of silvicultural practices on carbon stores in Douglas-fir - western hemlock forests in the Pacific Northwest. Can. J. For. Res. 32: 863-877.

Harr, R.D. 1976. Forest practices and streamflow in western Oregon. Gen. Tech. Rep. PNW-49. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 18 p.

Harr, R.D. 1983. Potential for augmenting water yield through forest practices in western Washington and western Oregon. Water Resources Bulletin. Vol. 19, No. 3: 383-393.

Harr, R.D.; Coffin, B.A. 1992. Influence of timber harvest on rain-on-snow runoff: a mechanism for cumulative watershed effects. American Institute of Hydrology. 455-469.

Harr, R.D.; Fredriksen, R.L.; Rothacher, J. 1979. Changes in streamflow following timber harvest in southwestern Oregon. Research Paper PNW-249. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 22 p.

Harr, R.D; Harper, W.C.; Krygier, J.T.; Hsieh, F.S. 1975. Changes in storm hydrographs after road building and clear-cutting in the Oregon Coast Range. Water Resources Research. 11(3): 436-444.

Harrington, C.A. 2006 Biology and Ecology of Red Alder In: Deal, R.L.; Harrington, C.A., eds. Red alder—A State of Knowledge. Gen. Tech. Rep. PNW-GTR-669. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. pgs 21-43.

Harris, L.D. 1984. The fragmented forest - island biogeography theory and the preservation of biodiversity. Univ. of Chicago Press. 211p.

Hart, S.K. 2006. Riparian litter inputs to streams in the Central Oregon Coast Range. Master theses held by Oregon State University, Corvallis. 102 p.

Hayes, J.P. 2001. Bird Response to Thinning. The Cooperative Forest Ecosystem Research Program. Annual Report 2001.

Hayes, J.P., S. S. Chan, W.H. Emmingham, J.C. Tappeiner, L.D. Kellogg, and John D. Bailey. 1997. Wildlife Response to Thinning Young Forests in the Pacific Northwest. J. For. Vol. 95 (8):28-33.

Hemstrom, M.A.; Logan, S.E. 1986. Plant Association and Management Guide-Siuslaw National Forest. USDA For. Serv. R6-Ecol 220-1986a. PNW Region, Portland, OR. 121 p.

Henderson, J.A. 1970. Biomass and composition of the understory vegetation in some *Alnus rubra* stands in western Oregon. Oregon State University, Corvallis. M.S. Thesis 64 p.

Hessburg, P.F., Goheen, D.J., and Bega, R.V. 1995. Black stain root disease of conifers. Forest Insect & Disease Leaflet 145 (revised). USDA Forest Service, Washington, D.C. 9 p.

Hibbs, D.E., D.S. DeBell, and R.F. Tarrant (editors). 1994. The biology and management of red alder. Oregon State University Press, Corvallis, Oregon.

Hibbs, D.E.; Bower, A.L. 2001. Riparian Forest in the Oregon Coast Range. Forest Ecology and Management 154:201-213.

Hibbs, D.E.; Emmingham, W.H.; Bondi, M.C. 1989. Thinning Red Alder: Effects of Method and Spacing. Forest Science. 35(1):16-29.

Hibbs, D.E.; Sarr, D. 2001. Environmental Controls on Woody Plant Diversity in Western Oregon Riparian Forests. in The Cooperative Forest Ecosystem Research Program Annual Report 2001, edited by J. Erickson. Corvallis, OR.. pp 48-53.

Hicks, B.J.; Beschta, R.L.; Harr, R.D. 1991. Long-term changes in streamflow following logging in western Oregon and associated fisheries implications. Water Resources Bulletin. 27(2): 217-226.

Hicks, W.T.; Harmon, M.E. 2002. The Importance of Nitrogen Fixation at Several Spatial Scales. H.J. Andrews Experimental Forest.

Hidalgo, H. G., T. Das, M. D. Dettinger, D. R. Cayan, D. W. Pierce, T. P. Barnett, G. Bala, A. Mirin, A. W. Wood, C. Bonfils, B. D. Santer, and T. Nozawa. 2009. Detection and attribution of streamflow timing changes to climate change in the western United States. Journal of Climate 22(13): 3838-3855.

Independent Multidisciplinary Science Team (IMST). 2004. Oregon's water temperature standard and its applications: causes, consequences, and controversies associated with stream temperature. Technical Report 2004-1.

IPCC. 2007. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change. S. D. Solomon, D. Quin, M. Manning, Z. Chen, M. Marquis, M. Averyt, M. Tignor, and H. L. Miller, Cambridge University Press, Cambridge, United Kingdom and New York, New York.

Jones, J.A.; Grant, G.E. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. Water Resources Research. 32(4): 959-974.

Jones, J.A. 2000. Hydrologic processes and peak discharge response to forest removal, regrowth, and roads in 10 small basins, western Cascades, Oregon. Water Resources Research. 36(9): 2621-2642.

Keim, R.F.; A.E. Skaugset; D.S. Bateman. 2000. Dynamics of Coarse Woody Debris Placed in Three Oregon Streams. Forest Science 46(1): 13-22.

Kimmey, J.W.; Furniss, R.L. 1943. Deterioration of fire-killed Douglas-fir. Tech. Bull. 851. USDA, Forest Service. Washington D.C. 61 p.

Kelty, M.J. 1986. Development Patterns in Two Hemlock-Hardwood Stands in Southern New England. Canadian Journal For. Research. 16:885-891.

Klinka, K., H.Y.H. Chen, Q. Wang, and L. Montigany. 1996 Forest canopies and their influence on understory vegetation in early-seral stands on West Vancouver Island. Northwest Science Vol. 70 (30:193-200).

Kramer, P.J.; Kozlowski, T.T. 1979. Physiology of Woody Plants Academic Press. NY. 811 pp.

Lenihan, J. M., D. Bachelet, R. Drapek, and R. P. Neilson. 2006. The Response of Vegetation Distribution, Ecosystem Productivity, and Fire in California to Future Climate Scenarios Simulated by the MC1 Dynamic Vegetation Model. Pages Appendix 5 in Climate Action Team Report. California Climate Action Team.

Levno, A.; Rothacher, J. 1969. Increases in Maximum Stream Temperatures After Slash Burning in a Small Experimental Watershed. USDA FS Res. Note, PNW-110. PNW Res. Sta., Portland OR.

Lindermayer, D.B.; Franklin, J.F. 2002. Conserving forest biodiversity: a comprehensive multiscaled approach. Island Press. Washington, Covelo and London. 351 p.

Lippke, Oneil, Harrison, Skog, Gustavsson & Sathre. 2011. Life cycle impacts of forest management and wood utilization on carbon mitigation. Future Science: Carbon Management 2(3), 303-333, publication review

Mainwaring, D.B., Maguire, D.A., Kanaskie, A., and J. Brandt. 2005 Growth Responses to commercial thinning in Douglas-fir stands with varying intensity of Swiss needle cast in Oregon USA. Can. J. For. Res. Volume 35 (10) : pgs 2394-2402.

May, C.L.; Gresswell, R.; Erickson, J. 2004. The importance of wood in headwater streams of the Oregon Coast Range. Cooperative Forest Ecosystem Research, Corvallis, OR.

May, C.L.; Gresswell, R.E. 2003a. Large wood recruitment and redistribution in headwater streams in the southern Oregon Coast Ranges, U.S.A. Can. J. For. Res. 33:1-11.

May, C.L.; Gresswell, R.E. 2003b. Processes and rates of sediment and wood accumulation in headwater streams of the Oregon Coast Range, USA. Earth Surf. Process. Landforms 28, 409-424. John Wiley & Sons, Ltd.

May, C.L. 2002. Debris flow through different forest age classes in the central Oregon Coast Range. Journal of the American Water Resources Association. Vol. 38, No. 4.

May, Christine. 2011. Re: debris flow width question. 29 August.

McArdle, R.E.; Meyer, W.H.; Bruce, D. 1961. The yield of Douglas-fir in the Pacific Northwest. Technical Bulletin 201. USDA, FS, Washington, D.C. 74 pgs. Reprinted 1974 by OSU Book Stores, Inc., Corvallis, OR.

McComb, W. C., K. M. McGarigal, and R. G. Anthony. 1993. Small mammals and amphibian abundance in streamside and upslope habitats of mature Douglas-fir stands, western Oregon. Northwest Science: 67:7-15.

McDade, M.H.; Swanson, F.J.; McKee, W.A.; Franklin, J.F.; VanSickle, J. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. Can. J. For. Res. 20:326-330.

McGreer, D.J.; Andrus, C. 1992. Woody debris in streams and riparian zone management research. Pages 47-71. In: Proceedings of Forest Soils & Riparian Zone Management: The Contributions of Dr. Henry A. Froehlich to Forestry Nov 17, 1992. Ore. St. Univ., Corvallis. 110 p.

Miller, Richard E.; Anderson, Harry W.; Murray, Marshall; Leon, Rick. 2005. Comparative effects of precommercial thinning, urea fertilizer, and red alder in a site III, Coast Douglas-fir Plantation. Res. Pap. PNW-RP-565. Portland, OR: USDA, FS, PNW Research Station. Pg 25

Millar, C. I., R. Neilson, D. Batchelet, R. Drapek, and J. Lenihan. 2006. Climate Change at Multiple Scales. Pages 31-62 in H. Salwasser and M. Cloughesy, editors. Forests, Carbon, and Climate Change: a Synthesis of Findings. Oregon Forests Resources Institute, Portland, OR.

Minore, D. 1979. Comparative Autecological Characteristics of Northwestern Tree Species . . . A Literature Review. General Technical Report PNW-87. USDA, FS, Pacific Northwest Forest and Range Experiment Station, Portland, OR. 72 pgs.

Minore, D. and H.G. Weatherly. 1994. Riparian trees, shrubs and forest regeneration in the coastal mountains of Oregon. New For. 8:249-263.

Molina R., T. O'Dell, D. Luoma, M. Amaranthus, M. Castellano, and K. Russell. 1993. Biology, ecology, and social aspects of wild edible mushrooms in the forests of the Pacific Northwest: A preface to managing commercial harvest. Gen. Tech. Rep. PNW-309, Pacific Northwest Research Station, U.S. Department of Agriculture, Forest Service, 42 p.

Molina, R., D. Pilz, J. Smith, S. Dunham, T. Dreisbach, T. O'Dell and M. Castellano. 2001. Conservation and management of forest fungi in the Pacific Northwestern United States: an integrated ecosystem approach. In Fungal conservation: Issues and solutions. Edited by D. Moore, M.M. Nauta, and M. Rotheroe. Cambridge Univ. Press, Cambridge, U.K. pg. 19-63.

Moore, J.A.; Miner, J.R. 1997. Stream temperatures: some basic considerations. Oregon State University Extension Service. Publication EC 1489. Corvallis.

Moore, R.D.; Wondzell, S.M. 2005. Physical hydrology and the effects of forest harvesting in the Pacific Northwest: a review. Journal of the American Water Resources Association. 763-784.

Mote, P. W., E. A. Parson, A. F. Hamlet, K. N. Ideker, W. S. Keeton, D. P. Lettenmaier, N. J. Mantua, E. L. Miles, D. W. Peterson, D. L. Peterson, R. Slaughter, and A. K. Snover. 2003. Preparing for Climatic Change: The Water, Salmon, and Forests of the Pacific Northwest. Climatic Change(61): 45-88.

Muir P., S., R. Mattingly, J. Tappeiner II, J. Bailey, W. Elliott, J. Hagar, J. Miller, E. Peterson, and E. Starkey. 2002. Managing for Biodiversity in Young Douglas-Fir Forests of Western Oregon. Biological Science Report. Oct. 2002.

Neitlich, P. and McCune, B. 1995. Structural factors influencing lichen biodiversity in two young managed stands, Western Oregon, USA. Unpublished study. 11 p.

Neitlich, P. N. 1993. Lichen abundance and biodiversity along a chronosequence from young managed stands to ancient forests. Master's Thesis, Field Naturalist Program, Dept. of Botany, University of Vermont, 90 p.

Neitlich, P. N., and B. McCune. 1997. Hotspots of epiphytic lichen diversity in two young managed forests. Conservation Biology 11(1):172-182.

Neitro, W. A.; Mannan R.W.; Taylor, D.; Binkley, V.W.; Marcot, B.C.; Wagner, F.F.; Cline, S.P. 1985. Snags. In E.R. Brown, editor. Management of wildlife and fish habitats in forests of western Oregon and Washington. Part 1 - Chapter Narratives. USDA Forest Service, PNW #R6-F&WL-192-1985, Portland, Oregon, USA. Pages 129-169.

Newton, M.; Cole, E.C. 1994. Stand development and successional implications: pure and mixed stands. In: Hibbs, D.E.; DeBell, D.S.; Tarrant, R.F., eds. The biology and management of red alder. Corvallis, OR: Oregon State University Press: 106-115.

Newton, M.; E. Cole. 1987. A Sustained-Yield Scheme for Old-Growth Douglas-fir. Western J of Applied For. 2(1):22-25.

Newton, M.; El Hassan, B.A.; Zavitkovski, J. 1968. Role of Red Alder in Western Oregon Succession. In: Trappe, J.M.; Franklin, F.E.; Tarrant, R.F. Hansen, G.M. (eds.) Biology of Alder. Portland, OR. pgs. 73-83.

Niemiec, S.S; G.R. Ahrens; S. Willits; D.E. Hibbs. 1995. Hardwoods of the Pacific Northwest. Forest Research Laboratory, Oregon State Univ. Corvallis. Research Contribution 8. 115 p.

North, M.P; J.F. Franklin; A.B. Carey; E.D. Forsman; T. Hamer. 1999. Forest Stand Structure of the Northern Spotted Owl's Foraging Habitat. For Sci 45(4):520-527.

ODF. 2007. Combined Administrative Rules & Forest Practices Rulebook. Oregon Department of Forestry.

Oliver, C.D. 1981. Forest development in North America following major disturbance. Forest Ecology Management 3: 153-168.

Oliver, C.D; Larson, B.C. 1990. Forest Stand Dynamics. McGraw-Hill, Inc. 467 pgs.

Oliver, C.D.; Larson, B.C. 1996. Forest Stand Dynamics. John Wiley and Sons, New York. 520 p.

Omni, P.N.; E.J. Martinson. 2002. Effect of Fuels Treatment on Wildfire Severity: Final Report, Western Forest Fire Research Center / Colorado State University

Oregon Climate Service (OCS). 1995. Two-inch precipitation values for the state or Oregon, developed from raster data.

Oregon Department of Environmental Quality (ODEQ). 2003. Source water assessment summary brochure: City of Coquille PWS # 4100213.

Oregon Department of Environmental Quality (ODEQ). 2006a. Umpqua Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP).

Oregon Department of Environmental Quality (ODEQ). 2006b. Assessment methodology for Oregon's 2004/2006 integrated report on water quality status.

Oregon Department of Environmental Quality (ODEQ). 2009. Water quality assessment database.

ORNHIC, 2007. Oregon Natural Heritage Information Center. Heritage Update.

Ottmar, R.D.; Hardy, C.C. 1989. Stereo photo series for quantifying forest residues in coastal Oregon forests: Second-growth Douglas-fir-western hemlock Type, western hemlock - Sitka spruce type, and red alder type. General Technical Report PNW-GTR-231. Portland, OR: U.S. Department of Agriculture Forest Service, Pacific Northwest Research Station. 67 p.

Parsons, W.F.J., D.H. Knight, and S.L. Miller. 1994. Root gap dynamics in lodgepole pine forest: nitrogen transformation in gaps of different sizes. Ecological Applications 4:354-362.

Peet, R.K.; Christensen, N.L. 1987. Competition and Tree Death. BioScience 37(8):586-595.

Perakis, S.S.; Maguire, D.A.; Bullen, T.D.; Cromack, K.; Waring, R.H.; Boyle, J.R. 2006. Coupled Nitrogen and Calcium Cycles in Forests of the Oregon Coast Range. Ecosystems 9: 63-74.

Peterson, E. B. and B. McCune. 1998. The importance of climate, forest structure, and forest thinning to epiphytic macrolichens in the Western Oregon landscape. A report to the USGS Biological Resources Division Forest and Rangeland Ecosystem Science Center (FRESC), Subproject 3-16-2, Cumulative Report, 25 p.

Pilz, D.; Mayo, J.; Molina, R. 2002. Chanterelle Mushroom Productivity Responses to Young Stand Thinning. Presented in poster session, Silvicultural Options for Sustainable Management of Pacific Northwest Forest Symposium, Oregon State University, Corvallis, OR.

Poage, N.J. 2000. Structure and Development of Old-Growth Douglas-fir in Central Western Oregon. PhD dissertation, Oregon State Univ., Corvallis. 164 pgs.

Price, F. 2006. Personal communication. Forest Ecologist, Umpqua Field Office, Coos Bay District BLM, 1300 Airport Lane, North Bend, OR 97459-2033.

Price, F. 2010. Re: Conifer height at age 20. Forest Ecologist, Coos Bay District BLM, 1300 Airport Lane, North Bend, OR 97459-2033 (20 April)

Price, F., et al. (2004). Middle Umpqua River Watershed Analysis. North Bend, OR, Bureau of Land Management.

Rambo, R.R., and P.S. Muir. 1998. Forest Floor bryophytes of Pseudotsuga menziesii – Tsuga heterophylla stands in Oregon: Influences of substrate and overstory. The Bryologist 101(1): 116-130.

Rashin, E.B.; Clishe, C.J.; Loch, A.T.; Bell, J.M. 2006. Effectiveness of timber harvest practices for controlling sediment related water quality impacts. Paper No. 01162 of the Journal of the American Water Resources Association. 1307-1327.

Reeves, G.H.; Benda, L.E.; Burnett, K.M.; Bisson, P.A.; Sedell, J.R. 1995. A Disturbance-Based Ecosystem Approach to Maintaining and Restoring Freshwater Habitats of Evolutionarily Significant Units of Anadromous Salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.

Reeves, G.H.; Burnett, K.M.; McGarry, E.V. 2003. Sources of large wood in the main stem of a fourth-order watershed in coastal Oregon. Can. J. For. Res. 33: 1363-1370.

Reeves, G.H.; Williams, J.E.; Burnett, K.M.; Gallo, K. 2006. The Aquatic Conservation Strategy of the Northwest Forest Plan. Conservation Biology Volume 20, No. 2, 319-329.

Reid, L.M.; Dunne, T. 1984. Sediment production from forest road surfaces. Water Resources Research Vol. 20. No. 11, 1753-1761.

Reid, L.M.; Hilton, S. 1998. Buffering the buffer. In Proceedings of the conference on coastal watersheds: the Caspar Creek story. Robert R. Ziemer, Technical Coordinator. Pacific Southwest Research Station, U.S. Department of Agriculture, Forest Service.

Reiter, M.L.; Beschta, R.L. 1995. Effects of forest practices on water. In: Cumulative effects of forest practices in Oregon: literature and synthesis. Oregon State University. Corvallis. Chapter 7.

Rich, T. D.; C. J. Beardmore; H. Berlanga; P. J. Blancher; M. S. W. Bradstreet; G. S. Butcher; D. W. Demarest; E. H. Dunn; W. C. Hunter; E. E. Iñigo-Elias; J. A. Kennedy; A. M. Martell; A. O. Panjabi; D. N. Pashley; K. V. Rosenberg; C. M. Rustay; J. S. Wendt; T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Robison E.G.; Beschta, R.L. 1990. Identifying trees in riparian areas that can provide coarse woody debris to streams. Forest Science, Vol. 36, No. 3.

Robison, E.G.; Mills, K.A.; Paul, J.; Dent, L. Skaugset, A. 1999. Oregon Department of Forestry storm impacts and landslide of 1996: final report. Forest practices technical note number 4.

Royer, T.A. 2006. Scaling hydrologic impacts from road segments to a small watershed. Master's thesis. Oregon State University, Corvallis.

Salathe, E. P. J., R. Leung, Y. Qian, and Y. Zhang. 2009. Regional climate model projections for the State of Washington. Climatic Change (In Press): 37. Web site: http://www.atmos.washington.edu/~salathe/papers/Salathe_et_al_2009_RCM_cc.pdf

Satterlund, D.R.; Adams, P.W. 1992. Wildland watershed management, second edition. John Wiley & Sons, Inc. New York.

Schmidt, Kirsten M., Menakis, James P., Hardy, Colin C., Hann, Wendel J., and Bunnell, David L. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. General Technical Report RMRSGTR-87. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 41p.

Sharrow, S. H. 2008. Carbon Farming- the Global Carbon Cycle. Oregon State University, Corvallis OR.

Skaugset, A. (Editor) 1992. Forest Soils & Riparian Zone Management: The Contributions of Dr. Henry A. Froehlich to Forestry. Oregon State Univ., Corvallis.

Sobota, D.J.; Gregory, S.V.; Van Sickle, J. 2006. Riparian tree fall directionality and modeling large wood recruitment to streams. Can. J. For. Res. 36: 1243-1254.

Sonne, E. 2006. Greenhouse gas emissions from forestry operations: a lifecycle assessment. Journal of Environmental Quality 35(4): 1439-1450.

Spies, T.A.; Franklin, J.F. 1991. The Structure of Natural Young, Mature, and Old-growth Douglas-fir Forests in Oregon and Washington. pg. 91-109.

Stout, B.B. 1956. Studies of the root systems of deciduous trees. The Harvard Forest, Harvard University, Harvard Black Rock Forest Bulletin No. 15, 45 p.

Strahler, A.N. 1957. Quantitative analysis of watershed geomorphology. Trans. Amer. Geophys. Union. 38: 913-920.

Stubblefield, G.; C.D. Oliver. 1978. Silvicultural Implications of the Reconstruction of Mixed Alder/Conifer Stands. in Utilization and Management of Red Alder, compiled by D.G. Briggs; D.S. DeBell; W.A. Atkinson. Gen. Tech. Rpt PNW-70. USDA. FS. PNW For. & Range Exp Stat, Portland, OR. pp 307-320.

Summers, R.P. 1982. Trends in Riparian Vegetation Regrowth Following Timber Harvesting in Western Oregon Watersheds. M.S. thesis, Oregon State Univ., Corvallis.

Swanson, F.J.; Fredricksen, R.L.; McCorison, F.M. 1982. Material transfer in a western Oregon forested watershed. In: Edmond, R.L., ed. Analysis of coniferous forest ecosystems in the western United States. New York: Hutchinson Ross: 233-266.

Tappeiner, J.C.; Huffman, D.; Marshall, D.; Spies, T.A.; Bailey, J.D. 1997. Density, Ages, and Growth Rates in Old-Growth and Young-Growth Forests in Coastal Oregon. Can. J. For. Res. 27: 638-648.

Tappeiner, J.C.; Zasada, J.; Ryan, P.; Newton, M. 1991. Salmonberry Clonal and Population Structure: The Basis for a Persistent Cover. Ecology. 72(2):609-618.

The National Map LANDFIRE: LANDFIRE Rapid Assessment Fire Regime Condition Class layer. (2006, September - last update). U.S. Department of Interior, Geological Survey.

Toman, J. (no date), Wildlife Biologist, Oregon Department of Fish and Wildlife, Charleston, OR.

U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2010. Response to April 1, 2010 request by the Interagency Coordinating Subgroup for position paper to support the February 23, 2010 elevation of two Northwest Forest Plan issues to the Regional Executives. 23 July.

U.S. Environmental Protection Agency (EPA). February 2005. Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel. EPA420-F-05-001.

U.S. Geological Survey. 1992. Policy statement on stage accuracy. Office of Surface Water Technical Memorandum No. 93.07.

USDA-FS; USDI-BLM. 1997. Survey Protocols for Survey and Manage Component 2 Bryophytes, Version 2.0. BLM-Information Bulletin No. OR-98-051, Forest Service Region-5/6 and Bureau of Land Management OR/WA/CA

USDA-FS; USDI-BLM. 1998. Survey protocols for survey and manage component 2 lichens, Ver. 2.0, BLM Instruction Memorandum No. OR-98-38, Forest Service Region-5/6 and Bureau of Land Management OR/WA/CA

USDA-FS; USDI-BLM. 1999. Survey Protocols for Seven Protection Buffer Fungi. Version 1.3. BLM-Instruction Memorandum Number OR-2000-018, Forest Service Region-5/6 and Bureau of Land Management OR/WA/CA

USDA-FS; USDI-BLM. 2000. Final Supplemental Environmental Impact Statement for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Two volumes, Forest Service Region-5/6 and Bureau of Land Management OR/WA/CA

USDA-FS; USDI-BLM. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, Oregon.

USDA-FS; USDI-BLM. 2004. Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines, Forest Service Region-5/6 and Bureau of Land Management OR/WA/CA

USDA-FS; USDI-BLM. 2004a. Final Supplemental Environmental Impact Statement Management of Port-Orford-Cedar in Southwest Oregon, January 2004. Portland, OR.

USDA-FS; USDI-BLM. 2007. The Final Supplement to The 2004 Environmental Impact Statement to Remove or Modify The Survey and Manage Mitigation Measure Standards and Guidelines, June 2007. Portland, OR, Forest Service Region-5/6 and Bureau of Land Management OR/WA/CA

USDA-FS 2011. U.S. Department of Agriculture, Forest Service. 2011. East Alsea Landscape Management Project Decision Notice. Central Coast Ranger District-ODNRA, Siuslaw National Forest, Lincoln County, Oregon.

USDA-USDI 1994a. United States Department of Agriculture, Forest Service, United States Department of the Interior, Bureau of Land Management. 1994. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl. Volume 1.

USDA-USDI 1994b. United States Department of Agriculture, Forest Service, United States Department of the Interior, Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl 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.

USDA-USDI 2001. United States Department of Agriculture, Forest Service, United States Department of the Interior, Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, Oregon.

USDI -USDA 2008. USDI Fish and Wildlife Service, USDI Bureau of Land Management and USDA Forest Service. 2008. Methodology for estimating the number of northern spotted owls affected by proposed federal actions. Version 2.0. Oregon Fish and Wildlife Office, Fish and Wildlife Service, Portland, OR.

USDI, BLM 1986. Timber Production Capability Classification, Handbook 5251-1, BLM Manual Supplement, Coos Bay Edition 5/86. Oregon State Office, Portland, OR.

USDI, BLM 1994. Final Coos Bay District Proposed Resource Management Plan Environmental Impact Statement. Sept. 1994. United States Department of the Interior, Bureau of Land Management, Coos Bay District, North Bend, OR.

USDI, BLM 1995. Coos Bay District Record of Decision and Resource Management Plan. United States Department of the Interior, Bureau of Land Management, Coos Bay District, North Bend, OR.

USDI, BLM 1997. Middle Main Coquille Watershed Analysis. United States Department of the Interior, Bureau of Land Management, Coos Bay District, North Bend, OR.

USDI, BLM 2001. North Fork Coquille Watershed Analysis. United States Department of the Interior, Bureau of Land Management, Coos Bay District, North Bend, OR.

USDI, BLM 2001. South Fork Coos River Watershed Analysis. United States Department of the Interior, Bureau of Land Management, Coos Bay District, North Bend, OR.

USDI, BLM 2010. Western Oregon Districts Transportation Management Plan. U.S. Dept. of the Interior - Bureau of Land Management, Portland, OR.

USDI, BLM 2003. Instruction Memorandum. No. OR-2003-054. 4 p.

USDI, BLM 2003. Instruction Memorandum- 2002 Annual Species Review. On file at Coos Bay District Office, North Bend, OR, March 3, 2003.

USDI, BLM 2004. Record of Decision and Resource Management Plan Amendment for Management of Port-Orford-Cedar in Southwest Oregon, Coos Bay District, Medford, and Roseburg Districts, May 2004. Portland, OR.

USDI, BLM 2006. South Fork Coos River Water Quality Restoration Plan. Umpqua Field Office, Coos Bay District Bureau of Land Management.

USDI, BLM 2007. Instruction Memorandum. No. OR-2007-072 4pp.

USDI, BLM 2008. Instruction Memorandum. No. OR-2008-038 4pp.

USDI, BLM 2008. Oregon-Washington Special Status Species Policy. Instruction Memorandum No. 2009-039.

USDI, BLM 2008. Umpqua River Subbasin Water Quality Restoration Plan. Umpqua Field Office, Coos Bay District Bureau of Land Management.

USDI, BLM 2008b. Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management. U.S. Dept. of the Interior - Bureau of Land Management, Portland, OR.

USDI, BLM 2009. 6840-Special Status Species Management. BLM Manual, Supersedes Rel. 6-116. Rel. 6-121, 1/19/01.

USDI, BLM 2010. Analysis of Greenhouse Gas Emissions and Consideration of Climate Change in National Environmental Policy Act Documents. Instruction Memorandum OR-2010-012, U.S. Dept. of Interior - Bureau of Land Management.

USDI, BLM 2010. Catching Beaver Watershed Analysis. United States Department of the Interior, Bureau of Land Management, Coos Bay District, North Bend, OR.

USDI, BLM 2010. Interim NEPA Direction for Survey and Manage Species. Instruction Memorandum No. OR-2010-017. USFS et al. 2001. United States Department of the Interior, Bureau of Land Management OR/WA/CA and the United States Department of Agriculture, U.S. Forest Service R-5/6. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Coos Bay District Office, North Bend, OR Jan. 2001.

USFWS 2010 Letter of Concurrence No. 13420-1-10, United States Department of the Interior, Fish and Wildlife Service, Roseburg Field Office, Roseburg, OR.

Weikel, J.M.; Hayes, J.P. 1997. Habitat use by cavity-nesting birds in young commercially thinned and unthinned forests. Coastal Oregon Productivity Enhancement Program. COPE Report. Volume 10(3). Hatfield Marine Science Center. Oregon State University, Newport, OR. 12 p.

Wemple, B.C. 1998. Investigations of runoff and sediment production from forest roads in western Oregon, Ph.D. dissertation, Dep. Of For. Sci., Oregon. State Univ.

Wemple, B.C.; Jones, J.A.; Grant, G.E. 1996. Channel network extension by logging roads in two basins, western Cascades, Oregon. Water Resources Bulletin. 32(6): 1195-1207.

Whiteaker, L., J. Henderson, R. Holmes, L., Hoover, R. Lesher, J. Lippert, E. Olson, L. Potash, J. Seevers, M. Stein, and N. Wogen, 1998. Survey protocols for survey & manage strategy 2 vascular plants. Ver. 2.0. Instruction Report on file on Coos Bay office.

Wierman, C.A.; Oliver, C.D. 1979. Crown Stratification by Species in Even-Aged Mixed Stands of Douglas-fir-Western Hemlock. Canadian Journal of Forest Research 9(1):1-9.

Wilson, J.S.; Oliver, C.D. 2000. Stability and Density Management in Douglas-fir Plantations. Can. J. For. Res. 30:910-920.

Wipfli, M. S., PNW Science Findings. Issue 63, 2004. Ecological Payoffs From Red Alder In Southeast Alaska, pg. 5.

WRI. 2010. The Greenhouse Gas Protocol Initiative. World Resources Institute. Zobrist, K. W., and T. M. Hinckley. 2005. A literature review of management practices to support increased biodiversity in intensively managed Douglas-fir plantations. Final Technical Report to the National Commission on Science for Sustainable Forestry (NCSSF): 1-14.

Wright, K.W. and Lauterbach, P.G. (1958). A 10-year study of mortality in a Douglas-fir sawtimber stand in Coos and Douglas Counties, Oregon. USDA FS Res. Paper 27. PNW, Portland, OR

Wu, T.H. 1986. Root geometry model and simulation. Unpublished final report. National Science Foundation Grant CEE-811253. U. S. Department of Agriculture, Forest Service Grant PNW-83-317. Department of Civil Engineering, Ohio State University. 62 p.

Ziemer, R.R. 1998. Flooding and stormflows. In: Ziemer, R.R., technical coordinator. Proceedings of the conference on coastal watersheds: the Caspar Creek story; 6 May 1998; Ukiah, CA. Gen. Tech. Rep. PSW-GTR-168. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 149 p.

CHAPTER V: LIST OF PREPARERS

John Goering	Forester – Project Lead
John Chatt	Wildlife Biologist
John Colby	Hydrologist
Glen Harkleroad	Fish Biologist
Jennifer Sperling	Botanist
Dale Stewart	District Soil Scientist
Bill Elam	Fuels Specialist
Meredith Childs	Forester, Silviculture
Nancy Zepf	Recreation Specialist
John Guetterman	GIS Specialist
Jim Counts	Civil Engineer
Stephan Samuels	District Archaeologist
Paul Gammon	Hazardous Materials Coordinator
Scott Knowles	Environmental Justice Coordinator

CHAPTER VI: LIST OF AGENCIES AND INDIVIDUALS CONTACTED

The public was notified of the planned EA through the publication of the Coos Bay District's planning update, a scoping notification on the District web site, and advertisement of scoping in *The World* newspaper.

The following public agencies and interested parties were notified directly:

American Forest Resources Council
Association of O&C Counties
Bonneville Power Administration
Cascadia Wildlands
Coast Range Association
Confederated Tribes of CLUS
Coos County Commissioners
Coquille Indian Tribe
Division of State Lands
Douglas Timber Operators
Friends of the Coquille
Klamath-Siskiyou Wildlands Center
NOAA National Marine Fisheries Service
NW Environmental Defense Council
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of Forestry
Oregon Division of State Lands
Oregon Wild
Plum Creek Timberlands
Rogue Forest Protective Assoc.
Umpqua Watersheds
Numerous Private Citizens
All adjoining landowners

APPENDIX A: FAIRVIEW NWFP PROJECT MAPS

Project Area Map A – Overview of Proposed Units, Land Use Allocations, and General Vicinity

Project Area Map B – Hardwood Stands and Proposed Units, Alder Conversion/Thinning

Project Area Map C 1, 2 – Proposed Unit Locations, Prescriptions, and Road Work

Project Area Map D 1, 2 –Yarding Methods and Road Decommisioning

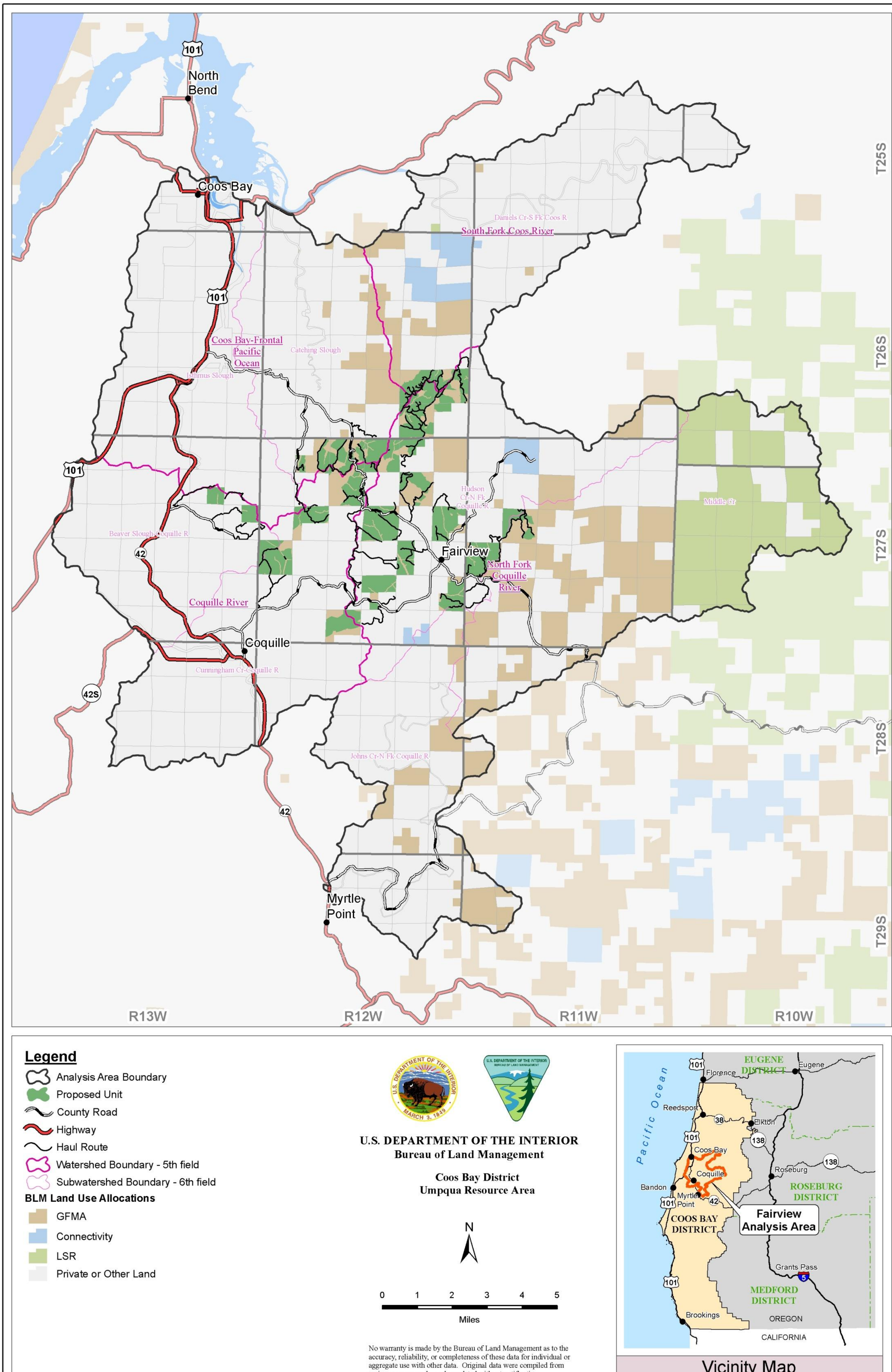
Project Area Map E 1, 2 – Soil Map Units, NRCS County Survey

Project Area Map F – Soil Compaction Resistance

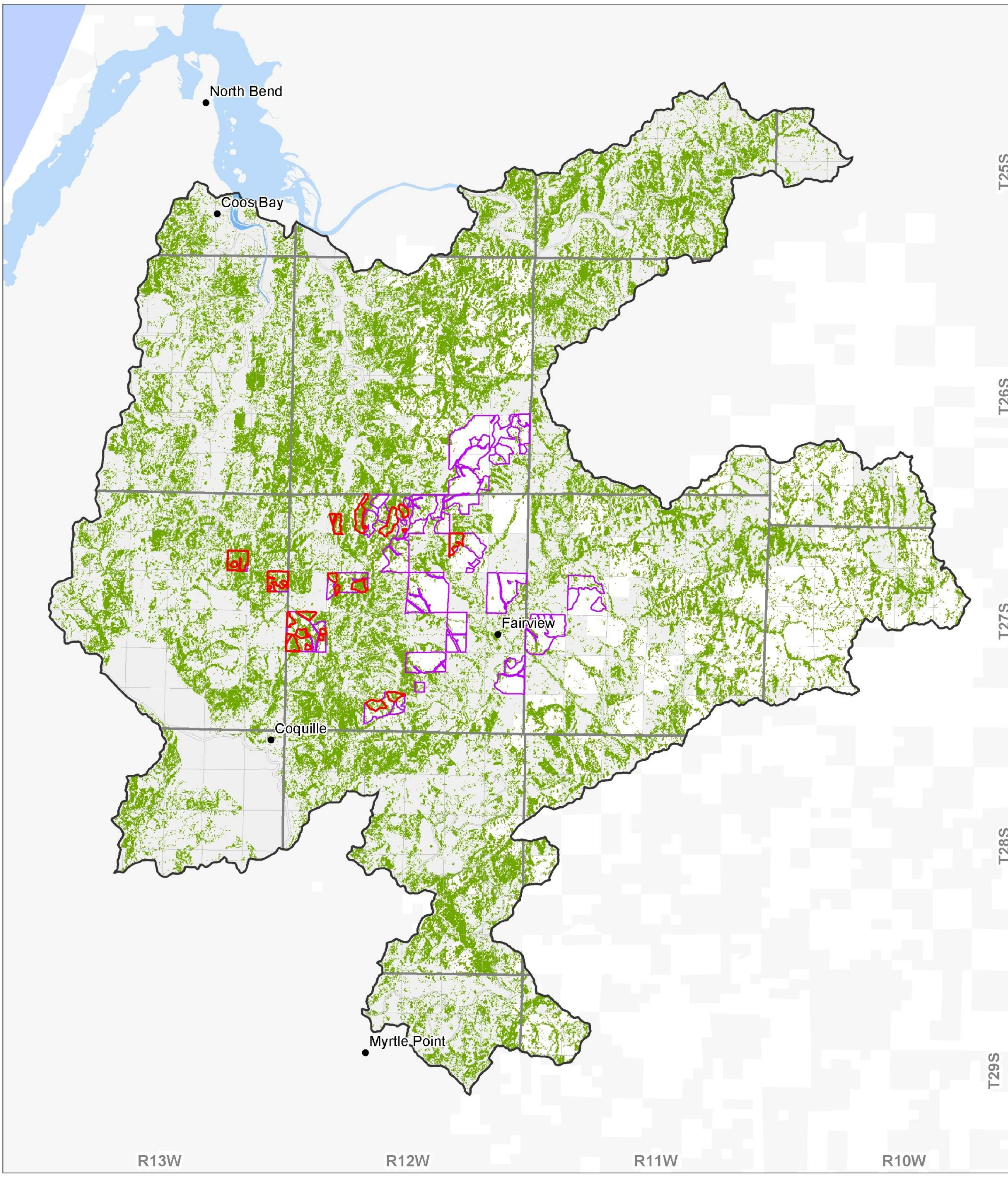
Project Area Map G – Equipment Operability

Project Area Map H – Erosion Hazard

Project Area Map I – Fish Distribution



Fairview EA Map A: Overview of proposed units, land use allocations, and general vicinity.



Legend

- Hardwoods
- Analysis Area Boundary
- Alder Conversion Unit
- Thinning Unit
- BLM Administered Land
- Private or Other Land

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Coos Bay District
Umpqua Resource Area

N

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Miles

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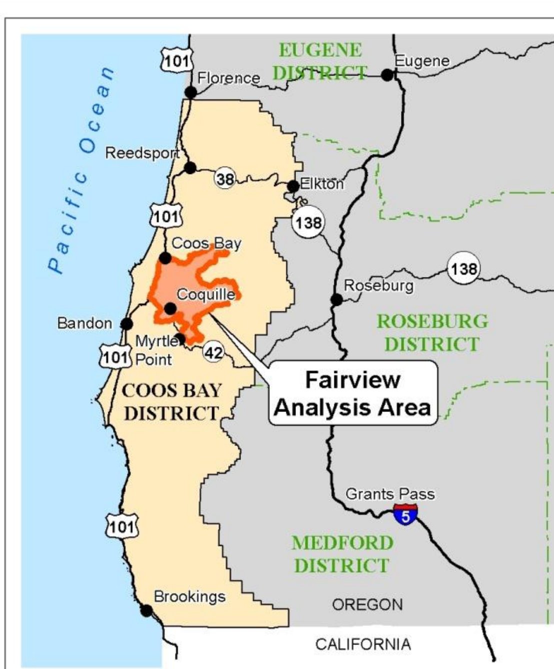
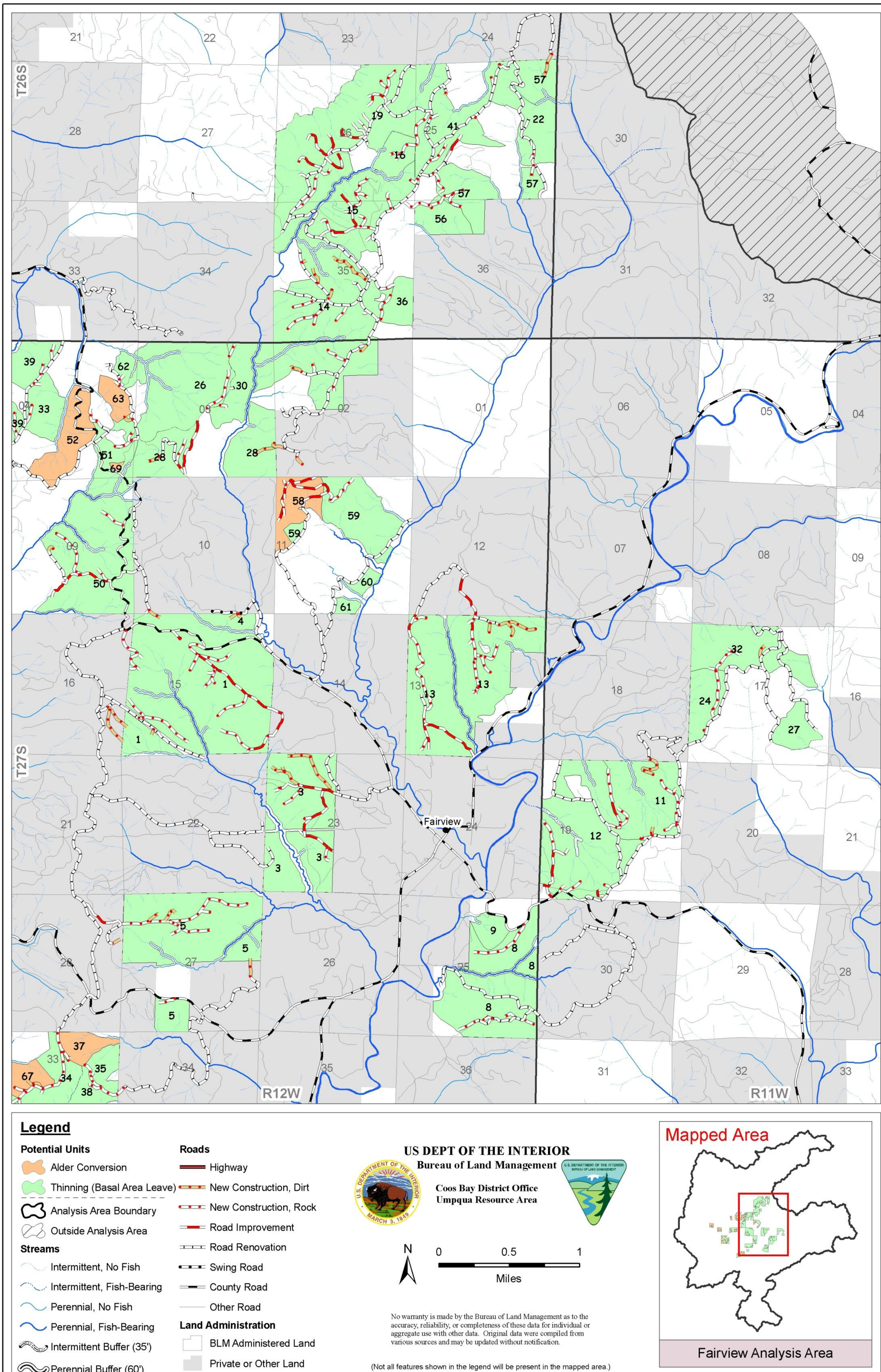
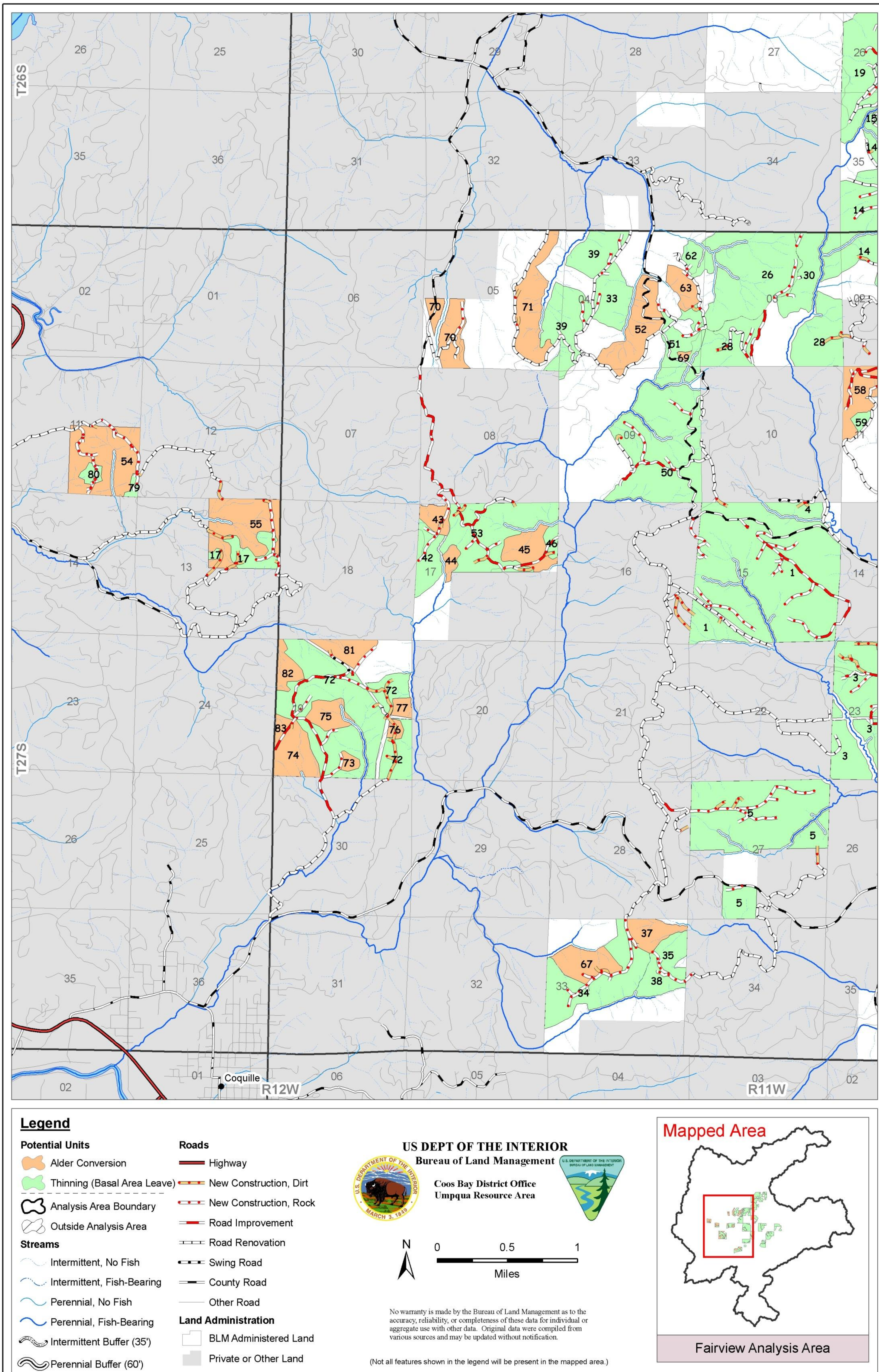


Vicinity Map

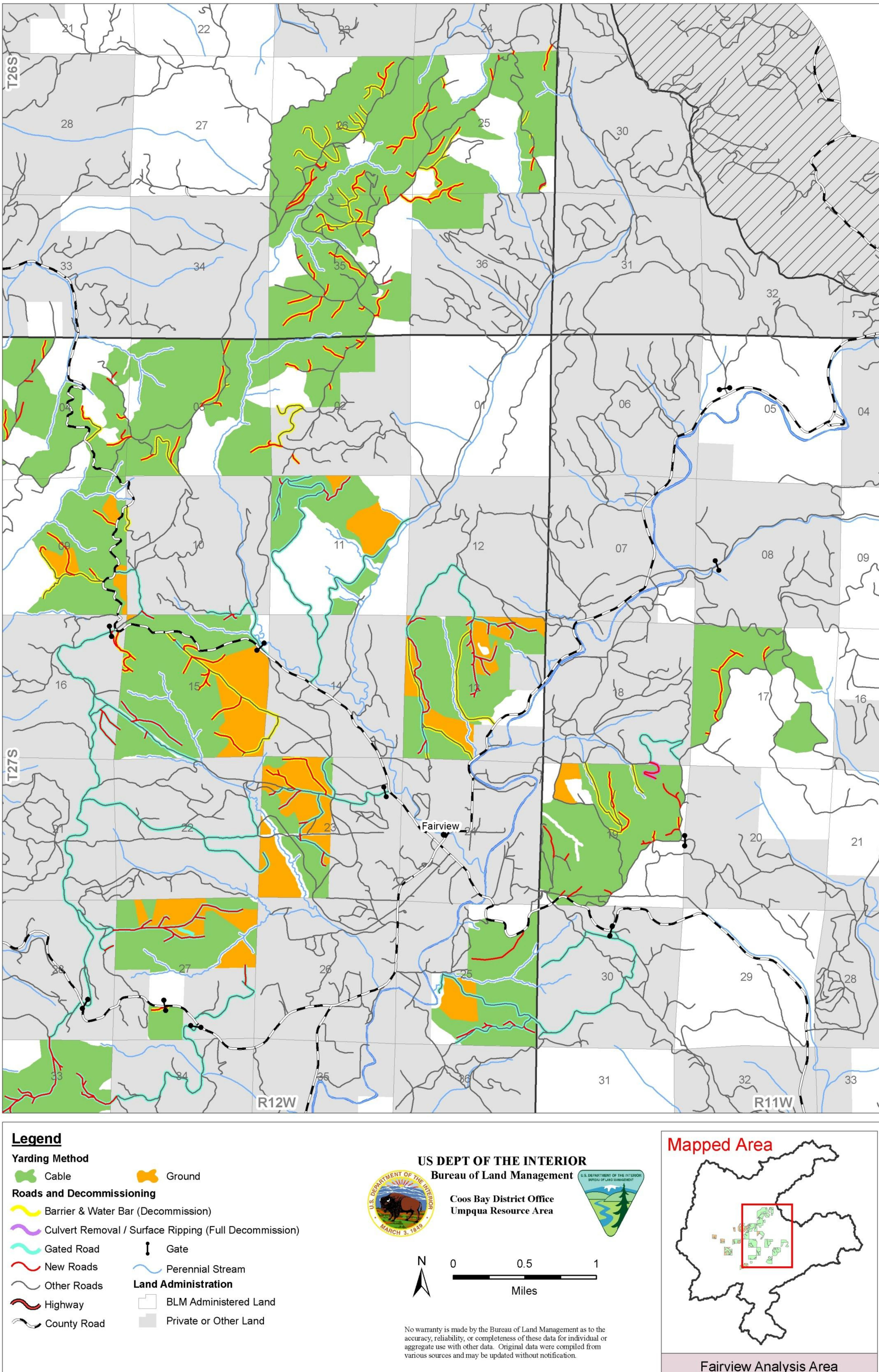
Fairview EA Map B: Hardwood stands and proposed units.



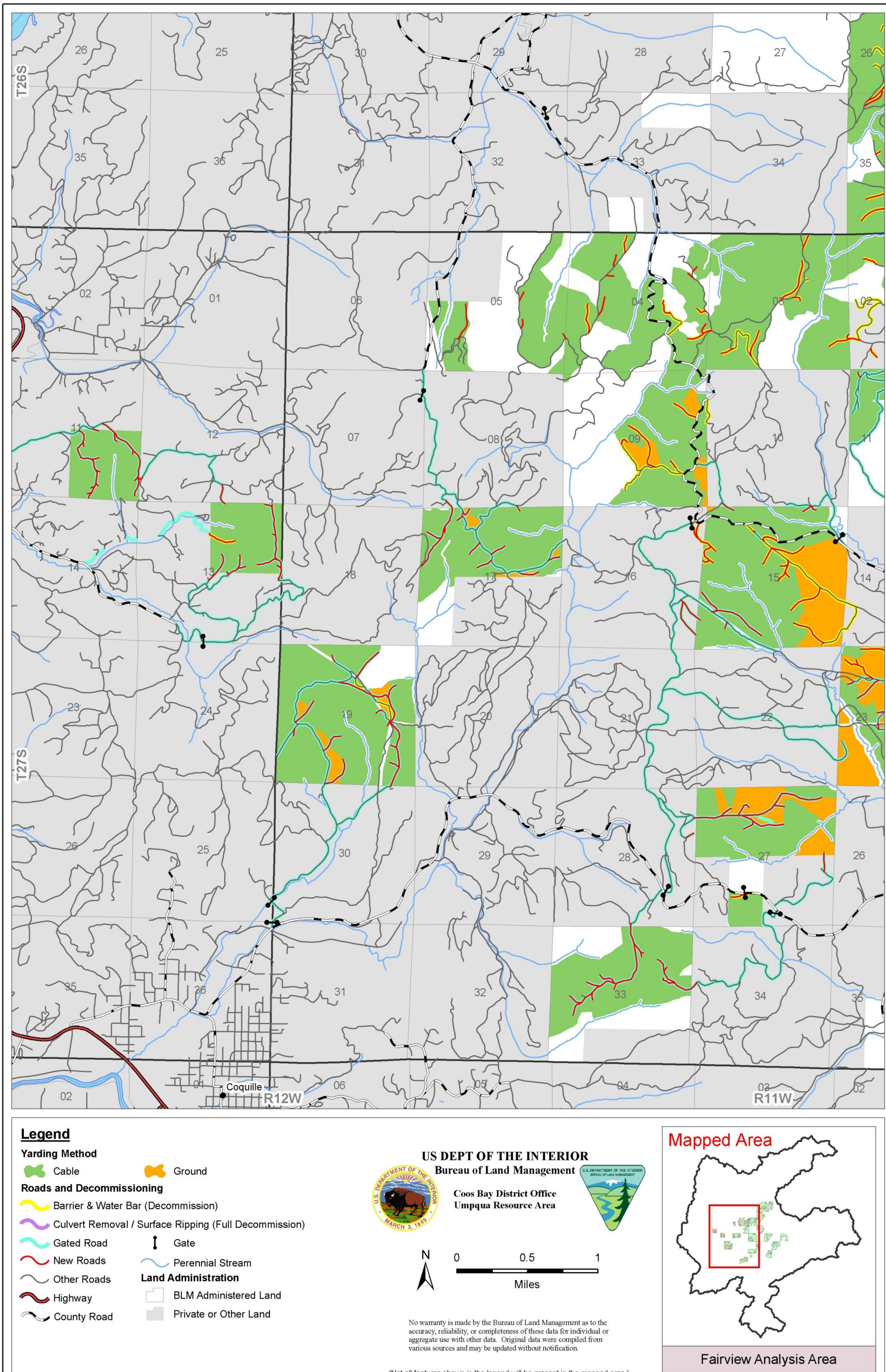
Fairview EA Map C-1 (of 2): Proposed unit locations, treatments, and road work.



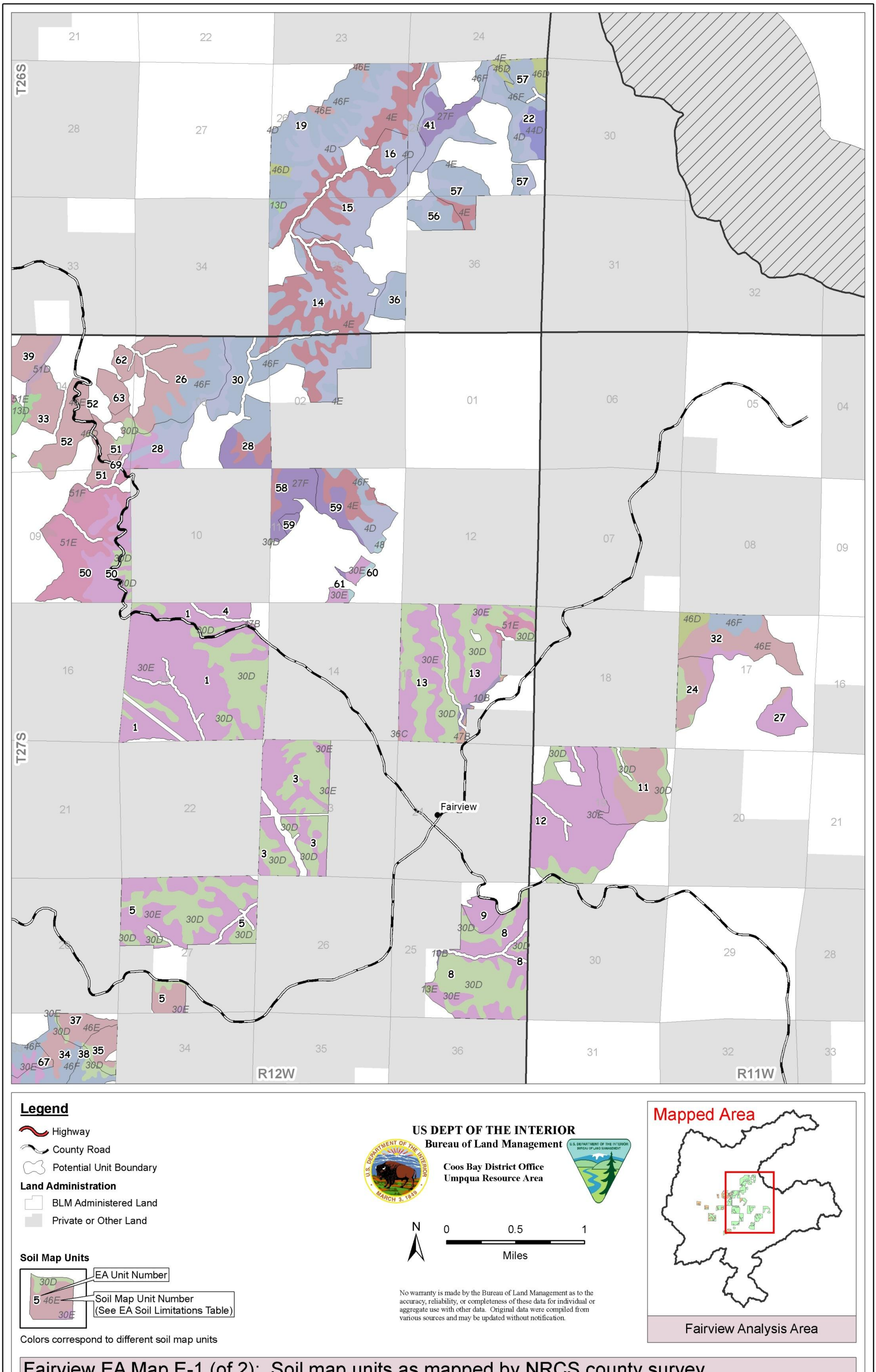
Fairview EA Map C-2 (of 2): Proposed unit locations, treatments, and road work.



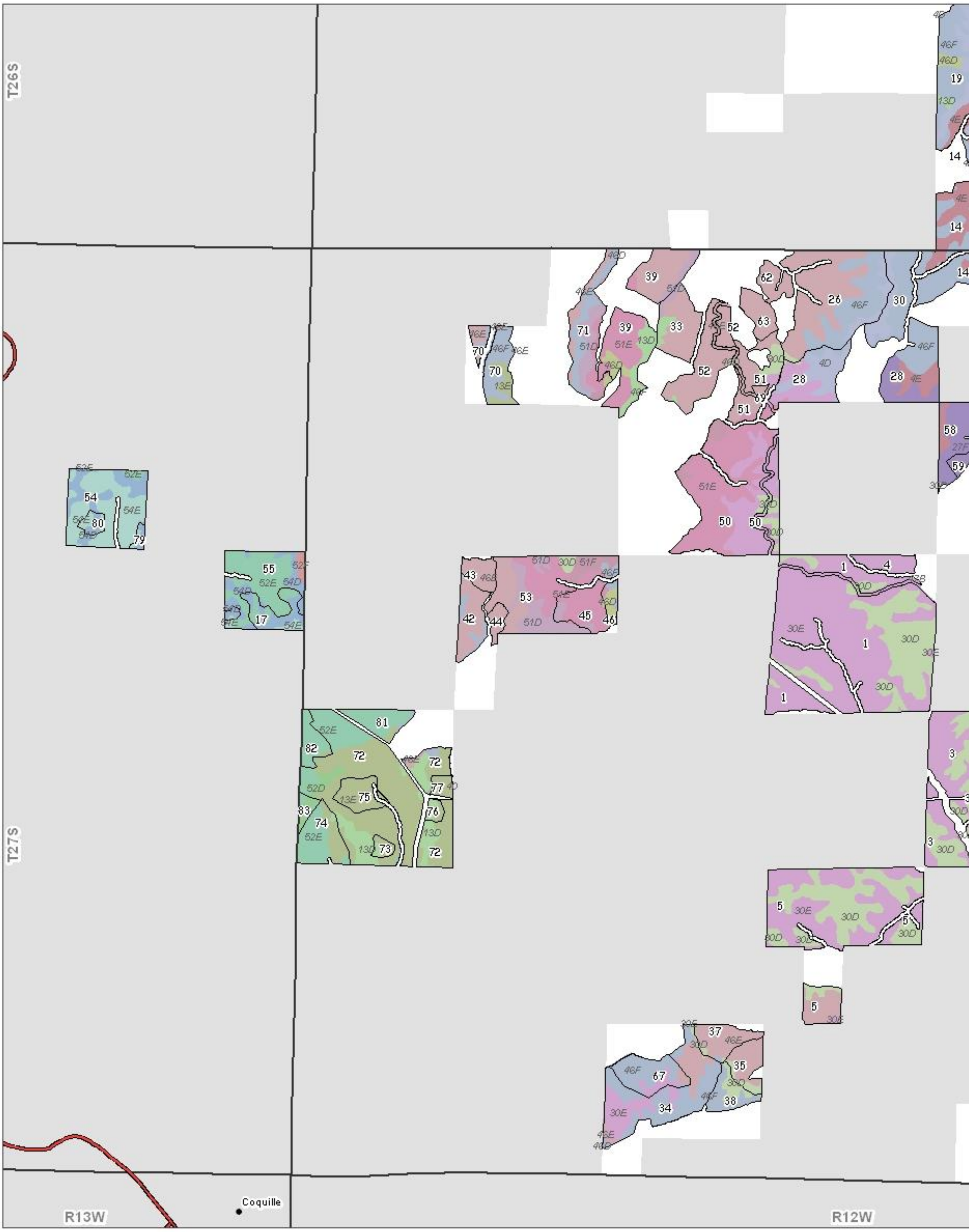
Fairview EA Map D-1 (of 2): Yarding methods and road decommissioning.



Fairview EA Map D-2 (of 2): Yarding methods and road decommissioning.



Fairview EA Map E-1 (of 2): Soil map units as mapped by NRCS county survey.



Legend

Highway
County Road
Potential Unit Boundary

Land Administration

BLM Administered Land
Private or Other Land

Soil Map Units

EA Unit Number
Soil Map Unit Number (See EA Soil Limitations Table)

Colors correspond to different soil map units

US DEPT OF THE INTERIOR
Bureau of Land Management

Coos Bay District Office
Umpqua Resource Area

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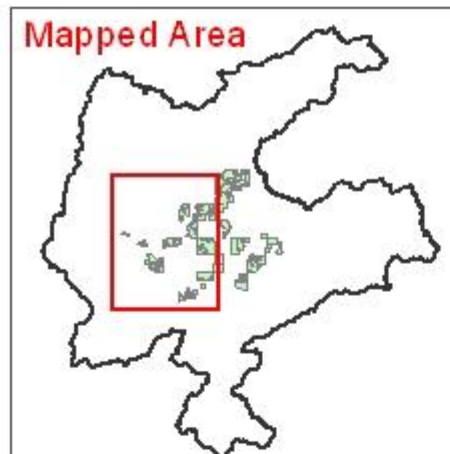
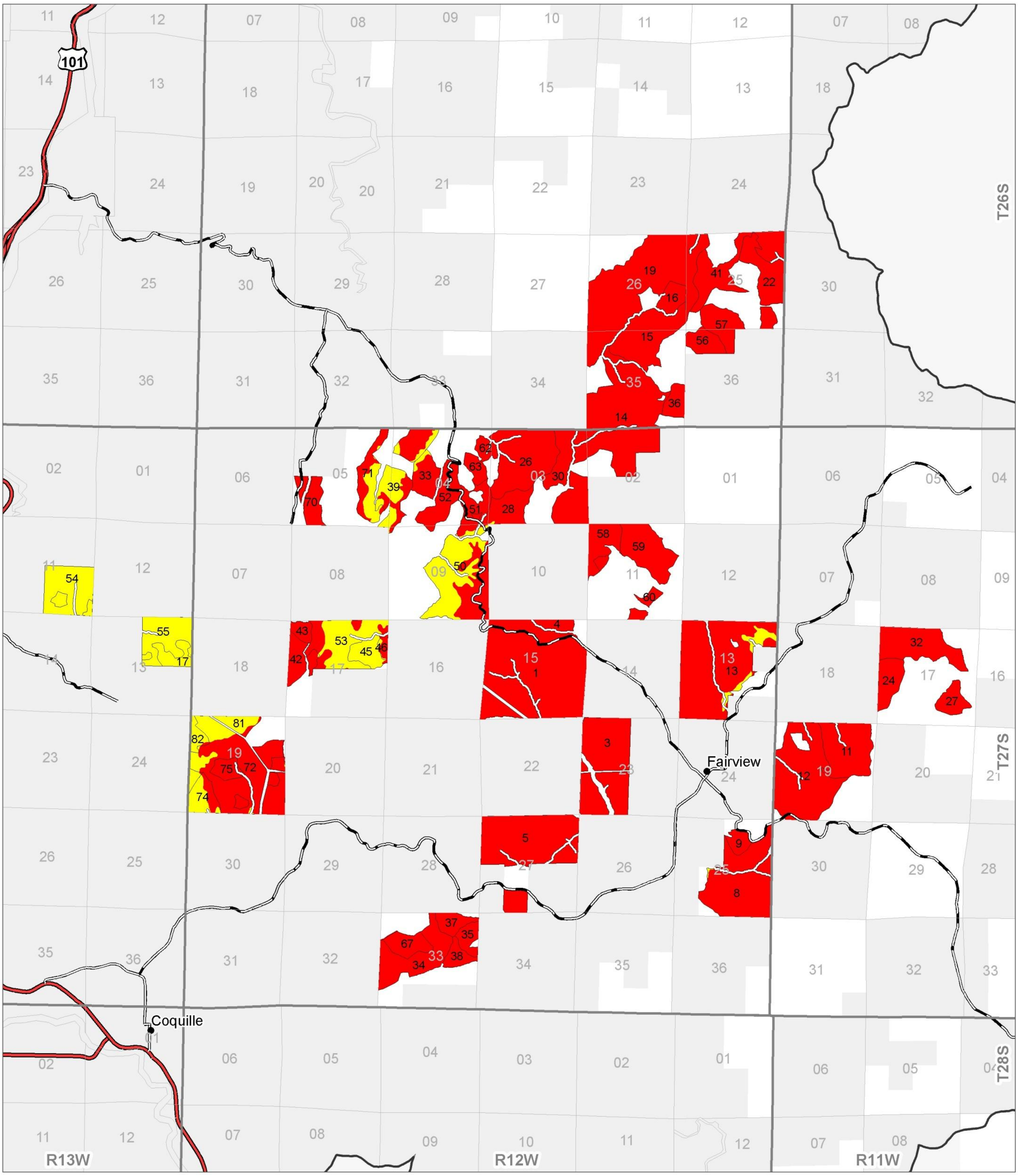


Fairview Analysis Area

Fairview EA Map E-2 (of 2): Soil map units as mapped by NRCS county survey.



Legend

- County Road
- Highway
- Analysis Area Boundary
- Proposed Unit

Soil Resistance to Compaction

- Low Resistance
- Moderate Resistance
- High Resistance
- Not Rated or Not Available

Land Administration

- Private or Other Land
- BLM Administered Land

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

Coos Bay District
Umpqua Resource Area

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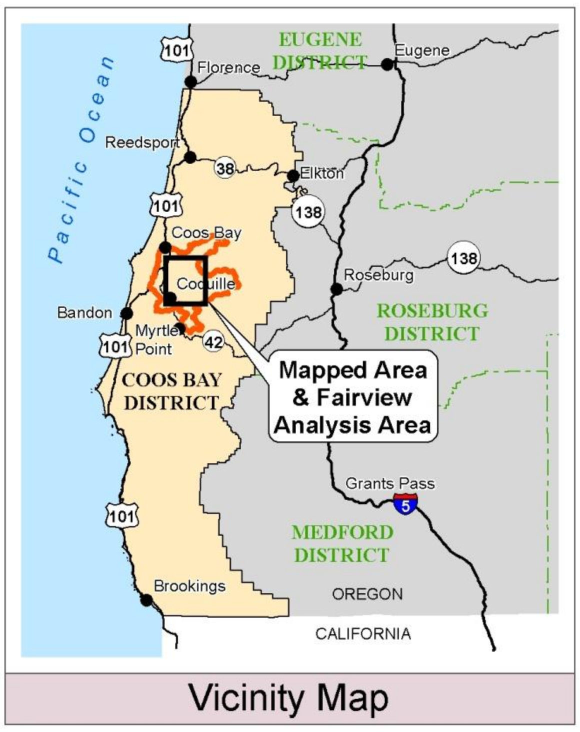
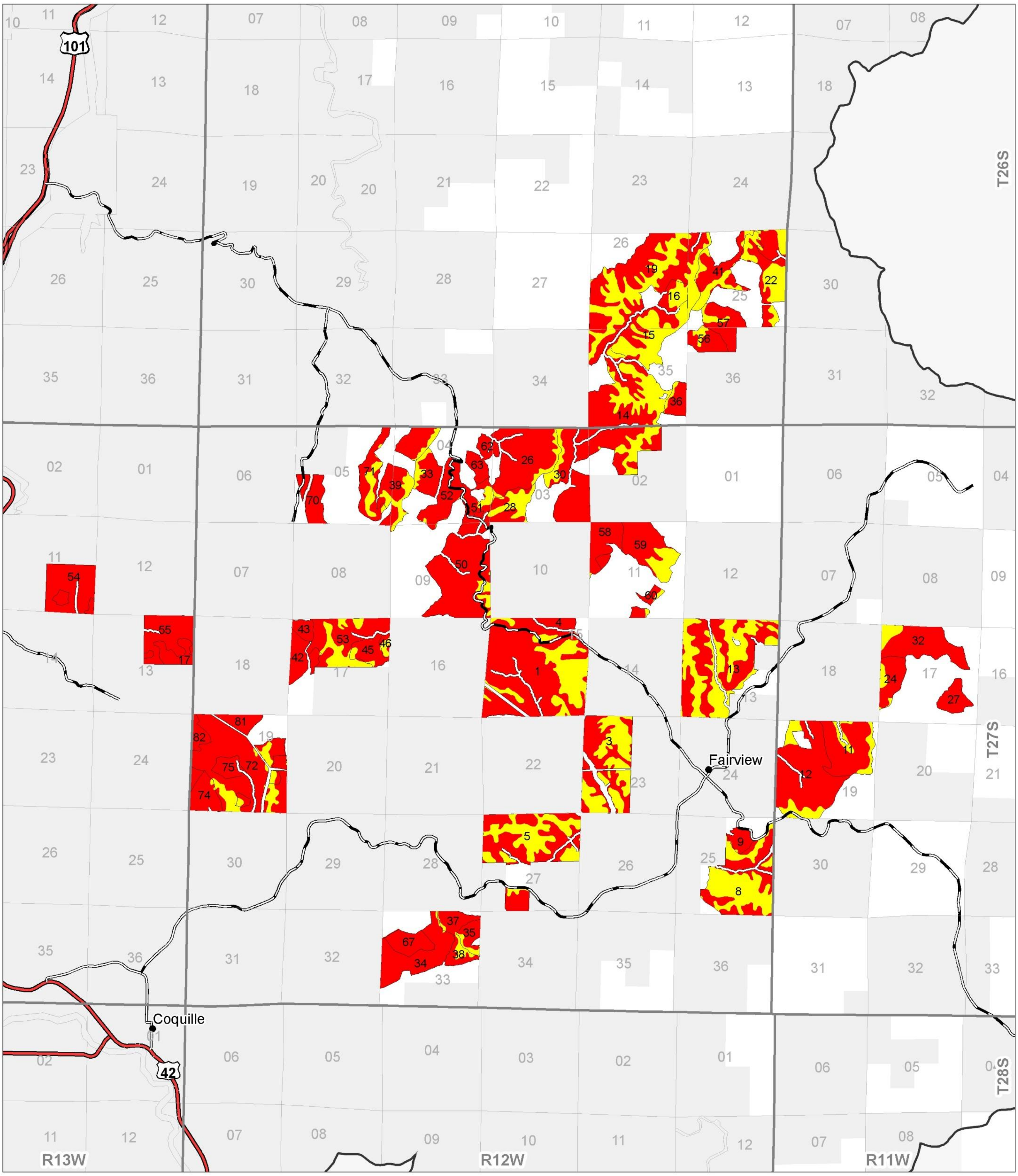


Vicinity Map

Fairview EA Map F: Soil resistance to compaction.



Legend

- County Road
- Highway
- Analysis Area Boundary
- Proposed Unit

Equipment Operability

- Poorly Suited
- Moderately Suited
- Well Suited
- Not Rated or Not Available

Land Administration

- Private or Other Land
- BLM Administered Land

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Coos Bay District
Umpqua Resource Area

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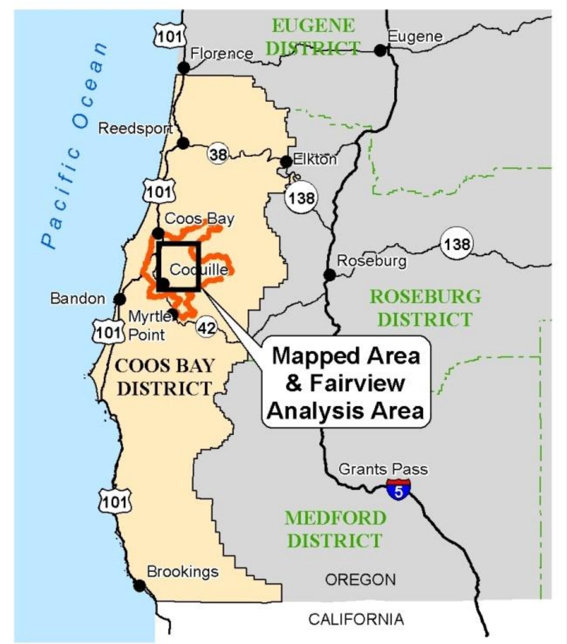
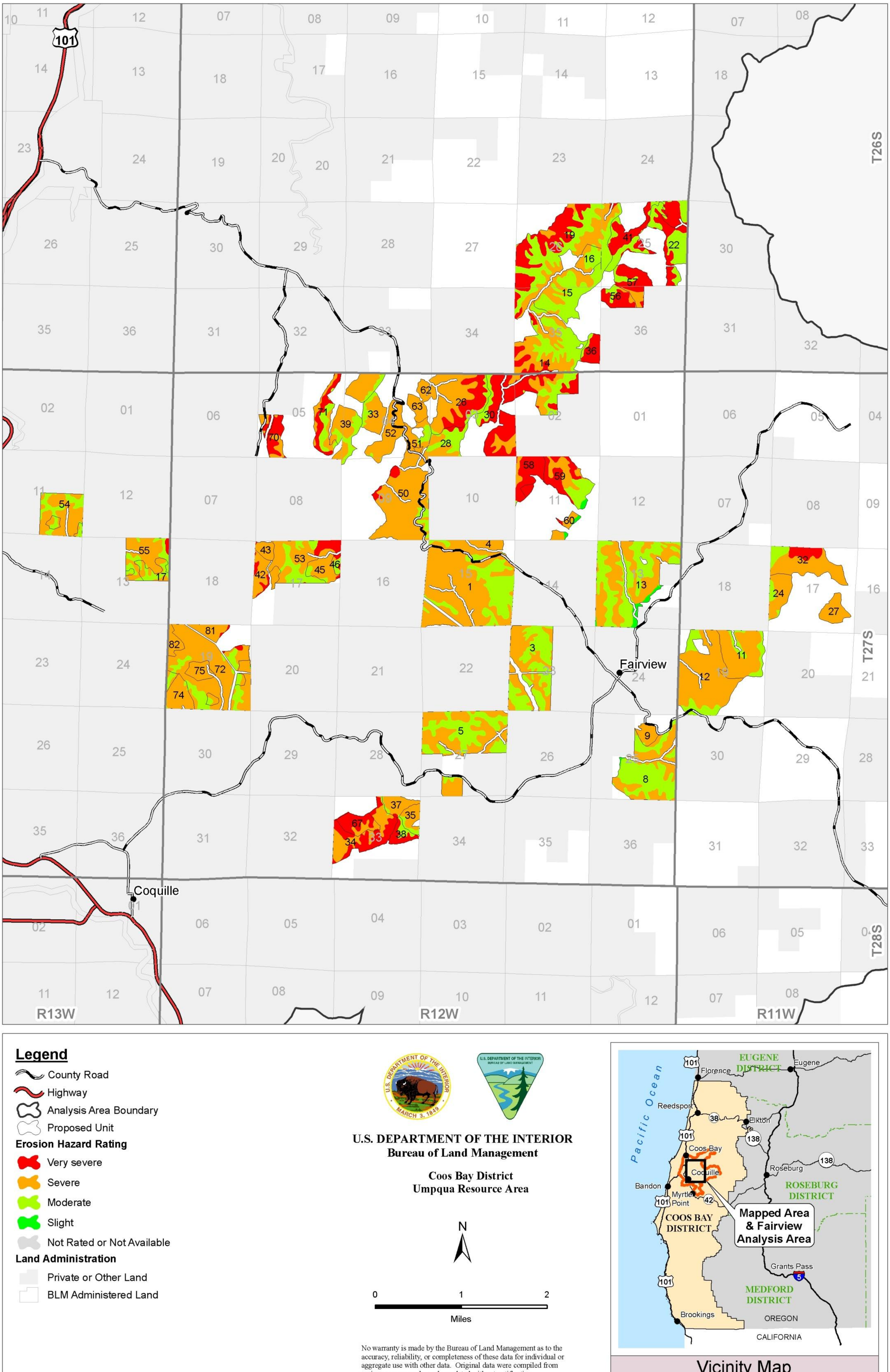
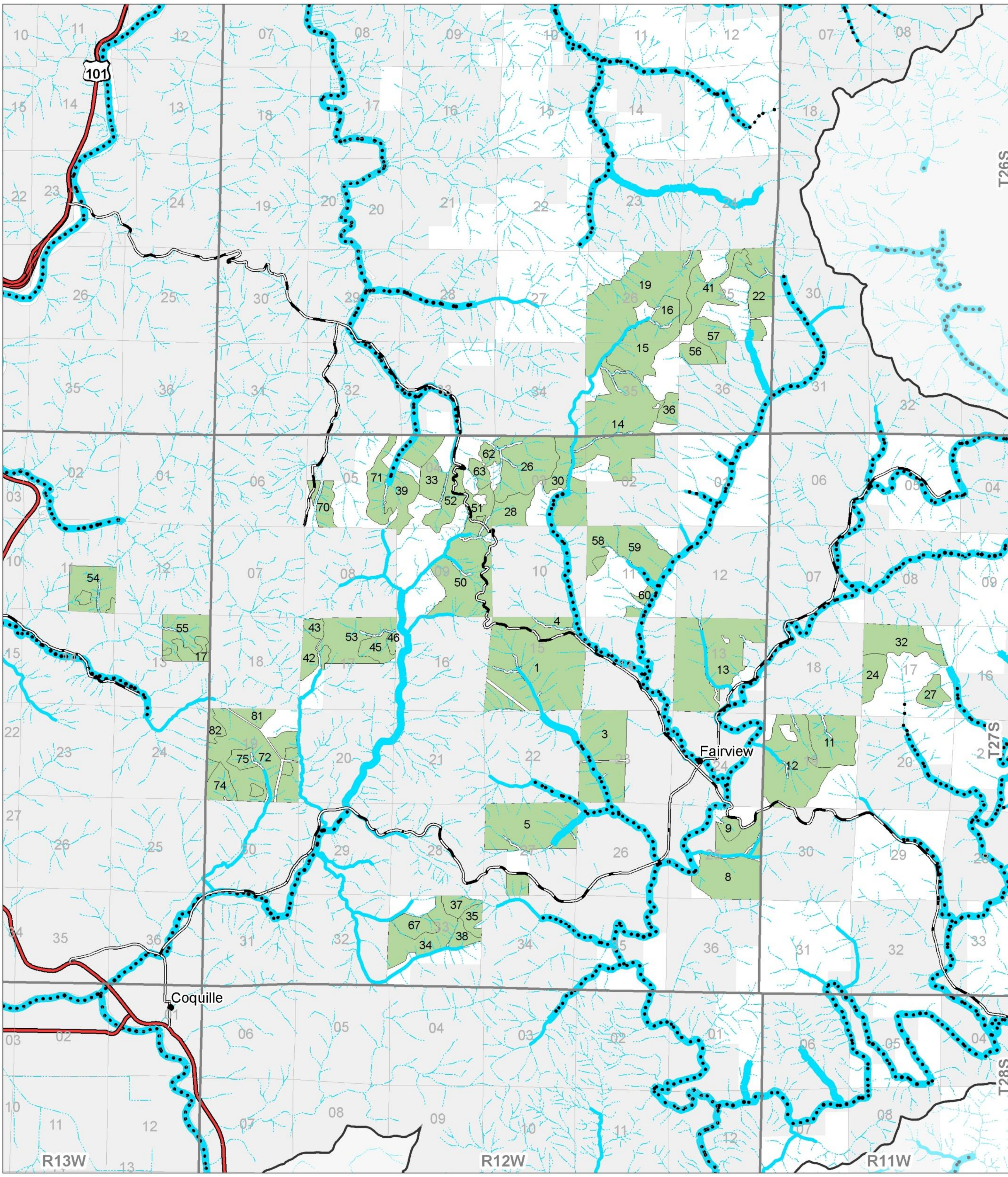


Vicinity Map

Fairview EA Map G: Soil suitability for equipment operation.



Fairview EA Map H: Soil erosion hazard.



Legend

- Coho present
- Anadromous fish present
- Other fish present
- Stream - fish absent
- County Road
- Highway
- Proposed Unit
- Analysis Area Boundary

Land Administration

- Private or Other Land
- BLM Administered Land

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Coos Bay District
Umpqua Resource Area

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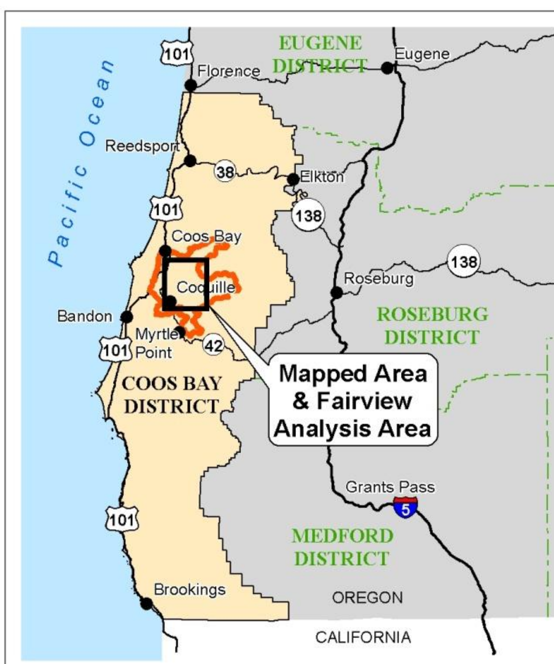

Vicinity Map

Fairview EA Map I: Fish distribution.

APPENDIX B: ROAD SUMMARY

Table B-1: Acres accessed by New Road Construction per T.R.S.

T.R.	Section	Miles	Acres
T26S-R12W	25	1.3	196
	26	1.4	163
	35	2.2	331
	36	0.4	77
T27S-R11W	07	0.1	8
	17	0.8	180
	19	1.9	288
T27S-R12W	02	0.5	111
	03	1.1	242
	04	1.2	206
	05	0.4	68
	09	0.7	99
	11	0.5	74
	13	2.4	253
	15	3.1	383
	17	1.4	211
	19	2.4	283
	23	1.2	111
	25	0.9	161
	27	2.0	337
	33	2.0	311
T27S-R13W	11	1.6	144
	13	1.7	160
Total		**31.2**	**4,397**

Table B-2: Road Work and Post-Harvest Closure by EA Unit

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
1	Natural/Unk	Rock	Spur 1	BLM	Improvement	Decom	No	0.08
1	Natural/Unk	Rock	Spur 2	Not Known	Improvement	Decom	Yes	1.03
1	Natural/Unk	Rock	Spur 2	Private	Improvement	Decom	Yes	0.22
1	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.13
1	Natural/Unk	Rock	A1	BLM	New Construction	Decom	No	0.01
1	Natural/Unk	Rock	B	BLM	New Construction	Decom	No	0.25
1	Natural/Unk	Rock	C	BLM	New Construction	Decom	No	0.13
1	Natural/Unk	Rock	D	BLM	New Construction	Decom	No	0.17
1	Natural/Unk	Rock	D1	BLM	New Construction	Decom	No	0.06

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
1	Natural/Unk	Rock	D2	BLM	New Construction	Decom	No	0.05
1	Natural/Unk	Rock	E	BLM	New Construction	Decom	No	0.28
1	Natural/Unk	Rock	F	BLM	New Construction	Decom	No	0.26
1	Natural/Unk	Rock	G	Not Known	New Construction	Decom	No	0.40
1	Natural/Unk	Rock	G1	BLM	New Construction	Decom	No	0.05
1	Natural/Unk	Rock	G2	BLM	New Construction	Decom	No	0.04
1	Natural/Unk	Rock	H	BLM	New Construction	Open	Yes	0.38
1	Natural/Unk	Rock	H1	BLM	New Construction	Open	Yes	0.21
1	Natural	Natural	J	Not Known	New Construction	Open	Yes	0.20
1	Natural	Natural	K	Not Known	New Construction	Open	Yes	0.27
1	Natural	Natural	M	Not Known	New Construction	Decom	No	0.10
1	Natural	Natural	N	BLM	New Construction	Open	Yes	0.05
1	Rock	Rock	27-12-23	Private	Renovation	Open	Yes	0.88
1	Rock	Rock	27-12-28	Private	Renovation	Open	Yes	1.08
1	Natural/Unk	Natural/Unk	27-12-9.6	Private	Renovation	Open	Yes	0.07
1	Natural/Unk	Natural/Unk	27-12-9.6	BLM	Renovation	Open	Yes	0.08
1	Natural/Unk	Natural/Unk	Private	Private	Renovation	Open	Yes	0.49
3	Natural/Unk	Rock	27-12-23	Private	Improvement	Open	Yes	0.37
3	Natural/Unk	Rock	D	Not Known	Improvement	Open	Yes	0.38
3	Natural/Unk	Rock	E	BLM	Improvement	Open	Yes	0.29
3	Natural/Unk	Rock	F	Not Known	Improvement	Open	Yes	0.07
3	Natural	Natural	A	BLM	New Construction	Decom	Yes	0.46
3	Natural	Natural	B	BLM	New Construction	Decom	Yes	0.25
3	Natural	Natural	B1	BLM	New Construction	Decom	Yes	0.04
3	Natural/Unk	Rock	C	BLM	New Construction	Open	Yes	0.20
3	Natural/Unk	Rock	D1	BLM	New Construction	Open	Yes	0.06
3	Natural/Unk	Rock	D2	BLM	New Construction	Open	Yes	0.04
3	Natural/Unk	Rock	E1	BLM	New Construction	Open	Yes	0.11
3	Natural/Unk	Rock	F	BLM	New Construction	Open	Yes	0.05
3	Natural/Unk	Natural/Unk	27-12-14.1	Other	Renovation	Open	Yes	0.33
3	Rock	Rock	27-12-23	Private	Renovation	Open	Yes	0.48
3	Rock	Rock	27-12-28	Private	Renovation	Open	Yes	1.70
3	Natural/Unk	Natural/Unk	Private	Private	Renovation	Open	Yes	0.18
3	Rock	Rock	Private	Private	Renovation	Open	Yes	1.93
4	Natural	Natural	L1	BLM	New Construction	Decom	Yes	0.04
4	Natural	Natural	L2	BLM	New Construction	Decom	Yes	0.07
4	Rock	Rock	27-12-15	BLM	Renovation	Open	Yes	0.46
4	Natural/Unk	Natural	L	Not Known	Swing Road	Decom	Yes	0.36
5	Natural/Unk	Rock	Private	Private	Improvement	Open	Yes	0.33
5	Natural/Unk	Rock	A	BLM	New Construction	Open	Yes	0.98
5	Natural	Natural	A1	BLM	New Construction	Open	Yes	0.09
5	Natural	Natural	A2	BLM	New Construction	Open	Yes	0.12
5	Natural/Unk	Rock	A3	BLM	New Construction	Open	Yes	0.18
5	Natural/Unk	Rock	A4	BLM	New Construction	Open	Yes	0.23
5	Natural/Unk	Rock	A5	BLM	New Construction	Open	Yes	0.07
5	Natural	Natural	B	Not Known	New Construction	Open	Yes	0.07
5	Natural	Natural	C	Not Known	New Construction	Open	Yes	0.14
5	Natural/Unk	Rock	D	BLM	New Construction	Decom	No	0.13
5	Rock	Rock	27-12-28	Private	Renovation	Open	Yes	0.79
5	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	Yes	0.21
5	Natural/Unk	Natural/Unk	Private	Private	Renovation	Open	Yes	0.62
8	Natural/Unk	Rock	A	BLM	New Construction	Open	No	0.46
8	Natural/Unk	Rock	C	BLM	New Construction	Open	Yes	0.09
8	Natural/Unk	Rock	D	BLM	New Construction	Open	Yes	0.09

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
8	Natural/Unk	Rock	E	BLM	New Construction	Open	Yes	0.07
8	Natural/Unk	Rock	E2	BLM	New Construction	Open	Yes	0.02
8	Natural/Unk	Rock	F	BLM	New Construction	Open	Yes	0.13
8	Rock	Rock	27-11-30.1	Private	Renovation	Open	Yes	0.74
8	Rock	Rock	27-11-30.12	Private	Renovation	Open	Yes	0.60
8	Rock	Rock	27-11-30.2	Private	Renovation	Open	Yes	0.55
8	Natural/Unk	Natural/Unk	B	Not Known	Renovation	Open	Yes	0.78
8	Natural/Unk	Natural/Unk	B	Not Known	Renovation	Open	Yes	0.05
8	Natural/Unk	Natural/Unk	E	Private	Renovation	Open	Yes	0.44
8	Natural/Unk	Natural/Unk	Private	Private	Renovation	Open	Yes	0.24
8	Natural/Unk	Natural/Unk	Spur 3	BLM	Renovation	Open	Yes	0.15
11	Natural/Unk	Natural/Unk	27-11-18.1	BLM	Decommission	Full Decom	No	0.22
11	Natural/Unk	Natural/Unk	27-11-18.3	BLM	Decommission	Full Decom	No	0.54
11	Natural/Unk	Natural/Unk	27-11-19	BLM	Decommission	Full Decom	No	0.14
11	Natural/Unk	Rock	27-11-19	BLM	Improvement	Decom	No	0.28
11	Natural/Unk	Rock	A	BLM	New Construction	Open	No	0.22
11	Natural/Unk	Rock	A1	BLM	New Construction	Open	No	0.05
11	Natural/Unk	Rock	B	BLM	New Construction	Open	No	0.07
11	Natural/Unk	Rock	B1	BLM	New Construction	Open	No	0.02
11	Natural/Unk	Rock	D	BLM	New Construction	Decom	No	0.18
11	Natural/Unk	Rock	I	BLM	New Construction	Open	No	0.11
11	Natural	Natural	J	BLM	New Construction	Full Decom	Yes	0.30
11	Natural/Unk	Rock	K	BLM	New Construction	Decom	No	0.26
11	Natural	Natural	L	BLM	New Construction	Decom	No	0.07
11	Natural	Natural	L1	BLM	New Construction	Decom	No	0.01
11	Natural/Unk	Rock	M	BLM	New Construction	Decom	No	0.07
11	Rock	Rock	27-11-17.1	BLM	Renovation	Open	No	0.79
11	Natural/Unk	Natural/Unk	Private	Private	Renovation	Open	Yes	0.24
11	Natural/Unk	Rock	Private	Private	Renovation	Open	Yes	0.30
11	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	Yes	0.21
12	Natural/Unk	Rock	Spur 4	Not Known	Improvement	Open	No	0.10
12	Natural/Unk	Rock	Spur 5	BLM	Improvement	Open	No	0.39
12	Natural/Unk	Rock	Spur 5	Not Known	Improvement	Open	No	0.09
12	Natural/Unk	Rock	C	BLM	New Construction	Open	No	0.05
12	Natural/Unk	Rock	E	BLM	New Construction	Open	No	0.24
12	Natural/Unk	Rock	F	BLM	New Construction	Open	No	0.06
12	Natural/Unk	Rock	G	BLM	New Construction	Open	No	0.06
12	Natural/Unk	Rock	H	BLM	New Construction	Open	No	0.13
12	Rock	Rock	27-11-17.1	BLM	Renovation	Open	No	0.77
12	Rock	Rock	27-11-18.2	BLM	Renovation	Open	No	1.20
13	Natural/Unk	Natural	27-12-12	BLM	Decommission	Full Decom	No	0.46
13	Natural/Unk	Unknown	27-12-12.1	BLM	Decommission	Full Decom	No	0.89
13	Natural/Unk	Rock	27-12-12	BLM	Improvement	Open	Yes	0.47
13	Natural/Unk	Rock	27-12-12	Private	Improvement	Open	Yes	0.04
13	Natural/Unk	Rock	27-12-12.1	BLM	Improvement	Open	Yes	0.10
13	Natural/Unk	Rock	27-12-12.1	Private	Improvement	Open	Yes	0.36
13	Natural/Unk	Rock	Spur 7	BLM	Improvement	Decom	No	0.48
13	Natural/Unk	Rock	A	BLM	New Construction	Open	Yes	0.64
13	Natural/Unk	Rock	B	BLM	New Construction	Open	Yes	0.13
13	Natural/Unk	Rock	C	BLM	New Construction	Open	Yes	0.11
13	Natural/Unk	Rock	D	BLM	New Construction	Open	Yes	0.48
13	Natural/Unk	Rock	D1	BLM	New Construction	Open	Yes	0.05
13	Natural/Unk	Rock	D2	BLM	New Construction	Open	Yes	0.24
13	Natural/Unk	Rock	D3	BLM	New Construction	Open	Yes	0.14

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
13	Natural/Unk	Rock	D4	BLM	New Construction	Open	Yes	0.03
13	Natural/Unk	Rock	D5	BLM	New Construction	Open	Yes	0.03
13	Natural/Unk	Rock	D7	BLM	New Construction	Open	Yes	0.01
13	Natural/Unk	Rock	E	BLM	New Construction	Open	Yes	0.06
13	Natural	Natural	F	BLM	New Construction	Open	Yes	0.28
13	Natural	Natural	F1	BLM	New Construction	Open	Yes	0.12
13	Natural	Natural	G	BLM	New Construction	Open	Yes	0.07
13	Natural/Unk	Natural/Unk	27-12-12	BLM	Renovation	Open	Yes	0.11
13	Rock	Rock	27-12-12	Private	Renovation	Open	Yes	0.47
13	Rock	Rock	Private	Private	Renovation	Open	Yes	0.09
13	Natural/Unk	Natural/Unk	Spur 6	Not Known	Renovation	Open	Yes	0.18
14	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.17
14	Natural/Unk	Rock	B	BLM	New Construction	Decom	No	0.36
14	Natural/Unk	Rock	B1	BLM	New Construction	Decom	No	0.08
14	Natural/Unk	Rock	C	BLM	New Construction	Decom	No	0.14
14	Natural/Unk	Rock	D	BLM	New Construction	Decom	No	0.04
14	Natural	Natural	E	BLM	New Construction	Decom	No	0.33
14	Natural	Natural	F	BLM	New Construction	Decom	No	0.10
14	Natural/Unk	Rock	G	BLM	New Construction	Decom	No	0.09
14	Natural/Unk	Rock	H	BLM	New Construction	Decom	No	0.01
14	Natural/Unk	Rock	I	BLM	New Construction	Decom	No	0.03
14	Natural/Unk	Rock	J	BLM	New Construction	Decom	No	0.17
14	Natural/Unk	Rock	L	BLM	New Construction	Decom	No	0.04
14	Natural	Natural	U	BLM	New Construction	Decom	No	0.08
14	Natural	Natural	V	BLM	New Construction	Decom	No	0.13
14	Natural	Natural	W	BLM	New Construction	Decom	No	0.03
14	Natural	Natural	X	BLM	New Construction	Decom	No	0.06
14	Rock	Rock	26-12-35.1	BLM	Renovation	Open	No	1.66
14	Rock	Rock	26-12-35.2	BLM	Renovation	Open	No	0.62
14	Rock	Rock	26-12-35.3	BLM	Renovation	Open	No	0.45
14	Rock	Rock	26-12-35.5	BLM	Renovation	Open	No	0.07
14	Rock	Rock	27-12-2	BLM	Renovation	Open	No	0.26
14	Natural/Unk	Natural/Unk	Spur 8	BLM	Renovation	Open	No	0.11
15	Natural/Unk	Rock	Spur 10	BLM	Improvement	Decom	No	0.06
15	Natural/Unk	Rock	Spur 11	BLM	Improvement	Decom	No	0.13
15	Natural/Unk	Rock	Spur 12	BLM	Improvement	Decom	No	0.06
15	Natural/Unk	Rock	Spur 8	BLM	Improvement	Decom	No	0.44
15	Natural/Unk	Rock	Spur 9	BLM	Improvement	Decom	No	0.30
15	Natural/Unk	Rock	N	BLM	New Construction	Decom	No	0.06
15	Natural/Unk	Rock	O	BLM	New Construction	Decom	No	0.13
15	Natural/Unk	Rock	P	BLM	New Construction	Decom	No	0.12
15	Natural/Unk	Rock	Q	BLM	New Construction	Decom	No	0.16
15	Natural/Unk	Rock	R	BLM	New Construction	Decom	No	0.09
15	Natural/Unk	Rock	S	BLM	New Construction	Decom	No	0.06
15	Natural/Unk	Rock	T	BLM	New Construction	Decom	No	0.06
15	Natural/Unk	Rock	Y	BLM	New Construction	Decom	No	0.09
15	Rock	Rock	26-12-35.1	BLM	Renovation	Open	No	0.48
15	Rock	Rock	26-12-35.4	BLM	Renovation	Open	No	0.41
16	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.52
16	Natural/Unk	Rock	A1	BLM	New Construction	Decom	No	0.05
17	Natural/Unk	Rock	A1	BLM	New Construction	Open	Yes	0.15
17	Natural	Natural	A4	BLM	New Construction	Open	Yes	0.03
17	Natural	Natural	B	BLM	New Construction	Open	Yes	0.17
17	Natural	Natural	B2	BLM	New Construction	Open	Yes	0.05

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
17	Natural/Unk	Natural/Unk	Private	Private	Renovation	Open	Yes	0.99
19	Natural/Unk	Rock	Spur 14	BLM	Improvement	Decom	No	0.06
19	Natural/Unk	Rock	Spur 15	BLM	Improvement	Decom	No	0.21
19	Natural/Unk	Rock	Spur 16	BLM	Improvement	Decom	No	0.27
19	Natural/Unk	Rock	Spur 17	BLM	Improvement	Decom	No	0.17
19	Natural/Unk	Rock	Spur 18	BLM	Improvement	Decom	No	0.25
19	Natural/Unk	Rock	Spur 19	BLM	Improvement	Decom	No	0.22
19	Natural/Unk	Rock	Spur 19a	BLM	Improvement	Decom	No	0.14
19	Natural/Unk	Rock	Spur 19b	BLM	Improvement	Decom	No	0.11
19	Natural/Unk	Rock	Spur 20	BLM	Improvement	Decom	No	0.09
19	Natural/Unk	Rock	Spur 21	BLM	Improvement	Decom	No	0.24
19	Natural/Unk	Rock	Spur 21a	BLM	Improvement	Decom	No	0.04
19	Natural/Unk	Rock	B	BLM	New Construction	Decom	No	0.17
19	Natural	Natural	B1	BLM	New Construction	Decom	No	0.09
19	Natural/Unk	Rock	D	BLM	New Construction	Decom	No	0.23
19	Natural/Unk	Rock	D1	BLM	New Construction	Decom	No	0.07
19	Rock	Rock	26-12-25.1	BLM	Renovation	Open	No	0.38
19	Rock	Rock	26-12-35.0	BLM	Renovation	Open	No	1.70
19	Rock	Rock	26-12-35.4	BLM	Renovation	Open	No	0.38
19	Natural/Unk	Natural/Unk	Spur 13	BLM	Renovation	Decom	No	0.14
19	Natural/Unk	Natural/Unk	Spur 22	BLM	Renovation	Decom	No	0.05
22	Natural/Unk	Rock	Spur 25	BLM	Improvement	Decom	No	0.03
22	Natural/Unk	Rock	H	BLM	New Construction	Decom	No	0.05
22	Rock	Rock	26-12-25.2	BLM	Renovation	Open	No	1.11
22	Natural/Unk	Natural/Unk	Spur 23	BLM	Renovation	Open	No	0.02
22	Rock	Rock	Spur 24	BLM	Renovation	Decom	No	0.10
24	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.60
24	Natural/Unk	Rock	A1	BLM	New Construction	Decom	No	0.06
24	Natural/Unk	Rock	A3	BLM	New Construction	Decom	No	0.02
24	Natural/Unk	Rock	C	BLM	New Construction	Decom	No	0.02
24	Rock	Rock	27-11-17.1	BLM	Renovation	Open	No	1.10
26	Natural/Unk	Rock	B	BLM	New Construction	Decom	No	0.35
26	Rock	Rock	26-12-35.1	BLM	Renovation	Open	No	0.13
26	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	No	1.35
27	Rock	Rock	27-11-17.2	BLM	Renovation	Open	No	0.61
27	Rock	Rock	27-11-7	Private	Renovation	Open	No	0.53
28	Natural/Unk	Rock	Spur 26	Not Known	Improvement	Decom	No	0.09
28	Natural/Unk	Rock	C	BLM	New Construction	Decom	No	0.19
28	Natural	Natural	E	BLM	New Construction	Decom	No	0.09
28	Natural	Natural	F	Not Known	New Construction	Decom	No	0.23
28	Natural	Natural	F1	BLM	New Construction	Decom	No	0.05
28	Natural/Unk	Natural/Unk	26-12-35.1	BLM	Renovation	Decom	No	0.26
28	Rock	Rock	27-12-3.1	Other	Renovation	Open	No	0.42
28	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Decom	No	0.38
28	Natural/Unk	Natural/Unk	Spur 26	Not Known	Renovation	Decom	No	0.40
30	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.06
30	Natural/Unk	Rock	D	BLM	New Construction	Decom	No	0.10
30	Natural/Unk	Natural/Unk	Spur 27	BLM	Renovation	Decom	N	0.03
31	Rock	Rock	27-11-7.0	Private	Renovation	Open	No	0.67
31	Rock	Rock	27-11-7.0	Private	Renovation	Decom	No	0.14
31	Rock	Rock	C	BLM	Renovation	Decom	No	0.07
31	Rock	Rock	private	BLM	Renovation	Open	No	0.10
32	Natural/Unk	Rock	A2	BLM	New Construction	Decom	No	0.04
32	Natural	Natural	B	BLM	New Construction	Decom	No	0.10

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
32	Rock	Rock	27-11-17.1	BLM	Renovation	Open	No	0.37
32	Rock	Rock	27-11-7	Private	Renovation	Open	No	0.70
33	Natural/Unk	Rock	D	BLM	New Construction	Open	No	0.14
33	Natural/Unk	Rock	E	BLM	New Construction	Open	No	0.06
34	Natural/Unk	Rock	A	Private	New Construction	Open	Yes	0.95
34	Natural/Unk	Rock	A1	BLM	New Construction	Open	Yes	0.04
34	Natural/Unk	Rock	A4	BLM	New Construction	Open	Yes	0.05
34	Natural/Unk	Rock	A5	BLM	New Construction	Open	Yes	0.10
34	Rock	Rock	Private	Not Known	Renovation	Open	Yes	0.35
35	Natural/Unk	Rock	C	BLM	New Construction	Open	Yes	0.36
35	Natural/Unk	Rock	C2	BLM	New Construction	Open	Yes	0.03
35	Natural/Unk	Rock	Private	Private	New Construction	Open	Yes	0.06
35	Rock	Rock	Private	Private	Renovation	Open	Yes	1.51
36	Natural/Unk	Rock	K	BLM	New Construction	Decom	No	0.24
36	Natural/Unk	Rock	K1	BLM	New Construction	Decom	No	0.01
36	Natural/Unk	Rock	M	BLM	New Construction	Decom	No	0.10
36	Rock	Rock	26-12-35.6	BLM	Renovation	Open	No	0.08
37	Natural/Unk	Rock	B	BLM	New Construction	Open	Yes	0.11
37	Natural/Unk	Rock	B1	BLM	New Construction	Open	Yes	0.02
38	Natural/Unk	Rock	C1	BLM	New Construction	Open	Yes	0.10
39	Natural/Unk	Rock	C	BLM	New Construction	Decom	No	0.21
39	Natural/Unk	Rock	F	BLM	New Construction	Open	No	0.09
39	Natural/Unk	Rock	G	BLM	New Construction	Decom	No	0.12
39	Natural/Unk	Rock	H	BLM	New Construction	Open	No	0.04
39	Rock	Rock	27-12-4	BLM	Renovation	Open	No	1.85
39	Rock	Rock	27-12-4.1	BLM	Renovation	Open	No	0.35
41	Natural/Unk	Rock	D	BLM	Improvement	Decom	No	0.14
41	Natural/Unk	Rock	C	BLM	New Construction	Decom	No	0.17
41	Natural/Unk	Rock	D1	BLM	New Construction	Decom	No	0.05
41	Natural/Unk	Rock	E	BLM	New Construction	Open	No	0.02
41	Natural/Unk	Rock	F	BLM	New Construction	Decom	No	0.08
41	Natural/Unk	Rock	G	BLM	New Construction	Open	No	0.03
41	Natural/Unk	Rock	L	BLM	New Construction	Decom	No	0.06
41	Natural	Natural	Z	BLM	New Construction	Decom	No	0.02
41	Rock	Rock	26-12-25.0	BLM	Renovation	Open	No	0.81
41	Rock	Rock	26-12-25.3	BLM	Renovation	Decom	No	0.25
41	Rock	Rock	26-12-35.4	BLM	Renovation	Open	No	0.50
41	Natural/Unk	Natural/Unk	Spur 29	Not Known	Renovation	Decom	No	0.06
42	Natural/Unk	Rock	A	BLM	New Construction	Open	Yes	0.55
42	Natural/Unk	Rock	A2	BLM	New Construction	Open	Yes	0.11
43	Natural	Natural	A1	BLM	New Construction	Open	Yes	0.05
45	Natural/Unk	Rock	27-12-17.2	BLM	Improvement	Open	Yes	0.49
46	Natural	Natural	I	BLM	New Construction	Open	Yes	0.08
50	Natural/Unk	Rock	Spur 30	BLM	Improvement	Decom	No	0.43
50	Natural/Unk	Rock	Spur 30	Not Known	Improvement	Decom	No	0.11
50	Natural/Unk	Rock	Spur 30a	BLM	Improvement	Decom	No	0.06
50	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.05
50	Natural/Unk	Rock	B	BLM	New Construction	Decom	No	0.40
50	Natural	Natural	C	BLM	New Construction	Decom	No	0.07
50	Natural/Unk	Rock	D	BLM	New Construction	Decom	No	0.19
50	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	No	0.17
50	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Decom	No	0.19
50	Natural/Unk	Natural/Unk	Spur 30c	BLM	Renovation	Decom	No	0.26
51	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.18

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
51	Natural/Unk	Rock	A1	BLM	New Construction	Open	No	0.09
52	Natural/Unk	Rock	I	BLM	New Construction	Decom	No	0.13
52	Rock	Rock	27-12-4.3	BLM	Renovation	Decom	No	0.26
53	Natural/Unk	Rock	27-12-17	BLM	Improvement	Open	Yes	0.74
53	Natural/Unk	Rock	Private	Not Known	Improvement	Open	Yes	1.16
53	Natural/Unk	Rock	Spur 31	Not Known	Improvement	Open	Yes	0.09
53	Natural/Unk	Rock	Spur 32	Not Known	Improvement	Open	Yes	0.28
53	Natural	Natural	B	BLM	New Construction	Open	Yes	0.08
53	Natural	Natural	C	BLM	New Construction	Open	Yes	0.05
53	Natural	Natural	D	BLM	New Construction	Open	Yes	0.04
53	Natural/Unk	Rock	E	BLM	New Construction	Open	Yes	0.11
53	Natural/Unk	Rock	F	BLM	New Construction	Open	Yes	0.11
53	Natural	Natural	G	BLM	New Construction	Open	Yes	0.11
53	Natural	Natural	H	BLM	New Construction	Open	Yes	0.12
53	Natural/Unk	Natural/Unk	Spur 32	Not Known	Renovation	Open	Yes	0.16
53	Natural/Unk	Natural/Unk	Spur 33	BLM	Renovation	Open	Yes	0.04
54	Natural/Unk	Rock	A	BLM	New Construction	Open	Yes	0.62
54	Natural/Unk	Rock	A1	BLM	New Construction	Open	Yes	0.04
54	Natural/Unk	Rock	A2	BLM	New Construction	Open	Yes	0.05
54	Natural/Unk	Rock	A3	BLM	New Construction	Open	Yes	0.03
54	Natural/Unk	Rock	A4	BLM	New Construction	Open	Yes	0.02
54	Natural/Unk	Rock	A5	BLM	New Construction	Open	Yes	0.02
54	Natural/Unk	Rock	A6	BLM	New Construction	Open	Yes	0.03
54	Natural/Unk	Rock	B	BLM	New Construction	Open	Yes	0.51
54	Natural/Unk	Rock	B1	BLM	New Construction	Open	Yes	0.07
54	Natural/Unk	Rock	B2	BLM	New Construction	Open	Yes	0.03
54	Natural/Unk	Rock	B3	BLM	New Construction	Open	Yes	0.04
54	Natural	Natural	D	Not Known	New Construction	Open	Yes	0.05
54	Rock	Rock	Private	Not Known	Renovation	Open	Yes	1.65
55	Natural/Unk	Rock	A	BLM	New Construction	Open	Yes	0.57
55	Natural	Natural	A2	BLM	New Construction	Open	Yes	0.05
55	Natural/Unk	Rock	A3	BLM	New Construction	Open	Yes	0.02
55	Natural	Natural	B	Not Known	New Construction	Open	Yes	0.04
55	Natural	Natural	B1	Not Known	New Construction	Open	Yes	0.02
55	Natural	Natural	C	BLM	New Construction	Open	Yes	0.23
55	Natural	Natural	D	BLM	New Construction	Decom	Yes	0.20
55	Natural	Natural	E	Not Known	New Construction	Open	Yes	0.15
55	Rock	Rock	27-13-13.0	Not Known	Renovation	Open	Yes	0.34
55	Rock	Rock	27-13-13.0	Private	Renovation	Open	Yes	0.27
55	Rock	Rock	27-13-13.1	Private	Renovation	Open	Yes	0.76
55	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	Yes	1.47
55	Rock	Rock	Private	Not Known	Renovation	Open	Yes	0.86
56	Natural/Unk	Rock	B	BLM	New Construction	Decom	No	0.19
56	Natural/Unk	Rock	B1	BLM	New Construction	Decom	No	0.02
57	Rock	Rock	26-12-25.2	BLM	Decommission	Full Decom	No	0.06
57	Natural/Unk	Rock	A	BLM	New Construction	Decom	No	0.50
57	Natural/Unk	Rock	A1	BLM	New Construction	Decom	No	0.16
57	Natural/Unk	Rock	I	BLM	New Construction	Decom	No	0.09
57	Natural/Unk	Rock	J	BLM	New Construction	Open	No	0.07
57	Natural	Natural	K	BLM	New Construction	Decom	No	0.18
57	Natural	Natural	M	BLM	New Construction	Decom	No	0.02
57	Rock	Rock	26-12-25.2	BLM	Renovation	Open	No	0.22
57	Rock	Rock	26-12-35.4	BLM	Renovation	Open	No	0.54
57	Natural/Unk	Natural/Unk	27-11-5	BLM	Renovation	Open	No	0.33

EA Unit #	Existing Surface	New Surface	Road Name/Number	Road Control	Construction Type	Closure Status	Existing Gate	Road Miles
57	Natural/Unk	Natural/Unk	27-11-5	Not Known	Renovation	Open	No	0.02
57	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	No	0.46
57	Rock	Rock	Spur 34	BLM	Renovation	Decom	No	0.05
58	Natural/Unk	Rock	A	BLM	Improvement	Open	Yes	0.87
58	Natural/Unk	Rock	A1	BLM	Improvement	Open	Yes	0.03
58	Natural/Unk	Rock	A2	BLM	Improvement	Open	Yes	0.06
58	Natural/Unk	Rock	B	BLM	Improvement	Open	Yes	0.17
58	Natural/Unk	Rock	A3	BLM	New Construction	Open	Yes	0.04
58	Natural	Natural	D	BLM	New Construction	Decom	No	0.08
58	Rock	Rock	27-12-14.2	BLM	Renovation	Open	Yes	1.26
58	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	No	0.14
59	Natural/Unk	Rock	C	BLM	New Construction	Open	Yes	0.33
59	Rock	Rock	27-12-14.0	BLM	Renovation	Open	Yes	1.72
62	Natural/Unk	Rock	B	BLM	New Construction	Open	No	0.05
63	Natural/Unk	Rock	J	BLM	New Construction	Decom	No	0.07
63	Natural/Unk	Rock	K	BLM	New Construction	Open	No	0.05
63	Rock	Rock	27-12-3	BLM	Renovation	Open	No	0.67
67	Natural	Natural	A2	BLM	New Construction	Open	Yes	0.13
67	Natural/Unk	Rock	A3	BLM	New Construction	Open	Yes	0.10
70	Natural/Unk	Rock	A	BLM	New Construction	Open	No	0.27
70	Rock	Rock	27-12-5	BLM	Renovation	Open	No	0.63
71	Natural	Natural	B	BLM	New Construction	Open	No	0.06
71	Natural	Natural	C	BLM	New Construction	Open	No	0.07
71	Rock	Rock	27-12-4.1	BLM	Renovation	Open	No	1.45
72	Natural/Unk	Natural	Spur 28	BLM	Decommission	Full Decom	Yes	0.09
72	Natural/Unk	Natural	Spur 36	BLM	Decommission	Full Decom	Yes	0.20
72	Natural/Unk	Rock	Private	Not Known	Improvement	Open	Yes	0.23
72	Natural/Unk	Rock	Spur 28	Not Known	Improvement	Open	Yes	1.35
72	Natural/Unk	Rock	B	BLM	New Construction	Open	Yes	0.18
72	Natural	Natural	E	BLM	New Construction	Open	Yes	0.84
72	Natural/Unk	Rock	E	BLM	New Construction	Open	Yes	0.24
72	Natural	Natural	E1	BLM	New Construction	Open	Yes	0.08
72	Natural	Natural	E2	BLM	New Construction	Open	Yes	0.04
72	Natural	Natural	E3	BLM	New Construction	Open	Yes	0.11
72	Natural	Natural	F	BLM	New Construction	Open	Yes	0.03
72	Natural	Natural	G	BLM	New Construction	Open	Yes	0.05
72	Natural/Unk	Natural/Unk	G	Not Known	Renovation	Open	Yes	0.10
72	Natural/Unk	Natural/Unk	Private	Not Known	Renovation	Open	Yes	0.50
72	Rock	Rock	Private	Not Known	Renovation	Open	Yes	1.08
73	Natural/Unk	Rock	A	BLM	New Construction	Open	Yes	0.26
74	Natural/Unk	Rock	Spur 35	BLM	Improvement	Open	Yes	0.27
74	Natural	Natural	I	BLM	New Construction	Open	Yes	0.05
75	Natural/Unk	Rock	C	BLM	New Construction	Open	Yes	0.20
79	Natural/Unk	Rock	C	BLM	New Construction	Open	Yes	0.13
81	Natural/Unk	Rock	D	BLM	New Construction	Open	Yes	0.25
81	Natural	Natural	H	BLM	New Construction	Decom	Yes	0.05
81	Natural/Unk	Natural	H	Not Known	Swing Road	Open	Yes	0.17

Unk = Unknown

Decom = Decommission

Table B-3: Road Renovation/Improvement and New Construction on Private Ownerships

Road Construction	Township and Range				Total Miles
	T26S-R12W	T27S-R11W	T27S-R12W	T27S-R13W	
Improvement			2.39		2.39
Renovation	2.16	3.64	14.55	5.91	26.26
Swing Road Renovation			0.36		0.36
New Dirt Roads	0.06	0.08	0.85	0.30	1.29
New Rock Roads			0.35	0.14	0.49
Total	**2.22**	**3.72**	**18.49**	**6.35**	**30.79**

Table B-4: Access on Private Ownerships - New/Amended Right-of-Way Agreements or Easements

Access Route Legal		Road Miles					Access Request	BLM Treatment Area	
T-R	Section	Improve-ment	Renovation	New Dirt Roads	New Rock Roads	Total Miles		Unit #	Legal
T26S-R12W	24		0.48	0.06		0.54	ROW	57	26-12-25
T26S-R12W	33,34		1.35			1.35	ROW	26	27-12-03
T27S-R12W	07, 08	1.20			0.07	1.27	ROW	42-46, 53	27-12-17
T27S-R12W	10		0.75	0.36		1.10	ROW	50	27-12-09
T27S-R12W	10			0.05		0.05	ROW	1, 4	27-12-15
T27S-R12W	14		0.30			0.30	ROW	1	27-12-15
T27S-R12W	16		1.77	0.44	0.18	2.39	ROW	1	27-12-15
T27S-R12W	18		0.46			0.46	ROW	55	27-13-13
T27S-R12W	21, 22		3.26			3.26	ROW	3	27-12-23
T27S-R12W	23	0.01	0.56			0.57	ROW	3	27-12-23
T27S-R12W	27		0.88	0.12		1.00	ROW	5	27-12-27
T27S-R12W	28	0.33	1.10	0.07	0.02	1.52	Easement	5	27-12-27
T27S-R12W	30, 31		1.15	0.01		1.16	Easement	72-77	27-12-19
T27S-R12W	28		0.36		0.02	0.38	Easement	34,37,67	27-12-33
T27S-R12W	34		1.25		0.06	1.31	ROW	35,38	27-12-33
T27S-R13W	11		0.19	0.02	0.08	0.29	ROW	11	27-13-11
T27S-R13W	12		0.91	0.16		1.07	ROW	55	27-13-13
T27S-R13W	13,14		1.17			1.17	Easement	17	27-13-13
T27S-R13W	25, 36		0.10			0.10	Easement	81-83	27-12-19
Total Miles		**1.55**	**16.04**	**1.28**	**0.43**	**19.30**			

APPENDIX C: SAMPLE TREE FALLING

Sample Tree Falling (STF) is supplemental to many cruise methods. STF provides the direct measurement of form class, bark thickness, taper, defect, breakage, volume and value without bias. Sample tree falling is a statistically valid sampling methodology (Bell and Dilworth 1997 (Revised), Iles 2003, USDI 1989) where a portion of the cruise trees are selected to be felled, bucked (cut-to-length) and scaled. By felling a sample tree and substituting the scale of the tree for the cruise in the volume calculations, the measurement bias created through ocular estimation is eliminated. Measurements that are gained by felling, such as form class, bark thickness, and stump to DBH ratio, can be applied to the remaining standing sample trees and incorporated into district databases. Because of the statistically valid cruise design, the volume of the sample trees can be reliably extrapolated to the rest of the harvest unit.

The pure ocular cruising method makes many assumptions about the tree:

- The cruiser selects the correct form class/bark thickness ratio/volume equation.
- The cruiser accurately measures the tree height and DBH.
- The form of the tree and merchantable height fit the measured form class/volume equation.
- Tree defect is apparent by visible indicators.
- The cruiser assumes the correct amount of hidden defect and breakage.

Although form class and bark thickness can be obtained by climbing the tree, these other variables are estimated and are subject to inherent measurement bias. Form class measurements derived from STF are used on sample trees that are not felled. Each form class often represents a 2.5 to 3 percent volume difference. The form class measurements are incorporated into the district databases, which supplies an average for each diameter class. These averages are used to estimate volumes on stands that are not sampled.

Some of the defect is evident, such as broken tops or frost cracks, while the hidden defect, such as laminated root rot or rot associated with visible defect, can often result in an appreciable loss of volume in the tree.

STF measurements are used to develop ratios of stump diameter (both inside and outside bark) to diameter at breast height. Similarly, bark thickness ratios have been developed on each district by the use of STF. The bark thickness ratio is used in the stand exam program and inventory program for the estimation of inside bark diameter at the top of the first log. This ratio is used in form class calculations.

STF is used to validate Flewelling or Ingy volume equations. Unlike Behre’s hyperbola, which utilizes form class, these volume equations are based on total height and taper. The STF of timber in any given area will show which volume equation model closely matches the actual volume of the scaled trees. By falling and measuring the sample trees, there is an opportunity to calibrate the volume equation to the correct taper. This information provides the opportunity for the cruise to achieve a higher degree of accuracy.

The Code of Federal Regulations requires the BLM to sell timber on a tree cruise basis (43 CFR 5422.1) and to have an accurate appraisal at the time the sale is offered (43 CFR 5420.0-6). This is referred to as a lump-sum sale. Timber in a lump-sum sale is assessed and given a specific value. This value becomes the BLM cruise estimate and is the minimum bid for the removal of timber in the advertised sale. The winning bidder pays the exact amount of the winning bid to the BLM.

The BLM Manual Supplement Handbook 5310-1, 1989 states 'In addition to meeting sample error standards, the volume estimates of all 3P and variable plot methods must be checked by felling a portion of sample trees. Sample trees must be felled, bucked and scaled to minimize technique error through an on-site check of merchantable tree height, form class/bark thickness, defect deduction and grade estimation." For timber with 85-99% recovery, a minimum of 10% of the sample trees are required to be felled.

It is in the public interest that the BLM maintains accurate and reliable timber cruises. This practice aids at improving and maintaining accurate and reliable timber cruise information and provides statistically reliable data. It helps ensure the public receives the fair market value for the timber sold as required by Congress through FLPMA.

APPENDIX D: RATING TERMINOLOGY OF THE NRCS SOIL LIMITATIONS

Erosion Hazard (off-road or trail) Rating

The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance.

The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Mechanical Equipment Rating

Ratings for this interpretation indicate the suitability for use of forestland harvesting equipment. The ratings are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification of the soil, depth to a water table, and ponding. Standard rubber-tire skidders and bulldozers are assumed to be used for ground-based harvesting and transport.

The ratings are both verbal and numerical. Rating class terms indicate the degree to which the soils are suited to this aspect of forestland management. "Well suited" indicates that the soil has features that are favorable for the specified management aspect and has no limitations. Good performance can be expected, and little or no maintenance is needed. "Moderately suited" indicates that the soil has features that are moderately favorable for the specified management aspect. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. "Poorly suited" indicates that the soil has one or more properties that are unfavorable for the specified management aspect. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration.

Soil Compaction Resistance

This interpretation rates each soil for its resistance to compaction. Compaction tends to reduce water infiltration, which affects plant production and composition, increases runoff which generally increased erosion rates, and affects organisms living within the soil.

Compaction 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.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are made suitable by all of the soil features that affect the suitability of soil material for chaining. "High resistance" indicates that the soil has features that are very favorable to resisting compaction. "Moderate resistance" indicates that the soil has features that are favorable to resisting compaction. "Low resistance" indicates that the soil has one or more features that favor the formation of a compacted layer.

The overall rating class for each soil is assigned based on the product of the numerical ratings of the individual soil properties considered in the interpretation, some of which may not be displayed.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer is determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Soil Restoration Potential

This interpretation rates each soil for its inherent ability to recover from degradation, which is often referred to as soil resilience. The ability to recover from degradation means the ability to restore functional and structural integrity after a disturbance. Both the rate and degree of recovery need to be considered. Soil functions that are important include sustaining biological activity, diversity and productivity; capture, storage and release of water; storing and cycling nutrients and other elements; filtering, buffering, degrading, immobilizing and detoxifying contaminants; providing support for plant and animal life; and protection for archeological sites. Restoration goals may include re-establishment of a preferred natural plant assemblage of the ecological site that existed prior to decline to a degraded state.

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. Dynamic soil properties, such as microbial biomass and diversity or carbon nitrogen ratio, are not used for this rating since they are not contained within the soil database.

Permeability Rating (Saturated Hydraulic Conductivity)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits. The classes are based on the number of micrometers of water that can infiltrate into the soil in a given length of time.

Ksat class	Ksat values
Very low	0.00 to 0.01
Low	0.01 to 0.1
Moderately low	0.1 to 1.0
Moderately high	1 to 10
High	10 to 100
Very high	100 to 705

APPENDIX E: BOTANICAL SPECIAL STATUS SPECIES

Table 1: Special Status Plant Species - Known or suspected to occur within Fairview NWFP Project area
Table 2: Survey and Manage Category A & C Species
Table 3: SSS Fungi - Reasonably certain to occur within project area

Table 1: Special Status Plant Species - Known or suspected to occur within Fairview NWFP Project area

Section 1: Vascular (Section 1) and Nonvascular plants (Section 2) and are Bureau Sensitive which warrant surveys.

Surveys are recommended for some Bureau Sensitive species that are known or suspected to occur in a proposed unit. If a Bureau Sensitive species is known or suspected to occur in the project area but the management activity is not likely to impact the species, then surveys are not recommended. In addition, surveys are not recommended for species considered impractical to survey for (USDA and USDI 2000). Surveys are considered practical "if characteristics of the species (such as size, regular fruiting) and identifying features result in being able to reliably locate the species, if the species is present, within one to two field seasons and with a reasonable level of effort" (USDA and USDI 2000, Vol. 1 p. 479). Characteristics determining practicality of surveys include: "individual species must be of sufficient size to be detectable; the species must be readily distinguishable in the field or with no more than a simple laboratory or office examination for verification of identification; the species is recognizable, annually or predictably producing identifying structures; and the surveys must not pose a health or safety risk" (USDA and USDI 2000, Vol. 1 p. 479).

*Scientific and Common Name	Habitat	Likelihood of Occurring in the Project Area
Adiantum jordanii (California maidenhair fern)	Perennial herb, moist shaded seeps, hillsides, or moist woods and forests, <1,200 m.	Moderate. Known from Bear Creek Rec. site T30S-R09W-9.
Carex gynodynama (wonderwoman sedge)	Perennial, moist meadows and open forests, <600 m, Smith Pond off of Signal Tree road at T30S, R9W, Sec 3.	Low. The habitat this species prefers is scarce in the proposed project area.
Cimicifuga elata var. *elata* (tall bugbane)	Perennial forb or herb, coniferous forest, north of Umpqua River, and east side of district, flowers June to early August.	Low. Present in the western hemlock forest association on Eugene and Roseburg BLM lands directly adjacent to Coos Bay BLM land.
Eucephalus vialis (=*Aster vialis*) Wayside Aster	Dry, open oak or coniferous woods with Douglas-fir, golden chinquapin and Oregon white oak, edges between forest and meadow, 200 to 500 m in Lane, Douglas, and Linn Counties.	Low. It prefers areas with more light- openings in the forest along roadside, etc.

*Scientific and Common Name	Habitat	Likelihood of Occurring in the Project Area
Iliamna latibracteata (California globe mallow)	Perennial forb or herb, moist ground and stream banks, blooms June and July, Big Sandy Tie road at T28S, R10W, Sec 31; a site at T31S, R12W, Sec 17 was extirpated during culvert replacement in 1999.	Moderate The only known site of this species on district is along the Big Creek mainline. It prefers areas with more light- openings in the forest, recent burns, roadsides, etc.
Pellaea andromedifolia (Coffee fern)	Perennial forb or herb, fern, rocky outcrops up to 5900 ft, Cherry Creek Ridge at T27S, R10W, Sec 25, and Irwin Rocks.	High A known site exists within the analysis area
Polystichum californicum (California sword-fern)	Perennial fern, woods, stream banks, shaded rocky outcrops, Pistol River T38S, R14W, Sec 22 and Indian Creek Road at T29S, R12W, Sec 24.	Low. The habitat this species prefers is scarce in the proposed project area.
Scirpus pendulus (drooping bulrush)	Marshes, wet meadows, and ditches, 800 to 1,000 m, KM Ecoregion.	Low. The habitat this species prefers is scarce in the proposed project area.

Table 1 - Section 2: SSS Nonvascular plants within the project area that are suspected to occur, are Bureau Sensitive and surveys are practical to complete.

*Scientific Name	Plant Group	Habitat	Likelihood of Occurring on the Project Area
Bryoria subcana	Lichen	Coastal forest and high precipitation summit. Several Coos Bay BLM sites have been located; Species seem to prefer ridgelines.	High There are several BLM sites located in 60yr. old+ Douglas-fir stands.
Calicium adspersum	Lichen	Growing on bark on boles of old-growth conifer trees.	Low There are very few legacy trees left on the project area.
Codriophorus depressus *(Racomitrium depressum)*	Moss	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. Bednarek-Ochrya and Ochyra (2006) stress its occurrence in intermittent streams and other seasonally wet habitats that dry out by midsummer.	Low Habitat is scarce on project area

*Scientific Name	Plant Group	Habitat	Likelihood of Occurring on the Project Area
Dermatocarpon mieophyllizum *(=D. luridum)*	Lichen	Occurs between 1,000-4,400 feet on rock and boulders in seepy terraces, slopes, and riparian edges with red alder, Douglas-fir and maple spp., and on granite rocks along stream edges hemlock and red cedar in riparian areas.	Low Habitat is scarce on project area
Diplophyllum plicatum	Liver-wort	Tree boles of western hemlock and red cedar in riparian areas.	High There are several sites within analysis area. Habitat is present
Heterodermia leucomela	Lichen	Wetter maritime, coastal western hemlock zone within highly oceanic northern temperate zone and appears to be restricted to twigs of Sitka spruce in sheltered, humid, foreshore situations.	Low. Habitat is scarce within project sites
Hypogymnia duplicata	Lichen	Mid-elevation moist western hemlock stands, old-growth Douglas-fir, mature western hemlock/Douglas-fir forest, moist Pacific silver fir or noble fir forests, Sitka spruce, riparian forest and later-successional forest along ridge-tops in Oregon Coast Range, also occurs on red alder in sedge-sphagnum bogs in Oregon Coast Range, elevation ranges from 1,100 to 5,450 feet.	Low. Habitat is scarce within project sites
Hypotrachyna revoluta	Lichen	Usually on bark and rarely on rock, Coast Range and immediate coast in OR, at Cape Arago, also from Rocky and Appalachian Mountains, east coast of Canada, Great Lakes area, and southwest border of US with Mexico.	Low Habitat is scarce on project area
Leptogium cyanescans	Lichen	Tree bark of deciduous trees, but also occurs on juniper and western red cedar, decaying logs, and mossy rocks in cool, moist microsites, widely scattered. Location in CR Ecoregion in Lane & Lincoln counties ONLY.	High Known site locates within the analysis area. Potential habitat is present on project area.
Lobaria linita	Lichen	Mature to old-growth forests, oak forests with rock outcrops, late-mature tan-oak and madrone forests, 1,800 to 6,700 ft; CR & WC Ecoregions	Low. Has been found as far south as Douglas Co.
Metzgeria violacea	Liver-wort	Hyper-maritime, on tree trunks, usually shaded, near coast; growing in dense mats or mixed among other bryophytes.	High Site occurs within the analysis area at Catching Slough and inland on the Siuslaw NF
Niebla cephalota	Lichen	Coastal habitats but may extend up to 15 miles inland where influenced by the coastal fog belt, occurs on exposed trees, shrubs, and less often on rocks, rock or bark; known from northern CA, Oregon coast (North Spit), and part of WA coast' CR Ecoregion.	Low Habitat is scarce within project sites.

*Scientific Name	Plant Group	Habitat	Likelihood of Occurring on the Project Area
Porella bolanderi	Liver-wort	On outcrops and boulders (limestone, silica, serpentine, or sandstone), soil, and epiphytic on oaks, myrtlewood, bigleaf maple, Douglas-fir, Shasta red fir, redwood, and ponderosa pine; commonly at 100-750 m but known from 0 to 2,000 m; KM & WV Ecoregion	Low.
Schistostega pennata	Moss	Mineral soil in shaded pockets of overturned tree roots, often with shallow pools of standing water at the base of the root wad: attached to rock or mineral soil around the entrance to caves, old cellars, and animal burrows: CR & WC Ecoregions.	Low.
Tayloria serrata	Moss	Grows on humus and animal dung; KM, WV, & WC Ecoregions.	Low.
Tetraphis geniculata	Moss	Found on down logs in late-successional conifer forests in W. OR and WA.	Low. Pockets of remnant legacy trees on proposed thinning and regen units and some large down wood throughout the project area.
Tetraplodon mnioides	Moss	In the Pacific Northwest, forming stiff, densely-packed sods on old carnivore dung, or soil and rotten wood enriched by dung, on roadsides, trails, in dry to moist coniferous forest of various age classes	Low. Tetraplodon mnioides has a fairly broad ecological tolerance

Table 2: Survey and Manage Category A & C species

Predisturbance surveys are required and practical for the rare Category A & C species. (USDA 2001)

Species	Group	S & M Category	Likelihood of occurring in project area	Habitat
Bridgeoporus nobilissimus	Fungi	A	Low	Mesic to wet microsites in forest of all seral stages in range of Pacific Silver Fir and Noble Fir.
Bryoria tortuosa	Lichen	A	Low	Grows on well-lit, open oak and pine stands in drier habitat.
Hypogymnia duplicata	Lichen	A	Low	Mid-elevation moist western hemlock stands, old-growth Douglas-fir, mature western hemlock/Douglas-fir forest, moist Pacific silver fir or Noble fir forests, Sitka spruce, riparian forest and later-successionial
Leptogium hirsutm	Lichen	A	Low	Deciduous tree bark also occurs on juniper and western red cedar, decaying logs, and mossy rocks in cool, moist microsites, widely scattered.
Leptogium cyanescens	Lichen	A	Medium	On mossy moist rocks in moist riparian areas in the Pacific Northwest.
Lobaria linita	Lichen	A	Low	Mature to old-growth forests, oak forests with rock outcrops, late-mature tanoak and madrone forests, 1,800-6,700 ft.
Niebla cephalota	Lichen	A	Low	Coastal habitats but may extend up to 15 miles inland where influenced by the coastal fog belt, occurs on exposed trees, shrubs, and less often on rocks, rock or bark; known from northern California and Oregon Coast.
Platismatia lacunosa	Lichen	C	Med.-high	Occurs on boles and branches of hardwoods and conifers in both moist, cool, upland sites and moist riparian forests from sea level to 3500' in elevation.
Pseudocyphellaria rainierensis	Lichen	A	Low	Old-growth conifer trees in western hemlock forests and on Pacific yew trees in stands, 300-4,000 ft
Ramalina thrausta	Lichen	A	High	Western hemlock stands on tree branches in open areas or along edges
Teloschistes flavicans	Lichen	A	Low	Coastal forests, shore pine and Sitka spruce. On hardwoods beneath sparse *Picea* (Cape Blanco)
Schistostega pennata	Moss	A	Low-Med.	Occurs on mineral soil in crevices on root mass of fallen trees in moist forests habitat such as Silver fir, Western hemlock and mountain hemlock forests.
Tetraphis geniculata	Moss	A	Medium	On well rotted logs and stumps, often on cut ends

Species	Group	S & M Category	Likelihood of occurring in project area	Habitat
Botrychium minganense	Vascular	A	Low	Dense forest to open meadow to permanently saturated fens and seeps. Most commonly found on the basaltic soils of the Blue Mountains of NE Oregon.
Botrychium montanum	Vascular	A	Low	Old-growth western red cedar (*Thuja plicata*) on alluvial terraces along smalls steams containing moist soil and organic matter. In California it grows in similar soils under incense cedar (*Calocedrus decurrens*)
Coptis aspleniifolia	Vascular	A	Low	Cool, moist, mossy sites in older forests with well-developed litter layer, below 2800 feet elevation.
Coptis trifolia	Vascular	A	Low	Boggy, wet seepage areas, sphagnum hummocks and muskegs to deep woods and mossy places.
Corydalis aquae-gelidae	Vascular	A	Low	Close proximity to seeps, springs or streams with relatively cold water, substrate of gravely sand, upper level canopy closure of 70-90 percent and little gerbaceous competition at 1200-4260 feet elevation.
Cypripedium fasciculatum	Vascular	C	Low	Perennial forb/herb, numerous plant habitats: mixed evergreen, mixed conifer, and pine/oak forests. A historic location along Williams River has not been relocated.
Cypripediium montanum	Vascular	C	Low	Occurs from 2500-4000 feet elevation on slopes of 25-50 percent in wooded communities with 60-80 percent canopy closure in Douglas-fir and Ponderosa pine forests.
Eucephalis vialis	Vascular	A	Low-Med.	Dry, open oak or coniferous woods with Douglas-fir, golden chinquapin and Oregon white oak, edges between forest and meadow, 200 to 500 m in Lane, Douglas, and Linn Counties.
Galium kamtschaticum	Vascular	A	Low	Occurs most often on low angle slopes with saturated soils, under dense shrub or fern thickets and in silver fir/devil's club, huckleberry plant association.
Plantanthera orbiculata var. orbiculata	Vascular	C	Low	Found in mature to old-growth stands in shade and deep, moist undisturbed litter from low to middle elevations on moderate slopes in either western hemlock or Pacific silver zones.

Table 3: SSS Fungi Species - Reasonably certain to occur within analysis area

SPECIES	# of Known Sites		Documented sites on Coos Bay BLM lands		Habitat requirements	Range of species
	WA/OR/CA	Coos Bay District	NFCR 5th field	CBFPO 5th field		
Arcangeliella camphorata	15	3	0	0	Associated with pines, especially Douglas-fir and western hemlock, 200-950 m, March through November, CR & KM Ecoregions and Washington.	Endemic to the Pacific Northwest (PNW) OR to British Columbia
Boletus pulchermis	26	0	0	0	West side Cascades in Lane County, sporocarps usually solitary in association with mixed conifer (grand fir, Douglas-fir) and hardwoods (tanoak) in coastal forests.	Endemic to the PNW from WA south to CA.
Cortinarius barlowensis	26	0	0	0	Coastal to montane mixed coniferous forests up to 4,000 feet elevation with western hemlock, Pacific Silver fir, Sitka spruce, and Douglas-fir. Known from Takenitch Lake in Douglas Co.	PNW from WA south to CA.
Cudonia monticola	32	2	0	0	Grows on spruce needles and coniferous debris; fruits in late summer and autumn	Western North America
Gomphous kaufmanii	72	1	0	0	Closely gregarious to caespitose, partially hidden in deep humus under Pinus and Abies	Western North America
Leucogaster citrinus	57	0	0	0	Sub-surface soil. Roots of white fir, sub-alpine fir, shore pine, western white pine, Douglas-fir, and western hemlock	PNW from WA south to CA.
Otidea smithi	13	0	0	0	Exposed soil, duff, or moss under black cottonwood, Douglas-fir, and western hemlock; solitary to gregarious. Fruits from August to December.	Known only from Roseburg and Salem BLM and near Crescent City, CA.
Phaeocollybia californica	66	9	0	0	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; fruits October-December	PNW from WA south to CA.
Phaeocollybia dissiliens	27	11	0	0	Occurs on soil, litter and humus in association with roots of Pacific fir, Sitka Spruce, Douglas-fir and western hemlock principally in Western Hemlock series. Elevation 300-2500 ft. OR Coast Range, Western Cascades, Klamath	PNW from British Columbia south to CA.

SPECIES	# of Known Sites		Documented sites on Coos Bay BLM lands		Habitat requirements	Range of species
	WA/OR/CA	Coos Bay District	NFCR 5th field	CBFPO 5th field		
Phaeocollybia olivacea	52	20	0	0	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; fruits October-December	PNW from WA south to CA.
Phaeocollybia oregonensis	42	3	0	0	On soil in association with roots of Douglas-fir, western hemlock and Pacific silver fir, primarily Western hemlock series at elevation 80-3800 feet. OR Coast Range, Western Cascades, Klamath.	PNW from WA south to CA.
Phaeocollybia pseudofestiva	46	12	0	0	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; fruits October-December	PNW from WA south to CA.
Phaeocollybia scatesiae	19	2	1	0	Occurs in litter, associated with roots of Pacific Silver fir, Douglas-fir, western hemlock. In OR/WA primarily in Western Hemlock and Pacific Silver Fir series. WA Olympic peninsula, OR Coast Range, Western Cascades, Klamath	PNW from WA south to CA.
Phaeocollybia sipei	66	38	0	0	40 year old plantations to >200 year old old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; fruits October-December	PNW from WA south to CA.
Phaeocollybia spadicea	88	28	0	0	40 year old plantations to >200 year old old-growth forests and in mature Sitka spruce stands in coastal lowlands regions;	PNW from WA south to CA.
Ramaria gelatiniaurantia	28	4	0	0	Occurs on litter and soil, associated with Pinaceae spp. Western Hemlock series. Elevation 1600-3600 feet. OR all provinces except Willamette Valley, WA Cascades	PNW from WA south to CA.
Ramaria largentii	17	1	0	0	Occurs on litter, humus and soil, associated with Pinaceae spp. Western Hemlock series, White Fir, Douglas-fir series. Elevation 1300-5000 feet. OR all provinces except Willamette Valley, WA Cascades.	PNW from WA south to CA.
Rhizopogon exiguus	3	0	0	0	Coastal, hypogeus fungi associated with roots of Douglas-fir and Western Hemlock around 950 meters elevationin; CR & KM Ecoregion. Fruits in March, August, September, and November.	Endemic to OR/WA
Sowerbyelia rhenana	73	1	0	0	Groups in duff of moist, undisturbed mature conifer forests, one collection from a tan oak stand in Curry County on Coos Bay BLM; CR & WC Ecogions.	North America as well as North Temperate zone in Europe and Asia.